SMBC and TfGM

STOCKPORT INTERCHANGE

Environmental Screening Report

14113-WSP-SKZ-ZZ-RP-Y-0040

MAY 2018

PUBLIC

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Environmental Screening Report

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WSP
The Victoria
150-182 The Quays
Salford, Manchester
M50 3SP
Phone: +44 161 886 2400
Fax: +44 161 886 2401
WSP.com

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1.1 REQUEST FOR EIA SCREENING OPINION

1.1.1. WSP UK Ltd and the wider project team are acting on behalf of Transport for Greater Manchester (TfGM) and Stockport Metropolitan Borough Council (SMBC) (hereafter referred to as the 'Applicant'). The Applicant intends to submit a planning application for the construction of a new bus interchange and mixed use development in Stockport (hereafter referred to as the 'Proposed Development'). Detail on the Proposed Development is provided in section 2.6, in brief it is proposed to include the following:

- A new covered bus interchange (hereafter referred to as the 'Interchange'), to include a northern and southern concourse building and operator accommodation (permanent driver accommodation and facilities);
- A multi-storey Residential Block of approximately 196 residential units hereafter referred to as the 'Residential Block';
- External green areas and a hard landscaped public park;
- Commercial Units / Offices on Exchange Street comprise of three office blocks;
- Construction of a pedestrian link bridge from the Interchange to the rail station;
- Swaine Street – consolidated arrangement which narrows the overall corridor;
- The external area of Heaton Lane Car Park is proposed to be used as a temporary bus station while the existing bus station is cleared and constructed; and
- Pedestrian / cycle routes via the proposed primary / secondary roads which will connect with the wider network.

1.1.2. This Request for a Screening Opinion has been prepared in order to obtain an Environmental Impact Assessment (EIA) Screening Opinion from SMBC as planning authority, in accordance with Part 2 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the 'EIA Regulations').

1.1.3. In accordance with Regulation 6(2) of the EIA Regulations, this request for a Screening Opinion includes the following:

- A plan sufficient to identify the land (Drawing No. STPT-BDP-XX-ZZ-DR-A-PM_30_10-0001_P01);
- A description of the development, including in particular:
  - A description of the physical characteristics of the development and, where relevant, of demolition works (Section 2); and
  - A description of the location of the development, with particular regards to the environmental sensitivity of geographical areas likely to be affected (Section 4 and 5).
- A description of the aspects of the environment likely to be significantly affected by the development (Section 5);
- To the extent the information is available, a description of any likely significant effects of the proposed development on the environment (Section 5) resulting from:
  - The expected residues and emissions and the production of waste, where relevant; and
  - The user of natural resources, in particular soil, land, water and biodiversity.
- Such other information or representations as the person making the request may wish to provide or make, including any features of the proposed development or any measures envisaged to avoided or prevent what might otherwise have been significant adverse effects on the environment. Mitigation has been identified and summarised within a Schedule of Mitigation in Appendix B. The aim of the schedule is to provide confidence to the local planning authority that mitigation identified is sufficient to avoid or prevent significant adverse effects.

1.1.4. The information provided in this report is considered to be sufficient to inform SMBC's Screening Opinion, in accordance with Regulation 6(2) of the EIA Regulations.

1.1.5. In line with Regulation 6(6a), SMBC have three weeks within which to provide a screening opinion, from the date of receipt of this request, as such a response is requested by 25th June 2018.

1.1.6. Due to there being two separate red line boundaries, where appropriate and where no studies of the Proposed Development have already been undertaken, this EIA Screening will be split into sub-headings based on these redline boundaries: the ‘Main Site’ (current bus station and Exchange Street) and the ‘Heaton Lane Site’ (temporary bus station location); together ‘the Site’.

2 CHARACTERISTICS OF PROPOSED DEVELOPMENT

2.1 INTRODUCTION

2.1.1. The Applicant intends to submit a hybrid planning application with full details for the Interchange, Residential Block development and principal detail only with respect to the Commercial Units / Offices, public realm improvements, split level car parking and the connecting pedestrian bridge on Exchange Street. This will consist of an outline planning application for the whole Proposed Development, with all reserved matters provided for the Bus Interchange site and the temporary bus station on Heaton Lane, but no reserved matters details provided for Exchange Street site (which includes the pedestrian bridge and commercial area).

2.1.2. All temporary and permanent works will be located within the Site, the boundary of which is shown in Appendix A, Drawing No. STPT-BDP-XX-ZZ-DR-A-PM_30_10-0001_P01.

2.1.3. Sections 2.2 – 2.6 provide further details of the Proposed Development, based upon information available at the time of the preparation of this request for Screening Opinion.

2.2 TIMINGS AND STAGES

2.2.1. The Proposed Development will be completed in seven key stages based on the RIBA (Royal Institute of British Architects) Plan of Works (2013)[1]. At this stage a definitive timeframe and phasing plan has yet to be confirmed past the current programme for Stage 2: Concept Design. In order to inform this report assumptions have been made with regards to timeframes for each stage.

2.2.2. The project team are currently working on Stage 2: Concept Design stage which will culminate in the production of the Concept Design Report to be submitted to the Applicant for Gateway Approval. This is due to be submitted to SMBC and TFGM on 25 July 2018, and will include all Stage 2 Discipline Reports.

2.2.3. TFGM and SMBC will then issue an instruction to commence RIBA Stage 3: Developed Design in September 2018. See Table 1 for more detail on the RIBA Stages and assumed timeframes for later stages of the Proposed Development.

Table 1: RIBA Stages with a brief definition for each stage and assumed (where yet to be confirmed) time period and time extent.

RIBA Stage	Brief Defintion	Time Period	Time Extent
1 – Preparation and Brief	Develop project objectives, undertake feasability studies and review of site information.	01/06/2017- 31/03/2018	209 days
2 – Concept Design	Prepare Concept Design, including outline proposals for structural design, building services systems, outline specifications and preliminary cost information. Issue final project brief.	09/03/2018- 07/09/2018	126 days
3 – Developed Design	Prepare Developed Design, including coordinated and updated proposals for structural design, building services systems, outline specifications, cost	03/09/2018- 31/01/2019	100 days

[1] RIBA, Plan of Works, 2013. Available online at: https://www.ribaplanofwork.com/PlanOfWork.aspx. Accessed May, 2018.

	information and project strategies in accordance with design programme.		
4 – Technical Design*	Prepare Technical Design in accordance with design responsibility matrix and project strategies to include all architectural, structural and building services information, specialist subcontractor design and specifications, in accordance with design programme.	02/08/2019- 16/04/2020	172 days
5 - Construction	Offsite manufacturing and onsite construction in accordance with construction programme and resolution of design queries from site as they arise.	01/05/2019- 06/06/2022	766 days
6 – Handover and Close Out	Handover of building and conclusion of building contract.	06/06/2022	-
7 – In Use (Operation)**	Undertake In Use services in accordance with schedule of services.	06/06/2022	-

*The Stage 4 design does not commence until after construction of the temporary bus station construction, the program will therefore need to be updated by the Applicant to reflect Heaton Lane design and construction, which may involve an element of accelerated Stage 4 design work later in 2018.

**The program will have phased openings starting with the interchange in Nov-2021 and the residential block in June-2022, this table has included only the final date of residential block completion.

2.3 DEMOLITION ACTIVITIES

2.3.1. It is currently planned for the following to be demolished:

- The existing bus interchange, including the bus driver accommodation;
- Light structures (existing lights attached to the east side of the Wellington (A6) Bridge);
- The McColl's convenience shop, located east, adjacent to Reggie's Chippy, off the Wellington (A6) Bridge, within the Main Site boundary; and Reggie's Chippy, located immediately east of the Wellington (A6) Bridge, within the Main Site boundary.

The existing Heaton Lane car park may also be required to be demolished but will be determined later in the design stages and, for the avoidance of doubt, does not form part of this request for Scoping Opinion.

2.3.2. A list of equipment that will be removed 'softly' (i.e. so they may be reused) from the original bus interchange will include:

- Seating;
- CCTV camera's; and
- Public address speakers.

2.3.3. The level and opportunity to recycle demolition material on site will be modest due to the limited amount of demolition required.

2.3.4. A number of assumptions have been made regarding key practices to be adopted and implemented as part of the demolition phase to manage anticipated activities and associated environmental effects.

2.3.5. A Demolition Environmental Management Plan (DEMP) will be prepared by the principal demolition contractor (when appointed) and submitted to the SMBC planning department for approval prior to commencement of demolition activities.

2.3.6. Whilst the exact content of the DEMP will be determined by the principal contractor, it is anticipated that the DEMP will include consideration of the following:

- Working hours;
- Haulage/ Access Routes;
- Environmental Management Practices;
- Noise and vibration;
- Dust;
- Air pollutants and particulate matter;
- Lighting; and
- Waste management.

2.3.7. Any earth works below existing ground levels and vegetation or tree clearance works that are proposed during the demolition phase, for the Site, will be determined and detailed within the DEMP which is referenced in the Schedule of Mitigation (Appendix B).

2.4 REMEDIATION ACTIVITIES

2.4.1. Given the historic use of the Main Site and the surrounding area, there is the potential for contaminants to be present. This is due to previous land uses including various factories, mills and print works within the Main Site and its immediate surrounding area.

2.4.2. There is the potential for contamination within the ground / groundwater during the piling process into the underlying Principal Aquifer, depending on the technique selected. Ground Investigations (GI) will be undertaken by the project team and a Contaminated Land Assessment Report will be carried out which will include an assessment of potential contaminated land risks, demonstrate where remediation is required and outline any remedial measures The Contaminated Land Assessment Report will be included as part of the planning submission for the Proposed Development.

2.5 CONSTRUCTION ACTIVITIES

2.5.1. At this stage, the details of the construction methods to be utilised on-site are not confirmed. Therefore, in order to determine any likely significant environmental effects arising during the construction phase, a number of assumptions have been made in relation to construction methods on-site.

2.5.2. The key site activities during the construction phase are summarised below and assume that during the demolition and remediation stage the majority of earthworks will have been completed in advance of the construction phase:

- Movement and use of static and mobile plant / construction vehicles;
- Validation of ground conditions, earthworks and re-profiling to meet required levels;
- Import of material on-site (to include any requirements for ground raising or surcharge);
- Materials handling, storage, stockpiling and disposal;
- Construction of infrastructure associated with the Proposed Development (i.e. loading out floors, use of scaffold towers, mobile elevated work platforms (MEWPs) etc);
- Foundation preparations;
- Construction of Heaton Lane including:
    - Re-surfacing of existing tarmac;
    - Alterations of some curb alignments;
    - Change gradients for tracking of vehicles;
    - Addition of lighting; and
    - Addition of CCTV;
- Construction of the Proposed Development; and
- Hard and soft landscaping including environmental mitigation.

2.5.3. Construction activities are anticipated to take place during working hours (08:00 – 18:00 Monday to Friday and 08:00 – 13:00 on Saturdays), with no works on Sundays and Bank Holidays.

2.5.4. A number of assumptions have been made regarding key practices to be adopted and implemented as part of the construction phase to manage activities and associated environmental effects.

2.5.5. A Construction Environmental Management Plan (CEMP) will be prepared and submitted to SMBC planning department for approval prior to the commencement of construction activities. The exact content of the CEMP will be dependent on finalised construction activities. At this time, it is expected that the CEMP would include the following details:

- Working hours (as outlined above);
- Haulage / Access Routes: the routing of vehicles and temporary workers will be confirmed as part of the CEMP;
- Environmental Management Strategies: At this point it is assumed that best practices and guidance for the management of noise, vibration, air quality, dust and artificial lighting will be included within the CEMP; and
- Waste Strategy: Which will be prepared and used to control waste volumes, in line with EU waste legislation and guidance and best practice measures.

2.6 PROPOSED DEVELOPMENT

2.6.1. A Proposed Development description has been prepared based on design information currently available in order to determine if there is potential for likely significant environmental effects arising from the Proposed Development (i.e. demolition, remediation, construction and operation phases).

PROPOSED LAND USE AND QUANTUM

2.6.2. The area of the Site is approximately 3.5ha, see Drawing No. STPT-BDP-XX-ZZ-DR-A-PM_30_10-0001_P01. A Feasibility Render of the Proposed Development is shown in Figure 4. It is anticipated that the Proposed Development will comprise the demolition, construction and operation (as appropriate) for the following:

- A new covered bus Interchange, to include a northern and southern concourse building and operator accommodation (permanent driver accommodation and facilities). The Interchange would include approximately 14 bus stands, with Drive In Reverse Out (DIRO) bays as a preference, and up to 9 layover/coach bays allowing up to 195 bus movements per hour. The Interchange will accommodate existing bus services only, therefore the number of buses will be very similar to the existing amount. The Interchange roof level will be approximately 51.2m AOD. The roof of this structure will form a public park. The Interchange will also include:
  - A permanent driver accommodation and facilities on site in the southeast corner;
  - A travel shop and a two storey area for offices; and
  - Ancillary food and beverage development opportunities.
- A multi-storey Residential Block of approximately 196 residential units (65% 2 bed and 35% 1 bed), made up of 14 residential floors at the front (north) and 16 residential floors at the back (south) creating a stepped plan layout (see Drawing No. STPT-BDP-RB-ZZ-SK-A-PM_40_40_79-0005 _ P01). There would be a commercial level at ground floor with two basement levels below this. The height of the building will be approximately 107.8m AOD to roof top level. The basement of the residential building will be at approximately 43.8m AOD therefore it will be just below the top of the Interchange, see above. There will be approximately 73 parking spaces (including disabled/ other operational spaces).
- External green areas and a hard landscaped public park. The green public park will be elevated above the Interchange. The park will include an oculus design in the centre which will be a large opening (approximately 40m by 90m in size) down into the bus interchange. This has been created to allow a clear bus routing which will not be obstructed by supporting columns within the Interchange and to introduce natural light and ventilation to the space. This area will be a high quality public space.
- Commercial Units / Offices on Exchange Street. Current outline development proposals for the Exchange Street area comprise of three office blocks, two of which will sit above a basement (undercroft) Multi-Storey Car Park (approximately 122 spaces) and one with no basement. The three buildings will be connected to Stockport Interchange by a pedestrian bridge and to Stockport rail station via Station Road (vehicle access). The Exchange Street development is proposed to be progressed through to outline

permission only, which once secured will enable commercial development and its design detail requirements to be forth coming. Therefore minimal information is available at this stage other than basic form, scale and mass allowing for assumptions such as this development will likely accommodate approximately 122 parking spaces.

- Construction of a pedestrian link bridge from the Interchange to the rail station, to promote improvements between the two facilities and onward to the town centre, whilst also catering for accessibility needs. The footbridge will provide step free access between Stockport Interchange and Stockport railway station
- Swaine Street – consolidated arrangement which narrows the overall corridor by combining the footway along the eastern edge of Swaine Street which will provide three drive in drive out bays, with a public right of way to be provided over private land. The new width of the road will be approximately 12.7m.
- The external area of Heaton Lane Car Park is proposed to be used as a temporary bus station while the existing bus station is cleared and constructed. The Heaton Lane temporary bus station will retain public car parking on the ground level to the south of the existing multi-storey car park building. The existing ramp access to the upper levels will also be retained for car access. The temporary bus station will occupy the external area to the southeast of the existing multi-storey building. This will include re-surfacing of the existing road surface on Heaton Lane and in the car park areas, changing some kerb alignments and gradients for tracking of vehicles; porta cabins for driver welfare, repositioning lampposts and providing appropriate CCTV measures.
- Pedestrian / cycle routes via the proposed primary / secondary roads which will connect with the wider network. The park will be accessible for pedestrians and cyclists via the following points:
    - Via a proposed pedestrian/cycling bridge link to the railway station in the south west corner;
    - Via at grade access to A6 Wellington Bridge viaduct from two points;
    - Via lift to the riverside / Interchange in the north east corner (the upper park level will be approximately 51.7m AOD); and
    - Via internal spiral stairs and internal lift in the northwest corner (from Park to River Mersey side).

PROPOSED ACCESS AND CIRCULATION

2.6.3. The primary access for buses into the Interchange will be from Swaine Street, buses will also be able to exit (but not enter) the interchange from the east towards Mersey Square via an arch under the A6 Wellington Bridge.

2.6.4. The Proposed Development will include additional pedestrian / cycle routes via the proposed access and primary / secondary roads which will connect with the wider network. The access points for pedestrians and cyclists are outlined above.

2.6.5. The park will also be designed to support light vans and lawnmowers for maintenance purposes, which will be accessed via the A6 and there will be cycle access through the park. This may also provide emergency vehicle access depending on conclusion of fire strategy.

2.6.6. The residential multi-storey car park will be accessed by residents from Daw Bank. Maintenance access and waste collection undertaken on a planned pre agreed basis will be via the interchange. There will be no vehicle access via the park (only potential emergency vehicle access, as mentioned above).

2.6.7. Cycle storage, for the use of the general public, is proposed to be located as close as possible to the Trans Pennine Trail (potentially Mersey Square) and would be well lit and have the benefit of CCTV. Further details of this aspect will be progressed at later design stages.

2.6.8. During construction there will be temporary closures and diversions to highways and access points which will be provided in detail in the planning application and RIBA Stage 3 of the Proposed Development.

2.6.9. The part of the Heaton Lane car park which will be occupied by the temporary bus station will be accessed via Heaton Lane. Cars will retain their current access to the Heaton Lane car park from Great Egerton Street, but minor changes to vehicle routing will be made within the car park ground floor parking area.

PROPOSED BUILDING DENSITY AND HEIGHTS

Residential Block

2.6.10. The Residential Block will comprise of approximately 196 units with approximately 65% 2 bed and 35% 1 bed, made up of 14 residential floors at the front (north) and 16 residential floors at the back (south) creating a stepped plan layout (see Drawing No, STPT-BDP-RB-ZZ-SK-A-PM_40_40_79-0005 _ P01). The typical size of the units are 675ft^2 for the 2 bed flats and 500ft^2 for the 1 bed flats.

- A commercial / office space level is proposed for below the residential building at park level.

Interchange

- The height of the interchange at roof level will be approximately 51.2m.

Park

- The park will sit on top of the bus interchange roof at a height of approximately 51.7m.
- The oculus mentioned above, will be approximately 40m by approximately 90m in width and length.

Commercial Units / Offices

- The Exchange Street area is approximately 0.9ha.
- Current outline development proposals for the Exchange Street area comprise of two office blocks linked by a three storey undercroft car park and a one office block with no basement.

3 SCHEDULE OF PROPOSED DEVELOPMENT WITHIN EIA REGULATIONS

3.1.1. Based on the characteristics of the Proposed Development (Section 2), it is not considered that the Proposed Development would fall under Schedule 1, as described within the EIA Regulations, but rather the Proposed Development is considered to fall under Schedule 2, Part 10b (urban development projects).

3.1.2. The Proposed Development is approximately 3.5 hectares (ha) and planning is sought for approximately 196 dwellings, exceeding both the 1 ha of non-dwelling house urban development, and the 150 dwellings thresholds outlined within Schedule 2 of the EIA Regulations. Nevertheless, as outlined within the EIA Regulations and Department for Communities and Local Government Planning Practice Guidance (2014)[2], the exceedance of the thresholds detailed within Schedule 2, Column 2 does not automatically determine that the Proposed Development is EIA, but rather that the "*proposal needs to be screened by the local planning authority to determine whether significant effects are likely and hence whether an assessment is required*".

3.1.3. The selection criteria for screening a Schedule 2 development are detailed within Schedule 3 of the EIA Regulations and are as follows:

- Characteristics of the development;
- Location of the development; and
- Types and characteristics of potential impact.

3.1.4. The following sections of this EIA Screening Report aim to fulfil the requirements of Schedule 3 and assist SMBC planning department in reaching an agreement in their decision that the Proposed Development does not require EIA. The requirements of Schedule 3 (1) in terms of characteristics of the Proposed Development are outlined in Section 2. Sections 4 and 5 outlines the location of the Proposed Development, the environmental sensitivity of areas potentially affected by the Proposed Development, potential mitigation and potential cumulative impacts.

[2] Department of Communities and Local Government (2014), Planning Practice Guidance.

4 LOCATION OF THE DEVELOPMENT

4.1 LOCATION OF SITE

4.1.1. The Proposed Development is located in Stockport Town Centre with the Main Site at Daw Bank Road on land currently used as Stockport Bus Station, and the Heaton Road site on land currently occupied by an existing car park. The indicative postcode for the Proposed Development is SK3 0EH and the approximate Ordnance Survey Coordinates for the centre of the Main Site (bus station) are 389,237 (E), and 390,233 (N). The approximate Ordnance Survey Coordinates for the centre of the Heaton Lane Site are 389,121 (E) and 390,401 (N). The boundaries of the two sites are illustrated in Drawing No. STPT-BDP-XX-ZZ-DR-A-PM_30_10-0001_P01Site Location Plan.

4.1.2. The River Mersey flows east to west separating the two site boundaries mentioned above. A railway line runs in a north / south direction, perpendicular to the River Mersey, and is immediately west of both sites described above.

Main Site (Stockport Interchange bus station)

4.1.3. The Main Site is approximately 2.8ha within a mixed commercial, industrial and residential setting. It is a redevelopment of the original Stockport bus interchange and is located north of Stockport train station and immediately south of the River Mersey. It is surrounded predominately by roads including Daw Bank Road immediately south of the Main Site and Swaine Street which is immediately west of the Main Site. The Main Site crosses under the A6 Wellington Road South Viaduct Bridge and ends at Mersey Square.

4.1.4. The Exchange Street site is part of the Main Site and is proposed to be a new development which will form part of the wider Stockport interchange development. It is located immediately north of Stockport train station. The Exchange Street site is located south of Exchange Street and Daw Bank, west of commercial properties fronting onto Exchange Street and east of Stockport railway viaduct.

4.1.5. There are two Sustrans routes which are within the redline boundary of the Main Site, the first is a short Sustrans local cycle route alongside the Wellington Bridge Viaduct, and the second is a Sustrans national cycle route which runs along Swaine Street, Daw Bank and Chestergate (see Figure 1, Appendix A).

4.1.6. The Trans Pennine Trail (a national trail/ recreational route) runs through the Main Site boundary and River Mersey before crossing the river via the A4560 and carrying on east along the River Mersey (see Figure 3), this is the only Public Right of Way (PRoW) within proximity to the Proposed Development.

4.1.7. The closest existing residential receptors are approximately 30m from the redline boundary of the Main Site and are located to the north at the Travelodge Hotel, Regent House. Other residential areas close to the Main Site are along Hilton Street, approximately 270m west of the Main Site, and Gradwell Street, approximately 260m south west of the Main Site.

4.1.8. To the south of the Main Site is a Holiday Inn hotel on Station Road and beyond this there is a residential area on Thomson Street and approximately 230m south of the Main Site.

4.1.9. To the east of the Main Site the closest residential area is along St Peters Square approximately 145m east of the Main Site (east of Wellington Road Bridge).

Heaton Lane Site

4.1.10. The Heaton Lane Site has an area of approximately 0.7ha, is proposed to be a temporary bus station during the construction of the Main Site and will use the ground level section only of the current car park which is the current use of the site. The Heaton Lane site is located between Heaton Lane and Great Egerton Street, west of Wellington Road North and east of the Stockport railway viaduct.

4.1.11. The closest residential receptors are on Heaton Lane opposite the Heaton Lane entrance to the existing car park where flats and a Travelodge hotel are situated. To the north of the Heaton Lane Site is the M60, to the east is Wellington Road North (A6) and to the west is the railway viaduct.

4.1.12. The car park is currently accessed from Heaton Lane or from Great Egerton Street.

4.1.13. There are no Sustrans routes within the boundary of the Heaton Lane Site, the closet Sustrans route is approximately 80m west of the Heaton Lane site (see Figure 1).

4.2 CURRENT LAND USE

4.2.1. The Proposed Development comprises of two separate boundary sites (Stockport bus interchange and Heaton Lane) which are divided by the River Mersey. The Main Site is predominately the original Stockport bus station, however this will extend under the Wellington Road Bridge Viaduct to Mersey Square which includes a commercial building hosting the McColl's convenience shop and Reggie's Chippy (see Drawing No. STPT-BDP-XX-ZZ-DR-A-PM_30_10-0001_P01

4.2.2. The southern section of the Main Site is the Exchange Street area which is an irregular shape comprising predominately sloped wooded/grassed areas, with a raised car park in the south accessing from Station Road and a further gravel surfaced car park gaining access from Exchange Street. The area between Station road and Daw Bank is generally heavily vegetated with mature trees and shrubs and there is a concrete stepped public footpath crossing through the site linking Exchange Street and Station Road.

4.2.3. The Stockport bus interchange was constructed by approximately 1983 had been built in its current location and has therefore been situated at this site for approximately 35 years. This outlines the existing and approved land use as required and outlined in Schedule 3 2(a) of the EIA Regulations.

4.2.4. The Heaton Lane Site was built by approximately 1983 as a multi-storey carpark and therefore the site has been a multi-storey carpark for approximately 35 years. This outlines the existing and approved land use as required and outlined in Schedule 3 2(a) of the EIA Regulations.

5 ENVIRONMENTAL CHARACTERISTICS

5.1 INTRODUCTION

5.1.1. A number of environmental baseline studies, assessments and reports have commenced and are at various stage of production. These studies have informed this Request for a Screening Opinion, where appropriate and support the conclusions of this Screening report with technical input. The final environmental studies will accompany the planning application which is currently expected to be submitted in August, 2018. In addition to the baseline surveys, information from publically available databases and sources has been used along with data held by the project team.

5.1.2. Regulation 6(2)(e) of the EIA Regulations allows for the discussion and identification of project specific measures to avoid and / or prevent significant adverse environmental effects when a request for a screening opinion from an authority is made. Mitigation can be relied on to reduce any potential significant effects from the Proposed Development and is set out where possible below as evidence for our conclusions that EIA is not required for the Proposed Development. The full appropriate mitigation will be provided within the relevant environmental assessments to be submitted alongside the planning application and secured through the grant of permission. See Section 5.20 for a full list of the planning application documents to be submitted.

5.2 TRAFFIC AND TRANSPORT

5.2.1. A Transport Assessment will be produced to support the planning application. A Travel Plan for the residential and commercial elements will be produced as outlined below.

5.2.2. The Transport Assessment will set out the various transport issues, anticipated transport impacts and identify what measures will be taken to deal with these impacts.

TRAFFIC

5.2.3. During RIBA Stage 2, the project team are proposing and have been advised by SMBC, to utilise the existing Stockport town centre traffic model to assess the traffic impacts of the Proposed Development.

5.2.4. The average bus flow is not expected to increase as the Proposed Development will be accommodating existing bus services only, therefore the number of buses will be very similar. The residential part of the Proposed Development will accommodate approximately 73 car parking spaces for the approximate 196 residential units within the building. This will naturally limit the traffic generated to a low level. The commercial development will accommodate approximately 122 parking spaces, and again this will provide a limit to traffic flows. It should also be noted that the nature of the residential and commercial developments will result in traffic being generated in alternate directions (i.e. residential traffic will leave the town centre in the morning and arrive in the evening, with commercial traffic being vice versa).

5.2.5. Due to the town centre location of the residential and commercial development and its very close proximity to both the bus station and train station, it is likely that many of the residents and employees will utilise these public transport facilities on a day to day basis and therefore the potential increase in traffic is unlikely to increase significantly during operation.

5.2.6. A Transport Assessment will cover all the development that is being proposed and will include the potential impacts of construction on traffic. A Construction Traffic Management Plan (CTMP) will also be produced at a later stage of the design process which will provide more detail on the movement and volume of construction traffic and guidance on best practice and mitigation on how to reduce any potential impacts.

5.2.7. A Travel Plan for the residential and commercial development will be produced which will cover specific required outcomes, targets and clear future monitoring and management. It will also consider measures for offsetting any potential impacts.

Likely Environmental Effects

5.2.8. Overall, it is unlikely that there will be any significant adverse effects with regards to operational traffic as the anticipated increase in traffic flow is not considered to be significant. Furthermore, due to the production of a CTMP which will set out best practice guidance to minimise and reduce potential adverse effects during construction, it is unlikely that there will be significant effects from construction traffic once all appropriate mitigation has been observed. It is therefore anticipated that any effects would not be sufficiently significant for the purposes of EIA.

PEDESTRIAN USERS

5.2.9. Pedestrian movement surveys were carried out on a consecutive Friday and Saturday, between the hours of 0700 – 1000 and 1600 – 1900 on Friday and 1200 – 1500 on Saturday. The purpose of these surveys was to capture all pedestrian movements in and out of Stockport Bus Station.

5.2.10. The survey recorded two way pedestrian movement at each footway, crossing and bus station entrance. It was also proposed that cyclists are counted on the Trans Pennine Trail on Swaine Street and Daw Bank.

5.2.11. The pedestrian and cyclist (Non-motorised users (NMU)) data will be evaluated and reported in an assessment where conclusions, potential impacts and potential mitigation will be drawn from it to inform of any changes or impacts the project will have on NMU users.

5.2.12. Although further work is required on the impact of the project in relation to NMUs, it is clear that a pedestrian input has been considered in the design of the Proposed Development with regards to providing the green space (Park) on the roof of the Interchange which will create a new area of space that is exclusively for pedestrians, and a new pedestrian and cycle footbridge access to the Stockport train station from the Park which will create an easier and safer access to the train station for pedestrians. This will encourage NMU users and discourage town centre traffic. Therefore it is likely that the Proposed Development will have a neutral or slightly positive impact, during operation, on NMUs. However it is possible that during construction some current NMU access points to the Interchange and other roads surrounding the bus station may be blocked or diverted. If this is the case, based on the outcome of the pedestrian assessment and modelling, mitigation will be required and should be outlined in the CEMP, to ensure safe temporary access to all affected NMU pathways, pavements and footpaths.

Likely Environmental Effects

5.2.13. Based on the production of the Transport Assessment, a Traffic Model and a pedestrian assessment, including impacts and mitigation, it is anticipated that pedestrian effects are unlikely to be significant and therefore an EIA is not considered to be required in relation to pedestrian users.

5.3 AIR QUALITY

5.3.1. In common with many areas in the UK the main source of air pollution for the Proposed Development is road transport. In places air quality is poor at roadside locations. In these areas, the pollutant of greatest concern is nitrogen dioxide (NO_2). As a consequence, Greater Manchester Combined Authority (GMCA) and SMBC have declared one Air Quality Management Area (AQMA) due to exceedances of the annual mean Air Quality Strategy (AQS) objective for NO_2. The AMQA encompasses many large urban areas and main roads within Greater Manchester and the Site is located within this AQMA.

5.3.2. The Site is located in an area where air quality is mainly influenced by emissions from road transport using the M60 motorway, the A6 and the A5145. Baseline local monitoring within 5km of the Site has been carried out and out of 22 sites monitored, six sites exceeded the annual mean objective for NO_2 (40µg/m^3) in either, both or all of 2014, 2015, 2016. These sites were:

- SK7 – Civic centre Hazel Groves (Urban background) (2014, 2015 and 2016);
- SK11 – Norwood Road (Roadside) (2014 and 2015);
- SK12 A34 Kingsway (Urban traffic) (2014, 2015 and 2016);
- SK18 – Debenhams (Roadside) (2014);
- SK19 – Gorton Road (urban background) (2014); and
- SK20 – Kennilworth Road (Urban background) (2014, 2015 and 2016).

5.3.3. Given the Site is located within an AQMA, there are concerns that the Proposed Development has the potential to cause adverse impacts to existing pollution levels at nearby sensitive receptors within the AQMA, as well as, to expose future site users to elevated levels of air pollution.

5.3.4. The Site is located in an area where local road transport is the primary contributor to emissions of oxides of nitrogen (NO_x), particulate matter 10 micrometres or less in diameter (PM_{10}) and particulate matter 2.5 micrometres or less in diameter ($PM_{2.5}$). This is due to the Site's proximity to M60 and other major roads. However, other key sectors such as gas combustion from both domestic and commercial sources also contribute. Re-suspension (from exposed dusty surfaces) is likely to be a primary source of PM_{10} emissions in the vicinity of the Site and non-road mobile machinery (NRMM) emissions are likely to be a key contributor to $PM_{2.5}$ emissions.

5.3.5. In terms of locations that are sensitive to pollutants emitted from engine exhausts, these will include places where members of the public are likely to be regularly present over the period of time prescribed in the AQS. For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15 minute mean or 1 hour mean) may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24 hour mean or annual mean) may be more appropriate.

5.3.6. The potential impacts of the Proposed Development on the local air quality include:

- Dust and PM_{10} and $PM_{2.5}$ generation during the construction stage;
- Emissions of NO_x, PM_{10} and $PM_{2.5}$ from NRMM and construction vehicles using the local road network;
- Emissions of NO_x, PM_{10} and $PM_{2.5}$ from traffic using the local road network during the operation of the Proposed Development; and
- Emissions of NO_x from any proposed on-site energy generating / heating plant during the operation of the Proposed Development.

5.3.7. Given the location of the Proposed Development within the GMCA AQMA, an air quality assessment will be submitted with the planning application.

5.3.8. The air quality assessment will include:

- A desk based study to determine baseline air quality conditions;
- A qualitative assessment of construction phase effects; and
- A quantitative assessment of the exposure of future users of the Proposed Development to exhaust emissions arising from vehicles.

5.3.9. The assessment will assess the local air quality impacts at existing receptor locations and will also consider exposure at future receptor locations.

Likely Environmental Effects

5.3.10. During the construction phase, the Proposed Development will result in impacts associated with fugitive dust and fine particulate matter (PM_{10} and $PM_{2.5}$) emissions as identified above. However, through the development and implementation of a CEMP and CTMP promoting good site practice and the suitable mitigation measures, the effect of dust and particulate matter releases would be significantly reduced. The residual effects of the construction phase on air quality are considered to be not significant.

5.3.11. Given that it is unlikely that there will be a significant increase in operational phase traffic as detailed in Section 5.2, it is considered unlikely that there will be any significant increase in pollutant concentrations as a result of operational phase traffic emissions and therefore no significant effects at sensitive receptor locations are expected.

5.3.12. Overall, it is unlikely that significant effects regarding air quality will occur, and with desk based, qualitative construction phase and quantitative operational phase assessments being undertaken to consider this further, it is suggested that EIA is not required in relation to air quality.

5.4 NOISE

5.4.1. The closest existing residential receptors are on Heaton Lane, adjacent to the Heaton Lane site and approximately 30m north of the Main Site.

5.4.2. The Site is partially within a Noise Action Planning Important Area (NIA) 10979, see Figure 1, which is located along A6 Wellington Road South.

5.4.3. The Site is also within a Preferred Noise Route (PNR) for inbound flights to Manchester Airport, which is located 7.8km to the south west.

5.4.4. An environmental noise survey has been carried out to establish the noise climate prevailing in the vicinity of the Proposed Development encompassing both daytime and night-time periods. The survey comprised of a number of attended short term measurements, over 24 hours from 1st February 2018 to 2nd February 2018; and a single continuous unattended measurement location lasting from 26th January 2018 until the 2nd February 2018. The survey therefore covered a sample of different weekdays as well as a Saturday and Sunday.

5.4.5. A noise assessment, based on the recent survey, is currently being undertaken in accordance with various legislation, guidance and standards including:

- Noise Policy Statement for England;
- National Planning Policy Framework;
- Planning Practice Guidance (PPG);
- Local Planning Policy;
- Supplementary Planning Documents (SPDS);
- Professional Planning Guidance (ProPG): Planning & Noise;
- BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings;
- World Health Organisation: Guidelines for Community Noise;
- BS 4142: 2014: Methods for Rating and Assessing Industrial and Commercial Sound; and
- A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level Leq, Report by a Working Party for the Technical Sub-Committee of the Council

5.4.6. The production of a 3D noise model is being undertaken which has incorporated the road traffic, rail, bus interchange and commercial / industrial sources in the vicinity of the Proposed Development that were observed during the baseline noise survey. The model has calibrated these sources using the measurement data obtained.

5.4.7. The potential impacts of the Proposed Development on the local acoustic environment include:

- Noise disturbance and nuisance during the construction stage;
- Noise disturbance and increasing noise levels from non-road mobile machinery (NRMM) and construction vehicles using the local road network; and
- Elevated levels of noise, higher than levels prior to the Proposed Development, from traffic using the local road network during the operation of the Proposed Development.

5.4.8. The noise assessment is including all existing receptors and any Noise Important Areas (NIAs), of which there is one within the Proposed Development on the A6, based on a desk based study. It will primarily present a quantitative assessment with general qualitative consideration given to potential noise and vibration impacts associated with the construction of the Proposed Development. The project team are not proposing any measurement or assessment of vibration due to the relative position of trains and the viaduct in relation to the residential element of the Proposed Development.

5.4.9. The noise assessment will be undertaken and will include all the noise sources listed above and the quantitative assessment will include existing industrial / commercial sound using methodology in BS8233:2014[3]. Results of the baseline noise survey and the noise model will be reported within the Environmental Noise Assessment report. Aircraft noise contours have also been obtained and will be incorporated into the cumulative section of the noise assessment.

5.4.10. The assessment will be submitted as part of the planning application for the Proposed Development.

5.4.11. A scheme of mitigation will be provided within the assessment so that internal sound levels in habitable rooms can be met. At this stage in the absence of detail on the fixed plant being proposed for the development, the project team intend to set noise rating criteria in line with SMBC's requirements. If further detail does become available this will also be incorporated into the predictions and assessed quantitatively within the assessment.

Likely Environmental Effects

5.4.12. The Proposed Development may result in the potential construction impacts considered above, however there will be design mitigation included in the scheme through the CEMP and CTMP to include best practice measures to limit and reduce nuisance and disturbance associated with construction traffic and other construction related activities.

5.4.13. Given that it is unlikely that there will be a significant increase in operational traffic as considered in Section 5.2, it is considered unlikely that there will be any significant increase in noise disturbance due to operational traffic and therefore no significant effects on noise sensitive receptors are expected.

[3] British Standards Institution, Guidance on sound insulation and noise reduction for buildings, (BS 8233:2014).

5.4.14. As such, it is considered that significant effects from construction noise and vibration are unlikely and therefore not sufficient to warrant EIA.

5.5 POPULATION AND HUMAN HEALTH

5.5.1. The Proposed Development is located within SMBC and is on the western border of the ward of Brinnington and Central. Stockport has a population of approximately 289,800 (in 2016), which is split 49% male, 51% female[4].

5.5.2. Stockport has both areas of very high deprivation and very low deprivation, with 14% of the population living in the most 20% deprived areas nationally and 28% living in the least deprived areas nationally[5]. The ward of Brinnington and Central falls within 0-20% most deprived areas nationally and the 20-40% deprived nationally categories showing high levels of deprivation in this area (2007 Index of Multiple Deprivation)[6].

5.5.3. Overall, the health of people in Stockport is varied compared with the England average. About 15% (7,900) of children live in low income families. Life expectancy for men and women is similar to the England average. In the most deprived areas of Stockport life expectancy is 10.2 years lower for men and 9.3 years lower for women when compared to the least deprived areas.

5.5.4. Stockport has 45 Council managed sites which are classified as parks and gardens totalling over 291 ha. There are also 27 natural and semi-natural greenspace sites covering 469 ha and 160 amenity greenspace sites covering over 240 ha in Stockport. There are 135 play provision sites in Stockport covering a total of over 18 ha and Central Stockport and Marple have the greatest levels of provision per 1000 population with 0.05 and 0.06 ha respectively[7].

Main Site

5.5.5. There are five GP practices within 1km of the Main Site, the closest being Dr M J Parkinson – Manor Medical Practice which is located approximately 680m south east of the Site, see Figure 1.

5.5.6. Stepping Hill Hospital is located approximately 3.2km south of the Main Site.

5.5.7. There are six dentists located within 1km of the Main Site, the closest being Mr AJ Taylor dental practice approximately 360m east of the Main Site.

5.5.8. There are 10 schools within 1km of the Main Site listed below (Figure 1):

- St Matthew's Church of England Primary School, located approximately 400m south west of the Main Site;
- Our Lady's Catholic Primary School, located approximately 360m south of the Main Site;
- Cale Green Primary School, located approximately 1km south of the Main Site;
- St Thomas' C of E Primary School, located approximately 580m south east of the Main Site;
- St Mary's RC Primary School, located approximately 820m north of the Main Site;
- All aboard Nursery, located approximately 100m south west of the Main Site;
- The School of make-up, located approximately 320m east of the Main Site;
- St Joseph's Stockport Catholic Primary School, located approximately 250m east of the Main Site;
- Lark Hill Nursery School, located approximately 960m west of the Main Site; and
- Hollywood Park Combined Nursery Centre, located approximately 340m west of the Main Site.

5.5.9. The Trans-Pennine Trail is a national trail/recreational route which runs through the Main Site parallel to the River Mersey. There are a number of Sustrans National Cycle Routes within the surrounding area of the Main Site (Figure 1). The closest of which are along Swaine Street and Daw Bank Road, both of which are along

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[4] Office of National Statistics, 2016 data Available online at: https://www.nomisweb.co.uk/reports/. Accessed March 2018.
[5] Stockport JSNA, 2015 Available online at: https://stockport-haveyoursay.citizenspace.com/stockport-council/socio-economic-trends/user_uploads/2015-jsna---socio-economic-context.pdf. Accessed March 2018.
[6] Stockport JSNA, 2008, Available online at: http://www.stockportjsna.org.uk/wp-content/uploads/2016/04/JSNA-First-Report-Summary-Analysis-by-Deprivation.pdf. Accessed March 2018.
[7] Stockport Metropolitan Borough Council Open Space Study, April 2017 [Online] http://democracy.stockport.gov.uk/mgConvert2PDF.aspx?ID=122302. Accessed March 2018

the edge of the redline boundary. There are also a number of Sustrans Local Cycle Routes the closest of which is along the section of A6 Wellington Road which intersects the Main Site (Figure 1).

Heaton Lane Site

5.5.10. There are two GP practices within 1km of the Heaton Lane Site, which are:

- Heaton Norris Health Centre, located approximately 680m north west of the Heaton Lane Site; and
- Dr Parkinson & Partners, located approximately 1km south of the Heaton Lane Site.

5.5.11. Stepping Hill Hospital is located approximately 3.6km south of the Heaton Lane Site.

5.5.12. There are six dentists located within 1km of the Heaton Lane Site the closest being Revive Dental Care Ltd, located approximately 240m north of the Heaton Lane Site.

5.5.13. There are 11 schools within 1km of the Heaton Lane Site outlined below (Figure 1):

- St Matthew's Church of England Primary School, located approximately 660m south of the Heaton Lane Site;
- Our Lady's Catholic Primary School, located approximately 780m south of the Heaton Lane Site;
- St Thomas' C of E Primary School, located approximately 900m south east of the Heaton Lane Site;
- St Mary's RC Primary School, located approximately 510m north of the Heaton Lane Site;
- All aboard Nursery, located approximately 270m south of the Heaton Lane Site;
- The School of make-up, located approximately 430m east of the Heaton Lane Site;
- Lark Hill Nursery School, located approximately 990m west of the Heaton Lane Site;
- Hollywood Park Combined Nursery Centre, located approximately 320m west of the Site;
- Moat House School, located approximately 930m north of the Heaton Lane Site;
- All Saints C of E Primary School, located approximately 885m north of the Heaton Lane Site; and
- St Joseph's Stockport Catholic Primary School, located approximately 430m east of the Heaton Lane Site.

5.5.14. There are a number of Sustrans National and Local Cycle Routes within the surrounding area of the Heaton Lane Site (Figure 1). The closest being adjacent along the M60 and Heaton Lane and the short section along the A6 Wellington Road as mentioned above. As mentioned above, the closest PRoW to the Heaton Lane is the Trans Pennine Way route running parallel to the River Mersey approximately 110m south of the Heaton Lane Site.

Likely Environmental Effects

<u>Non-motorised Users (NMU)</u>

5.5.15. During construction there is potential for PRoW to be temporarily diverted or blocked. The CEMP will seek to minimise these disruptions and provide alternative options. During operation the PRoW will be the same as the existing provision and there will be pedestrian access to the bus interchange as mentioned in Section 2.6. Based on this and the inclusion of best practice measures included within the Travel Plan, it is suggested that NMU effects are unlikely to be significant and therefore an EIA is not considered to be required in relation to NMUs.

<u>Health</u>

5.5.16. Given the inclusion of a DEMP and CEMP, it is assumed that best practice measures will limit emissions, dust and noise from demolition and construction, thereby minimising any effects on human health during these project phases.

5.5.17. During operation it is unlikely that there will be any significant adverse effects in relation to air quality emissions, dust, artificial lighting and noise disturbance on human health as it is unlikely that there will be a significant increase in operational traffic as considered in Sections 5.2, 5.3 and 5.4 and no other adverse effects on human health have been identified.

5.5.18. Therefore, no potential for significant effects have been identified to warrant EIA in relation to population and human health.

5.6 MATERIALS AND WASTE

5.6.1. At this time in the assessment process, there is no detail on the specific types, quantities and sources of materials resources and waste. It is only known what elements will be involved in this mixed development project, which include bus interchange, residential block, park/ oculus, footbridge, Exchange Street commercial units and temporary bus interchange site (Heaton Lane car park).

5.6.2. Surplus waste will arise from two major sources: existing site materials, such as concrete from demolition of existing structures, and material excavated from earthworks, and materials brought to site but not used for the original purpose (such as off-cuts, damage items and surplus).

5.6.3. Given that all new development will inevitably create waste and cause a demand on natural resources, any risks of pollution or nuisance should be minimised through good on site working practice. A DEMP, CEMP and Site Waste Management Plan (SWMP) will be produced prior to any demolition or construction activities.

Likely Environmental Effects

5.6.4. Overall, it is suggested that construction and demolition waste effects will be covered within various environmental management plans, actions and mitigation measures to ensure that there are no likely significant effects in relation to materials and waste. No potential for significant effects have been identified to warrant EIA in relation to waste and materials.

5.7 LANDSCAPE AND VISUAL

5.7.1. The Site is located within the Manchester Conurbation National Character Area (NCA) 55. The area is characterised by dense urban and industrial development, commercial, financial, retail and administrative centres, commuter suburbs and housing interspersed with a network of green infrastructure. This is due to the settlements that have grown and come together to form the Manchester Conurbation. The conurbation is centred on low hills, crossed by several river valleys and the geology is dominated by sandstones, which is overlain by thick deposits of glacial till. The river valleys form important corridors of semi-natural habitats and natural greenspace which links urban centres with open countryside[8].

5.7.2. Furthermore the Site area is bounded by various roads, A6 Wellington Road, Heaton Lane, M60 as well as the railway line. There are small pockets of open green space and small groups of trees along the River Mersey and within the Exchange Street area.

5.7.3. The urban context of the Site and the surrounding area is a suitable environment for the Proposed Development to be situated in as the existing site is a bus station and the residential building (approximately 107.8m AOD to roof top level) will not be out of place within the built-up townscape that it will sit in. There are various large multi-storey buildings within the surrounding area of the Proposed Development, which include but are not limited to:

- The Hat Works Museum immediately south of the bus interchange (seven floors):
- Regents House building and Travelodge Stockport immediately adjacent north of the River Mersey (11 floors);
- Applicon House, Stockport adjacent to Exchange Street (six floors); and
- High Bank House office building adjacent to Exchange Street (six floors).

Likely Environmental Effects

5.7.4. Construction landscape and visual impacts from the Proposed Development are unlikely to lead to significant effects after the implementation of the CEMP, relevant best practice and appropriate mitigation as defined within the CEMP.

5.7.5. The Proposed Development seeks to demolish the current bus station and replace it with a new, more contemporary interchange with multiple uses. The inclusion of the park's green space is in accordance with national planning guidance. The project team will be carrying out a Landscaping Scheme and Land Stability Report of the park and riverside public realm to ensure high quality landscaping is included within the project design.

5.7.6. The Proposed Development is likely to lead to an improvement in the visual amenity of the area as it will include a park and a new development which will look more visually appealing than the older existing buildings which it can be argued look tired and less visually and aesthetically appealing. In addition, it can be suggested

[8] Natural England, NCA Profile: 55. Manchester Conurbation (NE463), 2013

that, due to the urban and built up nature of the site and its surrounding area, the Proposed Development is in keeping with this dense and urban area.

5.7.7. Overall, given the urban context of the Proposed Development it is not considered a sensitive site in relation to landscape and visual, therefore EIA is not required in relation these aspects.

5.8 BIODIVERSITY

5.8.1. The Proposed Development is located within 2km of the following statutory sites:

- Reddish Vale Local Nature Reserve (LNR) (79.99ha), located approximately 1.5km north east of the Site. This site is designated due to its abundant flora and diversity of wildlife and is known to include kingfisher and sand martins.
- Mersey Vale Nature Park LNR (19.24ha), located approximately 1.3km west of the Site. The majority of this site is a species-rich neutral grassland abundant in crested dogs-tail and common bent.
- Woodbank Park LNR (19.08ha), located approximately 1.4km east of the Site. The southern section of this LNR is on a flood plain, has been identified as ancient woodland which is a UK Biodiversity Priority Habitat.

5.8.2. The Proposed Development is also located within 2km of known records of protected species. Identified within a desk-based search were notable species of breeding birds including kingfisher (*Alcedo atthis*), bats, European hedgehog (*Erinaceus europaeus*) and badger (*Meles meles*).

5.8.3. A Preliminary Ecological Appraisal (PEA) was undertaken for the Proposed Development in June 2017 to determine habitats present and their potential to support protected species. The PEA included a desk study and Phase 1 habitat survey and assessment for protected species. The PEA will be included in the supporting documentation for the planning application. The Phase 1 habitat survey included most of the current site location boundary, including Heaton Lane, except two small sections: the far west of the Wellington Bridge viaduct adjacent to Mersey Square and adjacent east of the McColl's convenience store; and the NCP car park adjacent to Station Road, see Figure 5.

5.8.4. Due to the small size of the areas which were not included in the 2017 PEA and the urban nature of both areas (they are concrete ground) it is unlikely that anything will be found to change the current opinion.

5.8.5. The desk study identified three non-statutory nature conservation sites within 2km of the Site, detailed below:

- Disused Railway at Brinnington Site of Biological Importance (SBI) Grade C (importance within the identified geographical locality) (17.8ha), located approximately 1.9km north east of the Site. This site is a lowland broadleaved woodland, is a UK Biodiversity habitat and is part of a matrix of habitats in the Goyt Valley.
- Woodbank Memorial Park SBI Grade B (District importance) (35.4ha), located approximately 1.8km east of the Site. This site is a mature woodland on a flood plain with steep slopes leading down to the River Goyt; part of it has been identified as ancient woodland with sycamore and oak being the dominant tree species.
- Disused Railway in Mersey Valley SBI Grade B (6.1ha), located approximately 1.8km west of the Site. A completed vegetated section of the disused railway supporting species-rich neutral grassland, scrub, a young woodland and a pond.

5.8.6. The Site features scattered scrub, broadleaved woodland and poor semi-improved grassland lying around hardstanding and buildings including the original bus station terminus. The River Mersey intersects the Main Site flowing from a tunnel situated under Stockport Shopping Centre where bat roosts have been recorded for common pipistrelle *Pipistrellus pipistr*ellus.

5.8.7. Other species which may present due to suitable habitat within the Site include: Bats, Birds, Otter, Water Vole and White Clawed Crayfish.

In terms of water voles and otters no further surveys are required as they will not be directly impacted by the Proposed Development. However, they may be indirectly affected during demolition and construction phases and therefore recommended methods of working to prevent impacts to otters and water voles, outlined below, should be followed.

- Building demolition and clearance of the trees on Site should ideally be undertaken outside of the nesting bird season (March – September inclusive). Should works be required during this period it is recommended that a suitably qualified ecologist undertakes a nesting bird check at the Site, no more than 24 hours prior to Site clearance/demolition activities.

- The demolition and construction phase of the Proposed Development should be undertaken during daylight hours only, to keep lighting impacts to a minimum. Any lighting proposed for the construction and operation phases of the Proposed Development should be kept away from the River Mersey with the appropriate use of fixtures, baffles and directional lighting in order to reduce impacts on any riparian mammals and bats using the river.
- Where site excavations are located in close proximity to the River Mersey, these should be covered or backfilled overnight, or if this is not possible, a ramp installed that that otters (or other small mammals) do not become trapped during the construction phase.
- General best practice measures should be implemented during construction, these should include guidance outlined in the EA's Pollution Prevention Advice and Guidance (EA, 2007) and those outlined by the Construction Industry Research and Information Association guidance (CIRIA, 2015). The following minimum standards must be adhered to prevent ecological impacts beyond the Site boundary:
  - Measures must be taken to prevent dust and other emissions from construction affecting the River Mersey to the south of the Site;
  - Chemicals and fuels must be stored in secure containers located away from the River Mersey. Spill kits must be available;
  - Excavations must be covered or securely fenced (with no potential access points beneath fencing) when the Site is closed (e.g. overnight) to prevent entrapment of animals;
  - Noise and vibration must be controlled and kept to the minimum necessary; and
  - Lighting used for construction must be switched-off when not in use and positioned so as not to spill on to adjacent land or the River Mersey.

5.8.8. For white claw crayfish the timeframe is not considered sufficient enough to reduce a historic population of white claw crayfish to a lost population and therefore no further survey or mitigation is proposed.

5.8.9. The key potential ecological constraints which will require further surveys to comply with legal planning policy include:

- The demolition and construction of the Proposed Development which may impact on the foraging habitats and commuting routes of bats through loss of habitat and disturbance from artificial lighting;
- Removal of any trees with moderate bat roost potential in the wooded area would destroy any bat roost present; and
- Vegetation clearance and demolition of the buildings within the Proposed Development may result in disturbance to nesting birds and damage/ destruction of nesting bird habitats[9].

5.8.10. Further surveys will be required, due to the presence of potential ecological constraints, to ensure legal and planning policy compliance and ensure surveys of the full current site location have been carried out.

5.8.11. The PEA conclusions are outlined below which are based on survey results that were taken from the Phase 1 habitats survey of the site area illustrated in Figure 5, however the change in site area, as mentioned above, is unlikely to change the overall conclusions of the PEA:

- All the buildings on Site have negligible suitability to support roosting bats therefore no further survey of these buildings is required prior to their demolition at this time.
- As the site has a low to moderate suitability for foraging and commuting bats with a high suitability water course with a known roost in a nearby bridge, activity surveys are required.
- Suitable environmental protection measures must be put in place to remove potential for contamination into the River Mersey so as not to adversely affect the LNR and any ecological value within the watercourse inclusive of animal and plant species.

[9] WSP 'Preliminary Ecological Appraisal report', July 2017

- Measures to reduce the effect of lighting on nocturnal species such as bats include only installing lighting where it is actually required and directing it away from the River Mersey and to where is needed by using hoods, cowls, louvres and shields (both during and post-construction).
- Ecological enhancements have been recommended and include the inclusion of artificial habitats such as bat and bird roost/nest boxes, ledges or bricks within or on the new building and where possible the provision of more natural areas within the landscape scheme.
- Nesting bird checks will be required prior to any vegetation clearance and demolition of buildings with nesting bird potential (B5) between March and September inclusive.
- Due to the relatively low ecological value of the proposed site footprint, it is recommended that ecological value is implemented into designs which will be beneficial for both ecology and the public perception of the site.

Bats

5.8.12. As per the Bat Advice Note provided by WSP[10], in March 2018, it has been recognised that the retaining wall along the banks of the River Mersey has been found to contain seven historic drainage tunnels from former Victorian cotton mills[11]. Four of these tunnels, portals B, D, E and F lie above the maximum water level based on river level data and may there have potential to support roosting bats.

5.8.13. The following surveys are recommended for these tunnels based on all information available to date for the Proposed Development with regards to bats, in line with industry standard good practice guidance (BCT, 2016[12]): presence/absence surveys, automated surveys and hibernation surveys. Therefore, even though a Bat Activity Survey Report was undertaken in November 2017, concluding that no further surveys for bats are required[13], the recent discovery of these tunnels providing potentially favourable habitats for bats means that further assessments will be undertaken to support this conclusion. Mitigation and compensations measures that were illustrated in the PEA and outlined above will enable compliance with relevant legislation and planning policy. These mitigation and best practice measure will be relevant for the bat roosting potential in the tunnels and will be required if bats are found during surveys.

5.8.14. Further ecological enhancement opportunities have been recommended within the PEA and will be undertaken, to further ensure that compliance with planning policy is undertaken, are summarised below:

- Reducing the effect of lighting on nocturnal species such as bats and moths by installing lighting only where required and directing it to where it is needed using hoods or shields;
- Provision of natural habitats to offer potential foraging opportunities for bats and birds, such as using native insect attracting trees;
- Inclusion of various sizes of artificial nesting habitats such as bird roost/ nest boxes, ledges or bricks within the new buildings;
- Provision of more natural areas within the landscape, where possible, such as low intensity managed grassland or trees;
- Green roofing of any new buildings, such as bus shelters; and
- Ecological consultation should be sought to maximise the ecological benefits during detailed design and implementation of the landscape to help ensure that natural features are designed and managed to benefit wildlife.

Riparian habitat

5.8.15. Given the close proximity of the Proposed Development to the River Mersey, the Main Site will be immediately adjacent to the river (see Drawing No. STPT-BDP-XX-ZZ-DR-A-PM_30_10-0001_P01). As such, consideration needs to been made to the riparian habitat along the river and how this may be affected with regards to Schedule 3 2(c)(i) of the EIA Regulations.

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[10] WSP ‘Stockport Interchange Tunnel – Bat Advice Note’, March 2018
[11] WSP ‘Stockport Interchange Tunnel Assessment’ October 2017
[12] Collins, J (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn).The Bat Conservation Trust, London.
[13] WSP ‘Bat Activity Survey Report’ November 2017

5.8.16. A further advice note on the riparian habitat has been drawn up following concerns raised by the Environment Agency (EA) regarding potential impacts to the riparian habitat of the River Mersey. The EA reviewed the Proposed Development plan and it was evaluated that there will be no direct riparian interaction with the river as it is confined behind vertical engineering flood walls which have no habitat value.

5.8.17. The riparian habitat with direct natural interaction is a narrow and confined channel of steep stone and heavily scoured earth banks with semi-mature trees and scrub; these will not be impacted by the Proposed Development. However, due to the steepness of the banks and the high water fluctuation within this channel, any potential intervention with regards to riparian enhancement could have a detrimental impact on the integrity of the existing banks and flow of water. Therefore intervention is not recommended but consideration could be taken for areas where safe access is feasible.

5.8.18. Following this evaluation the EA have agreed to the creation of a 2m scrub/scattered tree fenced ecological buffer bordering the southern boundary of the river. This will create valuable connecting habitat for breeding and foraging birds and foraging bats which commute along the river corridor. In summary, the EA have consented to and agreed the following recommendations:

- An 8m riparian easement is not achievable in this instance as the riparian habitat and interaction is confined and channelled within the River Mersey;
- Intervention with regards to riparian enhancement could have a detrimental impact to the integrity of the existing banks and flow of water and is not recommended; and
- Biodiversity net gain enhancements can be achieved along the northern edge of the Proposed Development in the form of a 2m fenced off scrub/scattered tree ecological buffer (extent to be determined).

Likely Environmental Effects

5.8.19. Overall, the potential impact on commuting bats during construction and demolition may occur, however mitigation, ecological enhancements and best practice measures will be undertaken and guidance followed prior to any construction and demolition. Additional bat surveys will be being carried out in summer 2018 within the tunnels and therefore the significance of the impacts on potential bat habitats within these tunnels will be established then. However, with best practice and mitigation it is anticipated that any potential impacts can be kept to a minimum. Therefore, it is considered there will be no significant effect during construction of the Proposed Development.

5.8.20. Permanent removal of trees will reduce the roost and nesting potential for bats and birds. However the inclusion of mitigation, best practice measures and ecological enhancements (outlined above) will reduce the potential ecological effects and therefore the likely effects will have limited and reduced significance. Furthermore, following best practice outlined by the EA and CIRIA (outlined above) which require that nesting bird checks are carried out prior to any vegetation clearance and demolition of buildings with nesting bird potential (which will be between March and September inclusive) no other impacts are anticipated.

5.8.21. The ecological bat surveys will be being carried out in summer 2018 within the tunnels. However,, with best practice and mitigation it is anticipated that any potential impacts can be kept to a minimum.

5.8.22. The potential impacts to the riparian habitat have been evaluated and recommendations have been consented and agreed by the EA. Therefore, following best practice guidance, mitigation, methods of avoidance and recommendations from the EA, all potential impacts on water voles, otters, other riparian mammals, birds and bats along the commuting corridor will be reduced and it is expected that no significant effects will occur. They will ensure that the active riparian corridor of the River Mersey will not be affected.

5.8.23. In summary, following best practice guidance and mitigation outlined by the EA, Natural England (NE) and CIRIA; the production of the relevant technical bat roost potential and activity surveys and ecological survey appraisal reports, the Proposed Development does not warrant EIA with regards to ecology and biodiversity.

5.9 ARBORICULTURE

5.9.1. Within the Main Site there is a strip of trees immediately north of Daw Bank and another strip of trees immediately south of the River Mersey which are within the boundary of the Main Site.

5.9.2. Within the Exchange Street area there is an area between the most southern car park on Station Road and Daw Bank that is heavily vegetated with mature trees and shrubs which, when removed, may disturb soils and cause shallow instability.

5.9.3. The project team will be carrying out a Tree Survey and Arboricultural Implications Study to be submitted with the planning application. This will consider the potential impacts of the Proposed Development on the areas of trees within the boundary and its immediate surrounding area, and the potential mitigation required. This study will take into account the advice note to the EA in relation to the riparian habitat.

5.9.4. It is assumed that the Arboricultural Implications Study will identify any valuable trees, shrubs and hedgerows and develop appropriate mitigation plans along with the design team. In addition the DEMP and CEMP will include details on the protection and management of trees, shrubs and hedgerows that are retained in the development in line with best practice guidance.

Likely Environmental Effects

5.9.5. Overall, following best practice measures within the DEMP and CEMP for reducing potential impacts on trees and the Arboricultural Implications Study which will include mitigation measures, there will be no impact that would warrant EIA in relation to arboriculture.

5.10 WATER ENVIRONMENT

5.10.1. The River Mersey delineates the northern boundary of the Main Site. The River Mersey begins at an altitude of approximately 40m AOD at the confluence of the River Tame and River Goyt and eventually discharges into the Manchester Ship Canal at an altitude of approximately 12m AOD. There is also a network of rock-cut tunnels / culverted watercourses which traverse beneath the existing Bus Station and which outfall to the River Mersey at various locations along the sites boundary.

FLOOD RISK ASSESSMENT (FRA)

5.10.2. A FRA is currently being undertaken (to be completed by June 2018) and has identified that, from a review of the EA Flood Map for Planning, a significant portion of the Main Site lies within Flood Zone 2. This specifies that the land has between a 1 in 100 and 1 in 1000 annual probability of river flooding and therefore has a medium probability of flooding from the River Mersey[14]. The bus interchange also borders and is immediately adjacent to Flood Zone 3, see Figure 1, and has a high probability of flooding.

5.10.3. It was agreed with the EA that there will be no need for any detailed river modelling as part of this Proposed Development.

5.10.4. It has also been identified from the EA's Surface Water Flood Map that the Main Site has a High risk of flooding from surface water which means that each year this area has a chance of flooding of greater than 3.3%. The main areas at high risk of surface water flooding are shown to be the central and northern portion of the existing Bus Station, close to the boundary with the River Mersey. Surface water from the Proposed Development will be discharged to the River Mersey via a new outfall structure (or a new connection to existing tunnels). Surface water attenuation will be provided to reduce existing runoff rates to the River Mersey, thereby reducing flood risk in the catchment overall.

5.10.5. The Heaton Lane Site does not fall within a flood zone as the Flood Zone 2 does not extend north past Heaton Lane, see Figure 1, therefore it is unlikely to be at risk of surface water flooding.

5.10.6. The EA mapping specifies that the underlying superficial deposits is classified as a Secondary (undifferentiated) aquifer, and the underlying bedrock is designated as a Principal aquifer. Furthermore, the Proposed Development does not fall within or adjacent to a Source Protection Zone (SPZ). Susceptibility of groundwater flooding and the risk of groundwater flooding will be will be assessed as part of the FRA.

5.10.7. Sewer flooding and its risk will also be assessed within the FRA.

5.10.8. Non-natural or artificial sources of flooding can include reservoirs, lakes, canals etc. The potential effects of flood risk management infrastructure and other structures will be considered in the supporting information as a normal part of FRA. The EA Online Reservoir Flooding Map shows that the Proposed Development is not within an area considered to be at risk of flooding from reservoirs.

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[14] Flood map for planning, Government Website. Available online: https://flood-map-for-planning.service.gov.uk/summary?easting=389214&northing=390232. Accessed April 2018.

DRAINAGE STRATEGY

5.10.9. A Drainage Strategy will also be undertaken which will incorporate pollution prevention measures in relation to the risk of oil spillage from the interchange and any pollutants from other hard surfaces. These measures will most likely be a combination of oil separators and sustainable urban drainage systems (SUDS) filtration where appropriate.

Likely Environmental Effects

5.10.10. Overall, the FRA and Drainage Strategy will provide a comprehensive study of suitable scope and detail to support a full planning application for the Proposed Development. The FRA will consist of relevant consultation, collection and review of data relevant to flood risk, assessment of the risk of flooding to the Proposed Development from all sources, including consideration of the effects of climate change, and will identify mitigation measures required to manage the risk of flooding where necessary. Provisionally, it is suggested that the FRA and Drainage Strategy will conclude that the Proposed Development is appropriate in terms of flood risk and the Proposed Development can be developed without significant effects on increasing flood risk overall. With these measures in place as well as the pollution prevention measures in the drainage strategy, it is considered that the construction and operational effects will not likely be significant and does not warrant the need for an EIA with regards to the water environment.

5.11 GEOLOGY, SOILS AND LAND CONTAMINATION

5.11.1. Available geological mapping[15] indicates that the Site's landscape typology is urban with extensive areas of predominately built land where the rural settlement pattern has been completely subsumed by urban development.

5.11.2. The geology of the wider Stockport area comprises solid geology of Carboniferous, Permian, and Triassic age and superficial Quaternary deposits. Geological mapping for the Proposed Development indicates that the solid geology comprises Chester Formation sandstone of the Sherwood Sandstone Group overlain by a combination of Quaternary deposits comprising Glacial Till, Glaciofluvial Deposits, and River Terrace Deposits. Previous site investigations undertaken have generally confirmed this sequence as well as encountering Made Ground.

5.11.3. With the exception of the wooded area located between Daw Bank and the car park off Station Road there is no unpaved areas on the Proposed Development and no relict topsoil beneath Made Ground was encountered in the previous investigation.

5.11.4. The EA mapping specifies that the underlying superficial deposits include glacial fluvial deposits (Secondary A aquifer and Secondary (undifferentiated)); and the underlying bedrock is designated as a Principal aquifer. Furthermore, the Proposed Development does not fall within or adjacent to a Source Protection Zone (SPZ).

5.11.5. For the Exchange Street section of the Main Site (outline development proposal) a Feasibility Study[16] has identified the likely ground and groundwater conditions, the potential sources of contamination, potentially complete contaminant linkages and an assessment of the geotechnical constraints. Conclusions from this report include:

- Widespread gross contamination is not anticipated to be present beneath Exchange Street area of the Main Site but there is potential for localised soil and / or groundwater contamination associated with current use as a car park utilising Made Ground and previous land uses including infilled reservoirs, former buildings and previous use of parts of the Site as a Dye House. Therefore it is considered that there is low to moderate potential for soil and groundwater contamination at the Site.
- The presence of granular drift deposits has the potential to enable the migration of mobile contamination of the upper superficial deposits easily and potentially into the underlying bedrock.
- There is the potential for contamination within the ground/ groundwater to be mobilised by piling process into the underlying Principal Aquifer, depending on the technique selected.

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[15] Environment Agency 'What's in my Backyard', Available Online at: http://apps.environment-agency.gov.uk/wiyby/default.aspx. Accessed April 2018
[16] WSP, Exchange Street Feasibility Study, 2018

5.11.6. Based on the environmental conclusions summarised above, it is recommended that an intrusive investigation is completed in order to characterise the onsite and groundwater conditions.

5.11.7. For RIBA Stage 2 the project team will produce the following assessments and reports:

- A Ground Gas Risk Assessment, which will include field work, ground gas monitoring results, ground gas risk assessment and conclusions and recommendations (to be completed in June 2018).
- Additional ground investigations will be undertaken due to the changes in the latest development plans for the Proposed Development. AECOM prepared a Ground Investigations Report in 2016[17] (Appendix C) for the Proposed Development. However, since the development plans have changed quite substantially, the project team considers that additional ground investigation (GI) is required to support the Proposed Development. The areas where additional GI will be undertaken are the following:
    - Landscaped areas adjacent to the river – this area has been identified as a former chemical works and geo-environmental investigation is required to assess potential contamination associated with historical uses. A Combined Phase I & II Site Investigation Report for the Landscaped Area will be prepared following GI works.
    - Residential Tower – no deep investigation has previously been undertaken in this part of the site. An addendum to the existing AECOM report including a preliminary pile design will be prepared.

Likely Environmental Effects

5.11.8. Previous investigation works conducted by AECOM in 2016 that identified potentially complete contaminant linkages that required mitigation to protect the health of future site users, primarily associated with the presence of polycyclic aromatic hydrocarbons and asbestos in the Made Ground. The reported dissolved phase concentrations were considered to present moderate / low risks to controlled waters (AECOM, 2016). Additionally, the ground gas risk assessment produced by AECOM stated gas protection measures were required to be implemented. Additional investigation works will be undertaken to assess soil and shallow groundwater conditions within an area of potential concern that was not investigated in 2016 (i.e. proposed landscaped area by the River Mersey) and to review the ground gas risk assessment and recommendations.

5.11.9. AECOM have outlined that if the site is contaminated and remediation is not deemed necessary that appropriate mitigation measures will be required which include:

- Mitigation to reduce potential leaching of contaminates;
- Mitigation measures should be determined in accordance with the water supply company's risk assessment guidelines;
- Consultation with United Utilities;
- Using appropriate concrete class and undertaking ground investigations;
- Conservative parameters used in analyses; and
- High standard of construction practice on site.

5.11.10. On the basis of the AECOM (2016) investigation report and the additional investigation works yet to be undertaken, a series of mitigation and remedial measures will be implemented to protect the health of future site users and the environment based on the conceptual site model. These measures will be outlined within the Contaminated Land Assessment Report and detailed within the Remediation Strategy Report which is scheduled for Stage 3.

5.11.11. Based on the above, the identified risks and potential impacts associated with soil and groundwater contamination on site will be addressed with a series of mitigation / remedial measures in line with applicable guidance. Therefore with inherent mitigation there will be no impacts sufficient to warrant EIA with regards to geology, soils and land contamination.

5.12 CULTURAL HERITAGE

5.12.1. The Historic Environment Desk-Based Assessment undertaken by AECOM in 2015[18] concluded that there are no World Heritage Sites or Registered Battlefields within a study area of 500m (from a redline boundary that

[17] AECOM ' Stockport Interchange – Ground Investigation Report', April 2016
[18] AECOM 'Historic Environment Desk-Based Assessment – Stockport Interchange', 2015

was used by AECOM which incorporates the Main Site but not the Exchange Square section). It was also concluded that there are no Scheduled Monuments, Registered Parks and Gardens or Registered Battlefields within the study area. There is one Scheduled Monument within 5km of the Site (none within 2km of the Site), Peel Moat Scheduled Monument, which is approximately 2.5km north west of the Site.

5.12.2. There are 33 Listed Buildings within the AECOM 500m study area comprising four Grade II* Listed Buildings and 29 Grade II Listed Buildings. There are also 22 locally listed buildings and five Conservation Areas within this study area.

5.12.3. A 'Feasibility Study – Historic Setting Analysis' was undertaken by BDP's Heritage Team in August 2017, which was a desk based assessment of the feasibility of the Proposed Development[19]. The assessment's aim was to inform the design team on the suitability of the initial proposals in terms of heritage setting. The assessment was prepared in context of relevant national and local heritage planning policy and describes the significance of the heritage assets affected. The report also sets out views on the potential consequent issues and impacts that may arise as a result of the Proposed Development.

5.12.4. There are seven Listed Buildings, within close proximity to the Main Site that are mentioned in the BDP assessment, these are outlined below:

- Railway Viaduct Grade II* Listed Building, which has been defined as being in Good condition with High heritage value and High significance. (Located approximately 30m west of the Main Site);
- Former Plaza Cinema Grade II* Listed Building, which has been defined as being in Good condition with High heritage value and High significance. (Located approximately 28m east of the Main Site);
- Steps Adjacent to Former Plaza Cinema Grade II Listed Building, which has been defined as being in Good condition with Medium to High heritage value and Medium significance (Located approximately 15m east of the Main Site);
- Wellington Bridge Grade II* Listed Building, which has been defined as being in Good condition with Medium to High heritage value and Medium significance. (Located within the boundary of the Main Site);
- Wellington Mill Grade II Listed Building, which has been defined as being in Good condition with Medium to High heritage value and Medium significance. (Located approximately adjacent (14m) to the Daw Bank edge of the Main Site);
- Wear Mill Grade II Listed Building, which has been defined as being in Fair condition with heritage value and Medium significance. (Located approximately 120m west of the Main Site); and
- Locally listed Upstairs and Downstairs Public House, which has been defined as being in Poor condition with Low to Medium heritage value and Medium significance. (Located immediately adjacent to the Main Site boundary, west of Daw Bank Road).

5.12.5. St Peter's Conservation Area was designated in 2005 and captures a wealth of heritage buildings both nationally and locally listed within the routes St Petersgate, Chestergate and Wellington Road. It is considered to be of medium value based on its designation and it is located approximately 90m north east of the Main Site and encompasses Wellington Road.

5.12.6. The following could have potential impacts upon heritage assets during the development of the Proposed Development:

- Physical impacts upon archaeological features;
- Physical impacts upon built heritage; and
- Impacts on the setting of heritage assets.

5.12.7. It should be noted that the above assessments and reports were written before the addition of Heaton Lane as a temporary bus station and therefore it is necessary for the project team to carry out a review of the above Desk-Based Assessments that have already been undertaken to ensure their conclusions are still accurate and fit for purpose. The review will state whether the assessments will require updating to be relevant for the current Proposed Development which has changed since they were produced

5.12.8. The project team will also be producing a 'Heritage Report: Significance and Impact' to be submitted as part of the planning application, which will combine a statement of significance for the Proposed Development and

[19] BDP 'Feasibility Study – Historic Setting Analysis', August 2017

impact assessment. The impact assessment will include a review of a number of views of the proposed development in relation the historically significant built heritage and the level of impact the new development will have.

Likely Environmental Effects

5.12.9. The project team are also compiling an archaeological mitigation schedule in consultation with the Greater Manchester Planning Archaeologist. This outlines the potential impacts on historical archaeology for the Heaton Lane Site and the Main Site which includes Exchange Street which are:

- Potential ground disturbance, at Heaton Lane, on particular archaeological assets of interest, such as the southern extent of Wellington Bridge Mill;
- Likely disturbed heritage assets, during ground works for the Proposed Development, of regional importance including: Chester Gate Print Works, Site of Chester Gate Mill and Site of Daw Bank Print Works.

5.12.10. Appropriate mitigation will therefore be required as there is potential for environmental impacts on the archaeology within and around the Site. However, it is suggested that, at sites that have been evaluated and established for significant remains such as Chester Gate Dye Works and Mill, open-area excavation mitigation should be undertaken and the full scale of the excavation should be agreed with the Heritage Management Director (Archaeology) at the Greater Manchester Archaeological Services. This will reduce the potential effects to non-significant levels if undertaken.

5.12.11. Where no investigation and evaluation has been undertaken this should be carried out prior to construction. These investigations should be supplemented by more detailed research into the development and plan of the assets, particularly for Daw Bank Print Works.

5.12.12. It is considered that, if all appropriate mitigation is implemented, that there will not be significant effects in relation to the built heritage. Details of impacts on the archaeological assets will be outlined after the various ground investigations and mitigation mentioned above has been undertaken

5.12.13. Potential impacts on the views of historically significant heritage assets will be considered as part of the Heritage Report to be submitted with the planning application and will include best practice to limit any potential effects.

5.12.14. Overall, once the planned Heritage studies, reports and excavations have been undertaken it is suggested that there will be no impacts sufficient to warrant Cultural Heritage.

5.13 LIGHTING

5.13.1. Lighting installations are present along Station Road, Exchange Street, Railway Road and Wellington Road South (A6). In addition, lighting is installed within the existing Stockport Railway Station associated with current operations and health and safety requirements. Based on the existing lighting installation, it is anticipated that the current lighting environment is indicative of an Environmental Zone E3 or E4 ('medium / high district brightness') as defined by the Institute of Lighting Professionals 'Guidance Notes for the Reduction of Obtrusive Light'[20].

Likely Environmental Effects

5.13.2. Given the nature of the Proposed Development, there is likely to be temporary lighting installed during construction for health, safety and security purposes. This is likely to cause a temporary increase in light spill and glare during this period. However, through the implementation of a CEMP and adherence to sensitive working practices (e.g. ensuring lighting faces inwards towards the Site) and the current anticipated lighting environment, there is unlikely to be a significant change in light spill and glare experienced by nearby residential properties.

5.13.3. Once complete, there will be permanent lighting fixtures installed within the Proposed Development. It is assumed that such installations will be designed in line with a lighting strategy / specification, which will be agreed with SMBC. This strategy / specification will be developed in line with best practice (including the

[20] Institute of Lighting Professionals 'Guidance Notes for the Reduction of Obtrusive Light' GN01:2011

Institute of Lighting Professionals Guidance Notes) and relevant British Standards. As such, given the anticipated lighting environment there is unlikely to be a significant change in light spill and glare experienced by nearby residential properties during operation.

5.13.4. Given the urban context of the Proposed Development, the area will already be well lit with various lighting installations, therefore is also not anticipated to be a significant change in the night-time lighting environment within the Site boundary due to the Proposed Development. Therefore this minimal change would not be sufficient to warrant an EIA with regards to Lighting.

5.14 MICROCLIMATE

WIND

5.14.1. A wind assessment was carried out by AECOM in March 2016[21] which included a 3D computational fluid dynamics (CFD) model of Stockport Interchange and its surroundings whereby the results were used to calculate the Lawson comfort criteria (a wind tunnel test to assess and quantify the pedestrian level wind microclimate) over the Main Site. The results from this study indicate that the Main Site has a suitable wind microclimate for passengers stood waiting in all areas of the bus interchange (Lawson category II – suitable for "Pedestrian Standing"). Furthermore, most areas are also suitable for Lawson category I – "Sitting". The assessment then concludes that the study indicates that no mitigation measures are required in terms of wind microclimate.

5.14.2. Given the changes that have occurred in the Proposed Development design since 2016, the project team are undertaking an updated wind assessment to confirm no further significant effects in relation to the wind environment. This will be submitted to support the planning application of the Proposed Development and will be prepared by a qualified microclimate.

5.14.3. The wind assessment will determine the impact of the Proposed Development on the pedestrian level wind environment and its surroundings. It will take into account the effect of the surrounding context and will pay particular attention to wind effects in open amenity spaces, building entrances and pedestrian routes to determine the level of compliance with recommended standards. The assessment will be based on drawings or 3D Computational Fluid Dynamics (CFD) modelling to predict air flows and wind velocities around the Proposed Development. The assessment will also include effects of the Proposed Development in combination with other future schemes.

Likely Environmental Effects

5.14.4. As mentioned above, a wind assessment will be carried out to ensure no impacts on the wind environment would occur. The wind assessment will be submitted as a standalone report as part of the planning application. The production of the wind assessment will clarify the various impacts, conclusions and identify and specify potential mitigation measures required to limit any potential effects. Given the conclusions of the AECOM 2016 assessment, it is considered that even with new design, the effects would not warrant an EIA with regards to Wind and Microclimate.

DAYLIGHT ASSESSMENTS

5.14.5. An assessment will be made of the potential impact of the Proposed Development on the daylight and sunlight of existing neighbouring properties and the level of daylight and sunlight within the Main Site's residential and commercial units.

5.14.6. The assessment will be based on the guidance and criteria given in the Building Research Establishment's (BRE) 'Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice (BRE, 2011)'[22]. This is the most recent and most complete set of guidance on daylight sunlight and overshadowing and are widely applied in the UK to assess the impacts of new developments both externally and internally. It will provide recommendations for improvements where necessary.

5.14.7. The receptors of the assessment will be the windows (adjacent properties) and habitable rooms (within Proposed Development) where the occupants have a reasonable expectation of natural light.

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[21] AECOM 'Wind Assessment' March 2016
[22] BRE, 'Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice (BR 209), 2011

Likely Environmental Effects

5.14.8. The assessment will include feedback for the design team if design changes are required and results will be summarised within a standalone report. It is suggested that no EIA is required on this basis as the assessment will follow best practice guidance which will reduce potential impacts and include recommendations for improvements where necessary.

5.15 SUSTAINABILITY AND BREEAM

5.15.1. A high level BREEAM (Building Research Establishment Environmental Assessment Method) Strategy Statement was undertaken by WSP in July 2017[23] which aimed to provide an indication of the potential number and type of BREEAM/ HQM (Home Quality Mark) assessments which could be undertaken as the design progressed. It details the aims of BREEAM and HQM and their benefits with regards to encouraging significant improvements in the overall performance of buildings.

5.15.2. SMBC encourage applicants to demonstrate the sustainability of their development proposal through a nationally prescribed best practice standard such as BREEAM and HQM, with a minimum rating of Excellent (BREEAM) and 3 stars (HQM).

5.15.3. It was concluded that '*in order to maximise opportunities for the achievement of BREEAM / HQM certification with efficiency of effort and cost, integration of the assessment requirements should be undertaken at the earliest stages of design*'. Throughout the design process, it should be ensured by the design team that continued consideration of the various aspects, particularly those relating to timing requirements, supporting studies and credit requirements[20].

5.15.4. In addition to SMBC Policy requirements, TfGM have produced a robust set of environmental criteria for construction projects which sets out requirements and aspirational targets for current construction projects being delivered for TfGM. It has been agreed with TfGM, SMBC and the project team that the TfGM Sustainability Assessment Toolkit will be used for monitoring and assessing sustainability credentials of the Proposed Development as it progresses.

5.15.5. The project team will be holding a workshop with the design team to draw out some of the sustainability issues and responses (with input from other disciplines). This will predominately be in response to local planning policy (determined with the SMBC Core Strategy, 2011) and the sustainability toolkit which will be used by the client to assess the project against.

5.15.6. A Sustainability Strategy report will be submitted with the planning application which will take into account the conclusions and further recommendations from the BREEAM Strategy Statement and environmental criteria mentioned above. Many of these criteria are over and above the requirements of Local Policy which is indicative of TfGMs commitment to sustainable development. To ensure the Sustainability Strategy addresses all the relevant policy requirements from Local Authorities and the TfGM Sustainability Toolkit, the project team will follow their Define, Develop, Deliver approach. This approach will ensure that all information on sustainability criteria against which the project will be assessed is gathered and a sustainability strategy is developed that outlines the credentials of the Proposed Development. This will then be issued for comment by the Client team.

Likely Environmental Effects

5.15.7. Overall, given that the Sustainability Assessment Toolkit will help monitor and assess sustainability credentials to ensure that the Proposed Development is in line with the environmental criteria set out by TfGM. This will ensure that any potential sustainability impacts not adhering to environmental policies and criteria are flagged up prior to the development of the project and appropriate assessment will be carried out to ensure they comply. Therefore, it is unlikely that there will be any significant effects. In addition, with the completion of the Sustainability Strategy no impacts will warrant EIA in relation to Sustainability and BREEAM

[23] WSP 'BREEAM Strategy Statement', July 2017

5.16 VULNERABILITY OF PROJECT TO RISKS OF MAJOR ACCIDENTS AND DISASTERS

5.16.1. The probability, frequency and likelihood of natural disasters arising from climatic occurrences (i.e. hurricanes) are considered to be very low due to the natural climatic condition of the UK within the global climate system. Specific geological events (i.e. earthquakes, tsunami, volcanic incidents etc.) are also considered to have very low probability, due to the general absence of required geological conditions (i.e. area of tectonic plate interaction) within or in close proximity to the UK. Although earthquakes have occurred within the UK, the magnitude of such events has generally been low.

5.16.2. In addition risks such as flood risk are considered and addressed in the FRA. It is therefore suggested that due to the low risk of major accidents and disasters this topic has been screened out and will not be considered further.

5.17 CLIMATE CHANGE

5.17.1. Schedule 4(5f) of the EIA Regulations indicates that the EIA process should consider the impact of the Proposed Development on climate and the vulnerability of the project to climate change. There is currently no guidance that determines the necessary assessment process for consideration of impact on the climate, however, the Institute of Environmental Management & Assessment (IEMA) guidance[24] [25] recommends that the EIA process should consider the following, with respect to climate change:

- Green House Gas (GHG) Emissions;
- Climate change resilience; and
- Climate change adaptation.

5.17.2. Climate change resilience should be a key part of the design process and evolution and should respond to changing climatic factors which are already anticipated. Equally, the Proposed Development will need to respond to changing climatic factors which are already anticipated. The design of the Proposed Development should seek to lower risks posed by the consequences of climatic changes (e.g. temperature, storm frequency, flooding and other factors). As such, the resilience and management of a changing climate will become integral to the Proposed Development. Due to the scale of the Proposed Development, the contribution of greenhouse gases to the GHG emission budget is unlikely to be considered significant.

5.17.3. Stockport has a Local Strategic Partnership Climate Change Strategy 2010-2020 which aims to reduce carbon dioxide (CO2) by 40% by 2020 based on 1990 baseline figures[26].

5.17.4. The Greater Manchester Air Quality Action Plan (2016-2021) mentions Stockport Interchange within the Appendix B: Infrastructure Improvement Schemes. It is briefly outlined as "*Replacement of the existing Stockport bus station with a new facility will enhance the quality of passenger facilities, support the interchange between bus and rail. … The interchange will support the ongoing development of the town centre*."[27]. The mentioned improvement in passenger facilities could potentially reduce the need for car transport, which could lead to a potential reduction in GHG emissions.

5.17.5. As per the BREEAM Strategy Statement, 2017, there are a number of credits within BREEAM which need to be met within specific timeframes. One credit is Wst 05 – Adaptation to Climate Change where the study/issue

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[24] IEMA, Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. (March, 2017).

[25] Institute of Environmental Management & Assessment (IEMA), Climate Change Resilience and Adaptation (November 2015).

[26] The Greater Manchester Climate Strategy 2011-2020, Available online at: http://media.ontheplatform.org.uk/sites/default/files/GM%20Climate%20Change%20Strategy.pdf. Accessed April 2018.

[27] Greater Manchester Air Quality Action Plan 2016-2021, Available online at: http://webcache.googleusercontent.com/search?q=cache:kHFsjQmd5AoJ:www.manchester.gov.uk/download/downloads/id/24676/greater_manchester_air_quality_action_plan_2016.pdf+&cd=1&hl=en&ct=clnk&gl=uk. Accessed April 2018.

should be a Climate Change Adaptation Strategy Appraisal which would need to be considered prior to the completions of RIBA Stage 2[28].

5.17.6. Overall, as climate change will be considered within the BREEAM assessment and the nature of the development as a public transport interchange could lead to a reduction in GHG emissions, significant effects in relation to climate change are not expected and therefore does not warrant EIA in relation to climate change.

5.18 SUMMARY OF KEY POTENTIAL SENSITIVE RECEPTORS

5.18.1. Based on the information included within Sections 5.1 – 5.17 the following key sensitive receptors have been identified:

- Local residential properties such as those on Heaton Lane and Station Road.
- Local community amenities such as schools within close proximity to the site, the closest of which is the All aboard Nursery approximately 100m south west of the Proposed Development.
- Users of pedestrian and cycle routes adjacent to the Proposed Development.
- Users of local road networks, principally Swaine Street, Exchange Street, Mersey Square and Heaton Lane.
- On-site habitat and protected species, in particular the potential for roosting bats.
- Potentially mature trees.
- Flood risk sensitive areas along the River Mersey which may be at an increased risk of flooding.
- Sensitive cultural heritage assets (Listed Buildings) that are within close proximity to the Site, principally the Railway Viaduct Grade II* Listed Building, Wellington Bridge Grade II Listed Building, Wellington Mill Grade II Listed Building and Plaza Cinema Grade II* Listed Building.
- Unknown below ground heritage assets.

5.19 CUMULATIVE EFFECTS

5.19.1. In line with EIA Regulations and best practice guidance, the potential for cumulative effects should be appropriately considered. This section outlines the identified committed developments that may cause in-combination effects with the Proposed Development and should therefore be considered during construction and/ or operation. It then evaluates the likely cumulative effects, in relation to the environmental topics outlined throughout this assessment, and their likely significance taking into account scheduled mitigation and best practice guidance.

COMMITTED DEVELOPMENTS FOR CONSIDERATION

5.19.2. Given the size and scale of the Proposed Development an appropriate consideration of committed developments has been undertaken. A review of information held on SMBC planning portal on 14/05/2018 has considered potential developments within a 2km search area. The committed developments selected for consideration in the in-combination effects assessment have been selected using professional judgment, because they are considered to be of sufficient size to potentially have in-combination effects: they are sufficiently close to the Proposed Development; potentially have overlapping construction phases and / or operational phases with the Proposed Development. The 17 committed developments identified for in-combination effects assessment are illustrated in Figure 2 and are:

- DC/062030 - Full planning application granted for new Astley Street, River Mersey Road Bridge including associated highway works. The location is the land off Swaine Street, Chestergate, Astley Street and Heaton Lane, Stockport. The bridge is located between the two separated sites for the Proposed Development and will link Swain Street with Astley Street over the River Mersey providing buses with direct access into the interchange from Heaton Lane. Construction work will begin in 2018 and is due to open to traffic in 2019. There will be some overlap with construction as the Proposed Development is due to start construction by May 2019, see Section 2.2.
- DC/061985 - Local Authority application of the former building on Railway Street, a brick boundary wall and a former petrol station canopy. Permission has been granted for the construction of the Travis Brow to A6 Wellington Road North Link Road and associated highway improvements works incorporating: a four

[28] WSP ‘BREEAM Strategy Statement’, July 2017.

lane road and a segregated cycleway/ footway between Travis Brow and A6 Wellington Road North; three new retaining walls; a restriction in the width of George's Road; relocation of a bus stop along the A6 Wellington Road North; a new 20 space car park of Andrew Street; installation of five toucan crossings and one puffin crossing; demolition and associated landscaping street lighting, drainage and footways/ cycleways improvements. The project includes Heaton Lane roundabout west of the railway line and west of the Heaton Lane Site, and Wellington Road North finishing just south of the M60. Construction was due to commence in May 2017 and be completed by spring 2020.

- DC/067888 - Power Related Development (electricity) for cable replacement works from Portwood to Heaton Mersey, the closest point is approximately 560m north of the Heaton Lane Site. The proposal involves the replacement of a 275kV oil filled direct buried electricity cable with a 2500mm^2 XLPE (cross linked polyethylene foam) cable between Portwood and Heaton Mersey. A PEA has been produced as part of the planning application which states that the works are scheduled to take place in 2020.
- DC/065974 - Minor Material Amendment granted permission for construction of a new section of highway, including a new four lane road, a gantry, a retaining wall and a cycle footway. The land is adjacent to Hollywood Way approximately 620m west of the Proposed Development. Consent was granted in May 2017.
- DC/068017 - Full planning application for the conversion and external alterations to Stockport Sorting Office to accommodate 117 apartments over five storeys, 943m^2 of B1 office floorspace and 211m^2 of A3, A4 or A5 floorspace or a combination of such over lower ground and ground floors. The site is located immediately adjacent to the Exchange Street site of the Proposed Development. Consent was granted in December 2017.
- DC/057245 - Local Authority application for creation of a new vehicle access into and out of Heaton Lane car park off Great Egerton Street and closure of the existing access on Heaton Lane. To be determined as of the date of this Screening report.
- DC/068127 – 2 Stockport Exchange (Stockport Exchange Phase 3). Reserved matters application seeking approval for access, layout, scale, appearance and landscaping, for the erection of a six storey office building (Use Class B1) including ground floor commercial uses (Use Class B1, A1, A2, A3, A4 and A5) and associated landscaping and works, following the grant of outline permission under DC/063213. The site is located approximately 85m south of the Proposed Development. Permission granted in March 2018.
- DC/054978 - Hybrid planning application Seeking: (1) full planning permission granted for the construction of an office building (Use Class B1) with ground floor commercial units (Use Classes A1, A2, A3, A4, A5 or B1), a hotel (Use Class C1), landscaping, areas of public realm and associated engineering and infrastructure works; (2) outline planning permission, with all matters reserved, for the demolition of existing buildings and the construction of office development (Use Class B1) with ground floor commercial units (Use Classes A1, A2, A3, A4, A5 or B1), a decked car park, landscaping, areas of public realm and associated engineering and infrastructure works. The site is located immediately adjacent to the railway and immediately adjacent to Exchange Street.
- DC/060491 - Full planning application for the demolition of existing hospital buildings, construction of 59 new residential dwellings, St Thomas Hospital (permanently closed).The site is located immediately south of the Stockport train station and consent was granted in December 2015.
- DC/068530 - Full planning application for the redevelopment of existing building, including partial demolition, to create a mixed-use commercial (A1, A2, A3 use) and residential scheme comprising 14 apartments, located on 1 Wellington Road South.
- DC/061476 - Full planning application for the change of use from vacant nightclub and retail unit (Sui Generis) to a 20 ensuite bedroom licensed HMO (house in multiple occupation) (Sui Generis), alterations to elevations and erection of a single storey extension, located at The Arches 1 Wellington Road South. Consent was granted in March 2016.
- DC/058692 - Full planning application for the change of use from a vacant nightclub and retail unit (Sui Generis) to 11 residential units (C3) with associated external alterations, located at The Arches 1 Wellington Road South Consent was granted in May 2015.
- DC/053364 - EIA Screening Opinion sought for mixed-use redevelopment of Grand Central Complex Leisure Park Railway Road, Stockport. The proposed site located adjacent south of Station Road. The planning decision is 'unknown'.
- DC/061237 - Full planning application for the redevelopment of the Rock building site to include retentions of existing retails unit, conversion of former warehouse to 52 residential apartments. Construction of a 4 storey residential block to accommodate 21 newly proposed apartments and 31 proposed in the existing buildings (52 apartments total) with ground floor A1 (retail) and A3 (restaurant) uses and associated works. Full planning permission was given.

- DC/062942 - Full planning application for the construction of a sports play area, a play area, a wildlife area, a new car park (6x spaces including 1x disabled), a new wall, 2x new access points (one for the Hollywood Park Combined Nursey Centre and one for Lundy Projects Ltd) and the relocation of boundary walls. The site is located to the west of the Proposed Development and consent was granted in August 2017.
- DC/060027 - Full planning application for the demolition of 1-3 Crowther Street, 76-78 Lower Hillgate, and 6 no. four storey flats and the construction of 74 no. new dwellings with associated landscaping, car parking, and highways works. Land at Convent Garden, Stockport, located approximately 260m from the Proposed Development. Planning consent was granted in October 2015.
- DC/068401 - Erection of a 4 storey supported care residential development comprising of 17 no. Apartments, on site office and associated works. Located along Mottram Street, SK1 3PA, approximately 480m south east of the Proposed Development. Planning consent was given in January 2018.
- DC/066642 - Full planning application for residential development of 21 affordable properties comprising of 5 no. 2 bed 4 no. 3 bed two storey dwellings and 12 no. 2 bed apartments within a 3 storey block including associated parking and landscaping works. The development is on 70 Range Road, Cale Green approximately 920m from the Proposed Development. Consent was granted in July 2017.

COMMON RECEPTORS WITH LIKELY ENVIRONMENTAL EFFECTS

5.19.3. As 17 committed developments have been identified within 2km of the Proposed Development as having potential for cumulative environmental effects on sensitive receptors, an appraisal of the likely significant in-combination effects has been outlined in Table 2 below. This has focused on the environmental topics considered in this request for Screening Opinion, and where there are overlapping and connected assessments, these have been merged.

Table 2: Cumulative Appraisal

Environmental Topic	Phase	Appraisal
Traffic / Air Quality / Noise / Population and Human Health	Demolition / Construction	Given that many of the committed developments outlined above are located within relatively close proximity to the Proposed Development, traffic associated with each development will utilise all or some of the same road network as the Proposed Development during demolition and construction. Therefore there is potential for in-combination effects, in relation to demolition / construction traffic, on common receptors. However, it is assumed that SMBC will expect and apply similar requirements and conditions, with regards to all planning application documents to be submitted alongside the planning application; such as a traffic assessment. An assessment of the cumulative effects of the Proposed Development and background traffic growth in relation to other committed developments will be carried out in the CTMP, identifying any cumulative effects and appropriate management practices or mitigation measures. It can therefore be considered that any in-combination effects are unlikely to be significant in relation to demolition / construction traffic. It is presumed that all potential cumulative construction and demolition traffic effects, in relation to air quality and noise on sensitive receptors, will be evaluated and that relevant mitigation will be outlined within the CEMP and DEMP. Given that it is unlikely that there will be any outstanding cumulative effects in relation to construction traffic, it will be unlikely that there will be significant in-combination effects in relation to air quality and noise once appropriate mitigation has been put in place. Given the urban context of the Proposed Development and unlikely significant traffic, air quality and noise in-combination effects after the inclusion of potential mitigation on cumulative effects in the CTMP, CEMP and DEMP, it is considered that in-combination effects on the population and human health are unlikely to be considered significant. Furthermore, it is assumed best practice guidance will be followed by all committed developments to ensure that construction is carried out with minimal air quality and noise nuisance to the local population. Appropriate mitigation best practice guidance for cumulative effects on population and human health will be considered within the CEMP and DEMP.
	Operation	It is anticipated that there will be no significant change in operational traffic and therefore there will be no significant effects in combination with other committed developments in relation to traffic. Given there is no significant change or impact on operational traffic it is unlikely that there will be any significant cumulative effects on air quality and noise in combination with other committed developments. Given no significant changes to the amount of traffic and the addition of a green park, it is unlikely

		that there will be any significant in-combination adverse effects on population and human health in relation to operation with some potential for positive effects.
Landscape / Cultural Heritage	Demolition / Construction / Operation	Landscape and potential viewpoints that are likely to be impacted are not considered to result in any detrimental effects due to the urban context of the Proposed Development and the implementation of best practice guidance on reducing visual impacts during construction outlined in the CEMP. It is assumed that implementation of appropriate best practice measures for the surrounding committed developments will be applied and lead to reduced demolition and construction impacts in relation to landscape and visual amenity, and therefore there will be reduced potential for in-combination significant effects. During operation, Landscape and potential viewpoints that could be impacted are not considered to result in any detrimental effects due to the urban context and built up environment surrounding the Proposed Development, and the potential for visual aesthetics of the Proposed Development. The level of impact on historically significant cultural heritage will be evaluated within the heritage statement of significance and impact assessment with mitigation measures set out at a project level. Relevant mitigation and best practice will be included within the impact assessment report and within the CEMP and DEMP to ensure that in-combination effects are reduced and limited as far as possible during demolition and construction. It is therefore unlikely that cumulative effects will be significant after the application of best practice guidance. Furthermore, due to the already built up nature of the surrounding environment potential historical viewpoints of built heritage are unlikely to have greater in-combination effects than those at the project level.
Waste and Materials	Demolition / Construction / Operation	It is likely that there will be generation of waste from the demolition, construction and operation of the Proposed Development and increased demand on local waste treatment / disposal facilities. Given the common geographical extent of the Proposed Development and committed developments it is likely that waste arising will be sent to similar waste treatment / disposal facilities. Although there is the potential for in-combination effects it is assumed that all schemes will implement a waste strategy to minimise waste arisings and pressure on local waste treatment / disposal facilities. The Proposed Development will produce a waste strategy and a SWMP which will reduce effects of the demolition, construction and operational waste levels to non-significant levels, therefore any potential in-combination effects would be no greater than that considered at the project level.
Biodiversity	Demolition / Construction	Mitigation will need to take into account in-combination effects on the potential habitats as well as mitigation for the Proposed Development in isolation. This will need to be included within the CEMP

		and DEMP and implemented prior to construction and demolition. As such, all required mitigation, best practice guidance measures and ecological enhancements will reduce the potential in-combination effects to ensure these would be no greater than that considered at the project level and therefore would not be anticipated to be significant.
	Operation	It has been recommended that ecological enhancements and mitigation as mentioned in Section 5.8 will be included as part of mitigation of the Proposed Development therefore reducing significant operational impacts. Protected species identified as having the potential to be present within the Proposed Development may overlap with the committed developments given their transient nature. It is assumed that protected species would be afforded appropriate protection and mitigation measures across each scheme. Therefore, in-combination effects are assumed to be no greater than that at the project level and operational effects on biodiversity within the Proposed Development will not be significant and will not cause or contribute to significant in-combination effects.
Water / Geology and Soils	Demolition / Construction / Operation	Given the common geographical context of the Proposed Development and many of the surrounding committed developments, it is likely that there will be a common foul flow, sewage and potable water network. However, with the implementation of the Drainage Strategy and various mitigation and remedial measures it is unlikely that there will be any significant construction, demolition or operational effects in relation to water, geology and soils. It is assumed also that other developments will be required to input a similar level of appropriate mitigation measures which will reduce in-combination effects and limit their significance. Furthermore, remedial measures will implemented to limit any potential for land contamination for the Proposed Development. It is assumed that this will be very similarly implemented across all projects with the potential for land contamination and therefore it is unlikely that significant in-combination effects will occur. Overall it is therefore unlikely to be significant in-combination effects in relation to water, geology, soils and contaminated land.
Lighting / Microclimate	Demolition / Construction	During construction there will be a temporary increase in light spill and glare during this period. However, through the implementation of a CEMP and adherence to sensitive working practices (e.g. ensuring lighting faces inwards towards the Proposed Development), there is unlikely to be a significant change in light spill and glare experienced by nearby residential properties. Therefore it is unlikely that there will be in-combination effects greater than that considered at project level. Appropriate best practice mitigation measures should be implemented prior to construction of the Proposed Development with regards to potential adverse impacts on the wind environment to reduce and limit any significant effects. It is assumed that other committed developments will be required to ensure no significant effects on the wind environment occur, particularly in relation to tall building developments. Significant cumulative impacts on the wind environment for construction of the Proposed Development and other developments are unlikely after the implementation of mitigation measures.

	Operation	Once the Proposed Development is operational the lighting fixtures will be designed in line with appropriate construction lighting strategy/ specification, which will be agreed with SMBC. A similar strategy and requirement is assumed amongst all the committed developments within the surrounding area and therefore it is unlikely that there will be significant in-combination effects for lighting.

5.19.4. It can be concluded from the table above that after an appraisal of potential environmental cumulative effects, it is considered unlikely that impacts in relation to the environmental topics identified above will result in significant in-combination effects and therefore there is no requirement for any further cumulative assessment in addition to those that will be carried out in the separate environmental assessments.

5.20 APPLICATION

5.20.1. A planning application is currently being prepared, in support of this the following technical reports are being prepared:

- Completed standard application form
- Location Plan (scale of 1:1250 or 1:2500)
- Site Plan/ Block plan (scale of 1:100 or 1:200)
- Copy of other plans and drawings necessary to describe the application
- Completed Ownership Certificate(s)
- Daylight/Sunlight Study
- Design and Access Statement (to include pedestrian movement analysis)
- Air Quality Assessment
- Airport Safeguarding Information
- Biodiversity Survey/ Assessment
- Contaminated Land Survey
- Crime Impact Statement
- Electronic Information (for Major Development in the Town Centre/ M60 Gateway to allow integration into Council's Three Dimensional Town Centre Model)
- Energy Statement
- Flood Risk Assessment
- Foul Drainage Assessment and Surface Water Drainage Assessment
- Heritage Statement
- Land Stability Report
- Landscaping Scheme
- Lighting Impact Assessment/Scheme
- Noise Impact Assessment
- Other Plans and Drawings (not covered by the National Requirements)
- Photographs/ Photomontages
- Planning Obligations (Heads of Terms) (possible Unilateral Undertaking as SMBC own the land)
- Planning Statement
- Pollution Prevention Statement
- Referencing of Plans and Drawings
- Road Safety Audit
- Statement of Community Involvement and pre-application discussion
- Sustainability Checklist
- Transport Assessment
- Travel Plan
- Tree Survey / Arboricultural Implications Study
- Ventilation / Extraction Statement
- Viability Appraisal/ Marketing Exercise/ Business Plan
- Wind Analysis Study Conclusions

6 CONCLUSIONS

6.1.1. This Request for a Screening Opinion report has provided EIA screening information on the potential environmental effects of the Proposed Development, in line with Regulation 6(2) of the EIA Regulations. This report has considered the likely relevant environmental effects using both desk-based baseline information and ongoing environmental assessments.

6.1.2. These ongoing environmental assessments will determine any further effects and identify additional relevant mitigation where required, which will further reduce the effects to as low a magnitude as possible.

6.1.3. As highlighted above, much of the mitigation is inherent in the Proposed Development design or within supporting documentation that can be controlled by planning condition, such as the CEMP or DEMP documents.

6.1.4. This request for Screening Opinion, as per the EIA Regulations, has taken into account the sensitivity of the location, the potential for effects on locational sensitivities such as the absorption capacity of the riparian area, and have been qualified by surveys and assessment previously undertaken. Potential environmental effects have been summarised within this report, and these have been considered against the EIA Regulations and guidance.

6.1.5. The potential for disruption and reduced integrity of the riparian habitat has been evaluated and mitigation has been agreed by the EA which will reduce the potential indirect impacts on the riparian habitat and its associated species by keeping and creating a valuable connecting habitat corridor for breeding and foraging.

6.1.6. It is therefore concluded that due to the inclusion of the proposed and embedded mitigation, and ongoing environmental assessments in the planning application, the Proposed Development does not require an EIA and that we would ask SMBC to respond to this in the positive within the statutory time period of 21 days.

APPENDIX A: DRAWINGS AND FIGURES

Drawing No.: STPT-BDP-XX-ZZ-DR-A-PM_30_10-0001_P01: Site Location Plan

LEGEND

Denotes Red Line Boundary

BUILDING DESIGN PARTNERSHIP SHALL HAVE NO RESPONSIBILITY FOR ANY USE MADE OF THIS DOCUMENT OTHER THAN FOR THAT WHICH IT WAS PREPARED AND ISSUED.

ALL DIMENSIONS SHOULD BE CHECKED ON SITE.

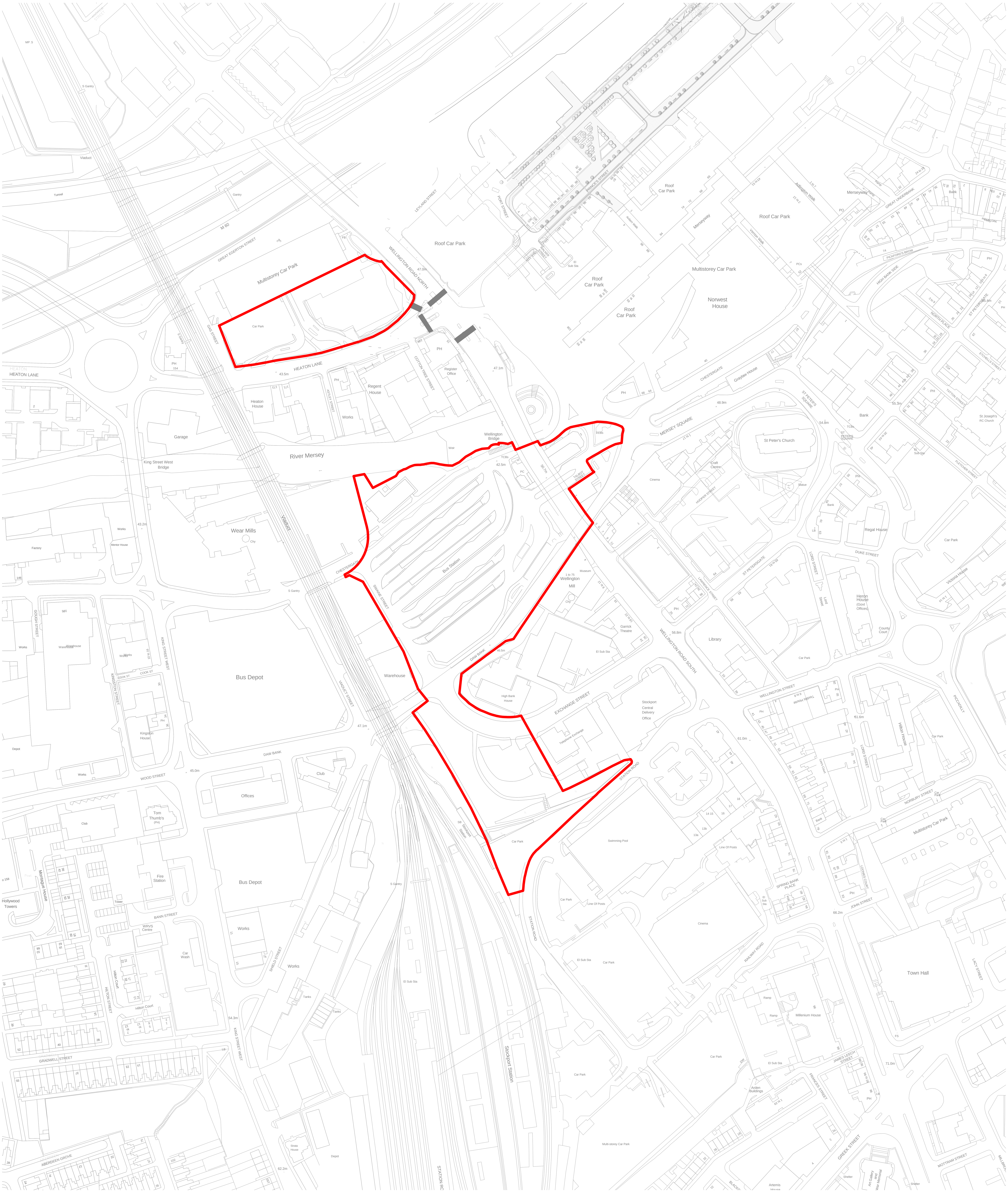
DO NOT SCALE FROM THIS DRAWING

ANY DRAWING ERRORS OR DIVERGENCIES SHOULD BE BROUGHT TO THE ATTENTION OF BUILDING DESIGN PARTNERSHIP AT THE ADDRESS SHOWN BELOW.

DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE FOLLOWING BEFORE WORK COMMENCES:

- THE CDM DESIGN ISSUES REGISTER
- THE BDP RISK SERIES OF DRAWINGS
- THE PROJECT CDM RISK REGISTER

NOTES



REVISION	DESCRIPTION	DRAWN	CHECKED	DATE
P01	First Issue	AB	AB	04.05.18

CLIENT

Transport for Greater Manchester

STOCKPORT METROPOLITAN BOROUGH COUNCIL

BDP.

11 Ducie Street
PO Box 85
Piccadilly Basin
Manchester
M60 3JA
United Kingdom

T +44 [0]161 828 2200

PROJECT TITLE
Stockport Interchange

BDP JOB NUMBER
P2007822

ISO 27001 CLASSIFICATION
Commercial In Confidence

DRAWING TITLE
Sitewide
Red Line Boundary Plan

SCALE
@ A1
1 : 1250

DATE FIRST ISSUED
04.05.18

DRAWING No.
STPT- BDP- XX- ZZ- DR- A- PM_30_10- 0001

REVISION
P01

Drawing No.: STPT-BDP-RB-ZZ-SK-A-PM_40_40_79-0005_P01 Sketch Drawing of Residential Block

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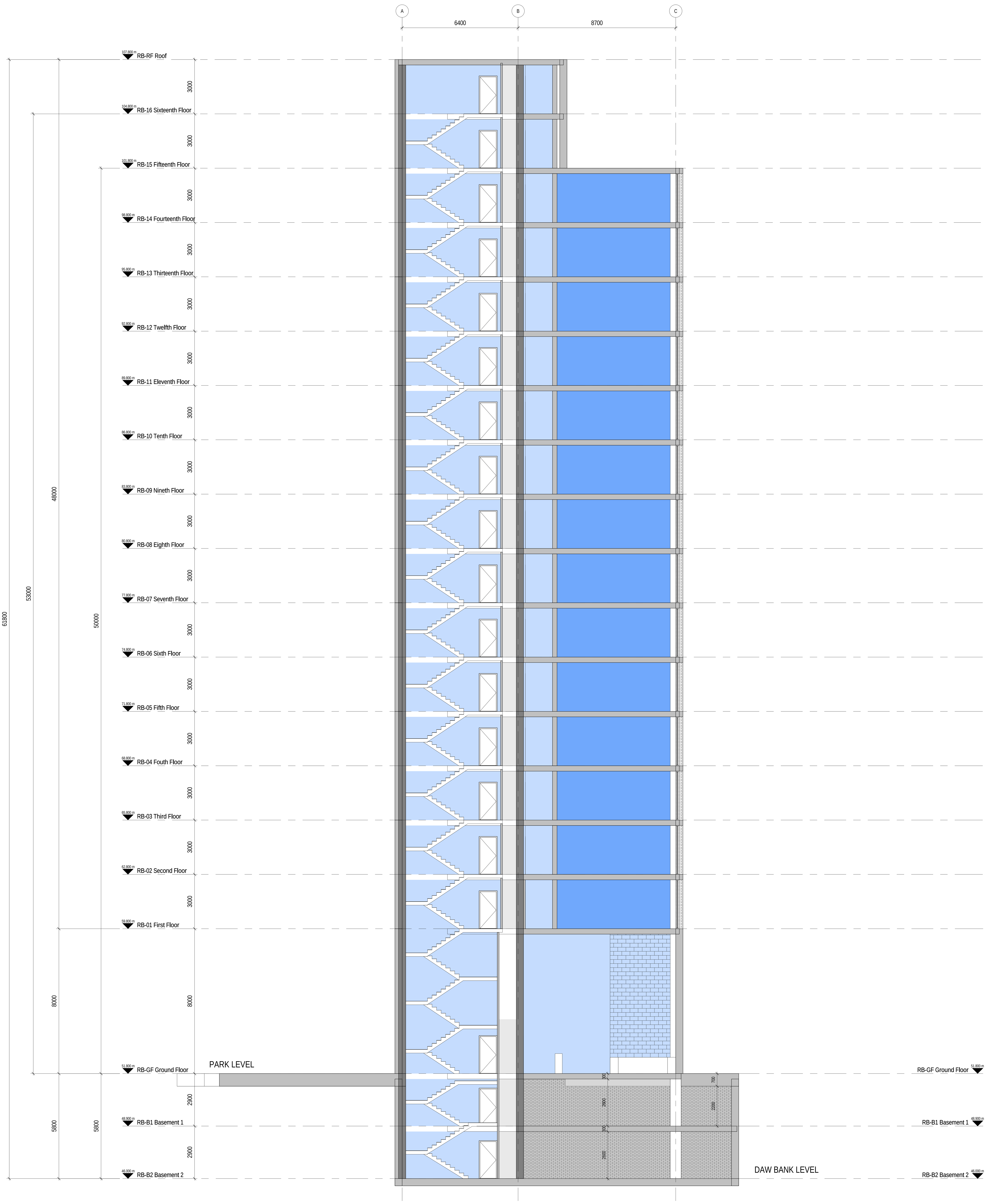


REVISION	DESCRIPTION	DRAWN	CHECKED	DATE
P01	First Issue	AMWB	AB	05/04/15

CLIENT

Transport for Greater Manchester

STOCKPORT METROPOLITAN BOROUGH COUNCIL

BDP.

11 Ducie Street
PO Box 85
Piccadilly Basin
Manchester
M60 3JA
United Kingdom

T +44 [0]161 828 2200

PROJECT TITLE
Stockport Interchange

BDP JOB NUMBER
P2007822

ISO 27001 CLASSIFICATION
Commercial In Confidence

DRAWING TITLE
Sketch Drawing
Proposed GA Section
Section AA

SCALE
@ A1
1 : 100

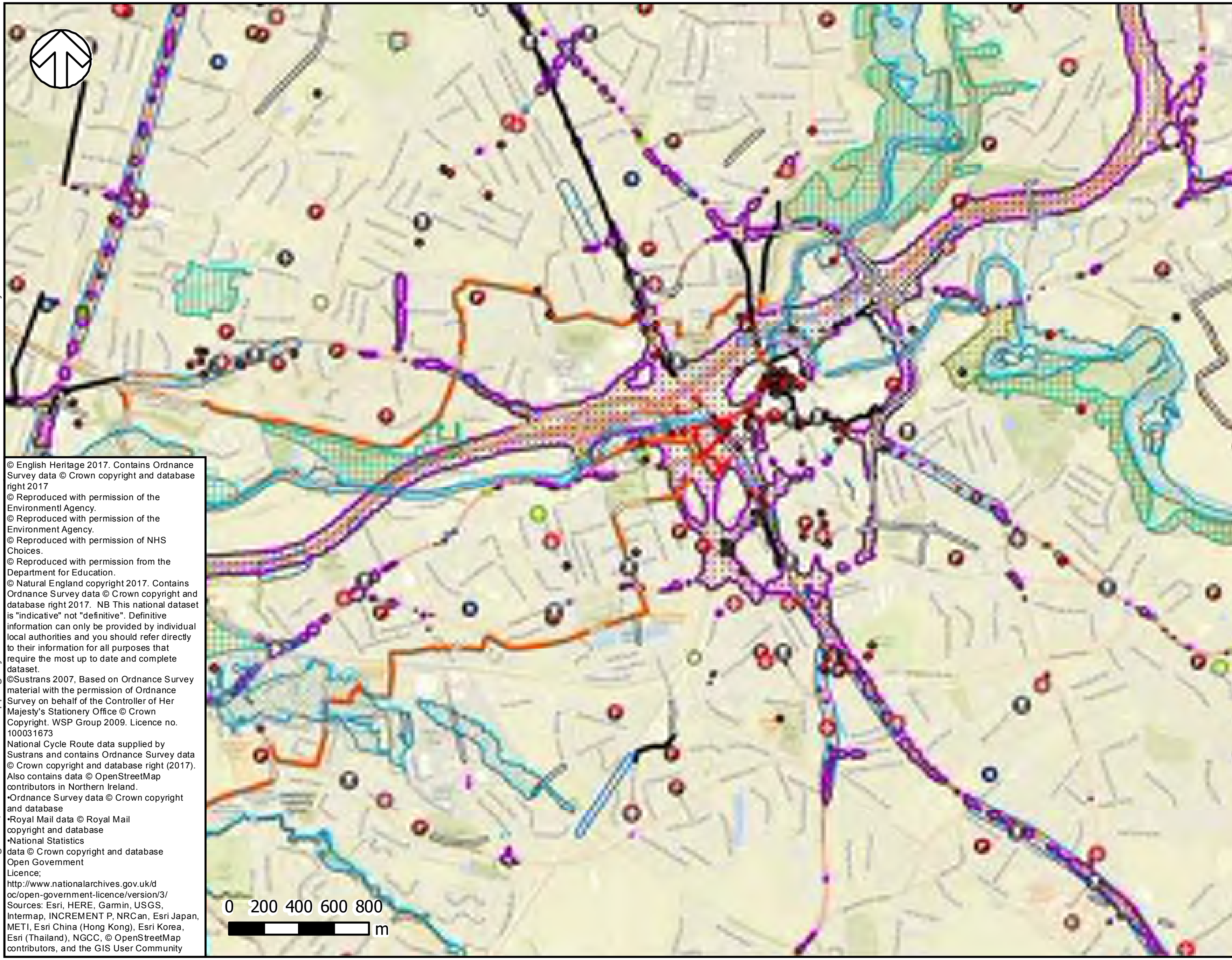
DATE FIRST ISSUED
05/04/18

DRAWING No.
STPT- BDP- RB- ZZ- SK- A- PM_40_40_79- 0005

REVISION
P01

Figure 1: Environmental Constraints Map

File: Created using iGIS, WSP's Online Mapping System Drawn By: UKBRL002 Date Modified: 21/05/2018 12:52



Key

- Heaton Lane Site Boundary
- Main Site (Stockport Interchange) Boundary
- Listed Building
- Hospitals
- GP Practice
- Dentists
- Secondary Schools
- Primary Schools
- Nursery Schools
- Flood Zone 3
- Flood Zone 2
- Air Quality Management Area 2017
- Noise Action Planning Important Areas (NIA)
- Local Nature Reserve
- Sustrans Local Cycle Route (On Road)
- Sustrans Local Cycle Route (Off Road)
- Sustrans National Cycle Route (On Road)
- Sustrans National Cycle Route (Off Road)

wsp

TITLE:

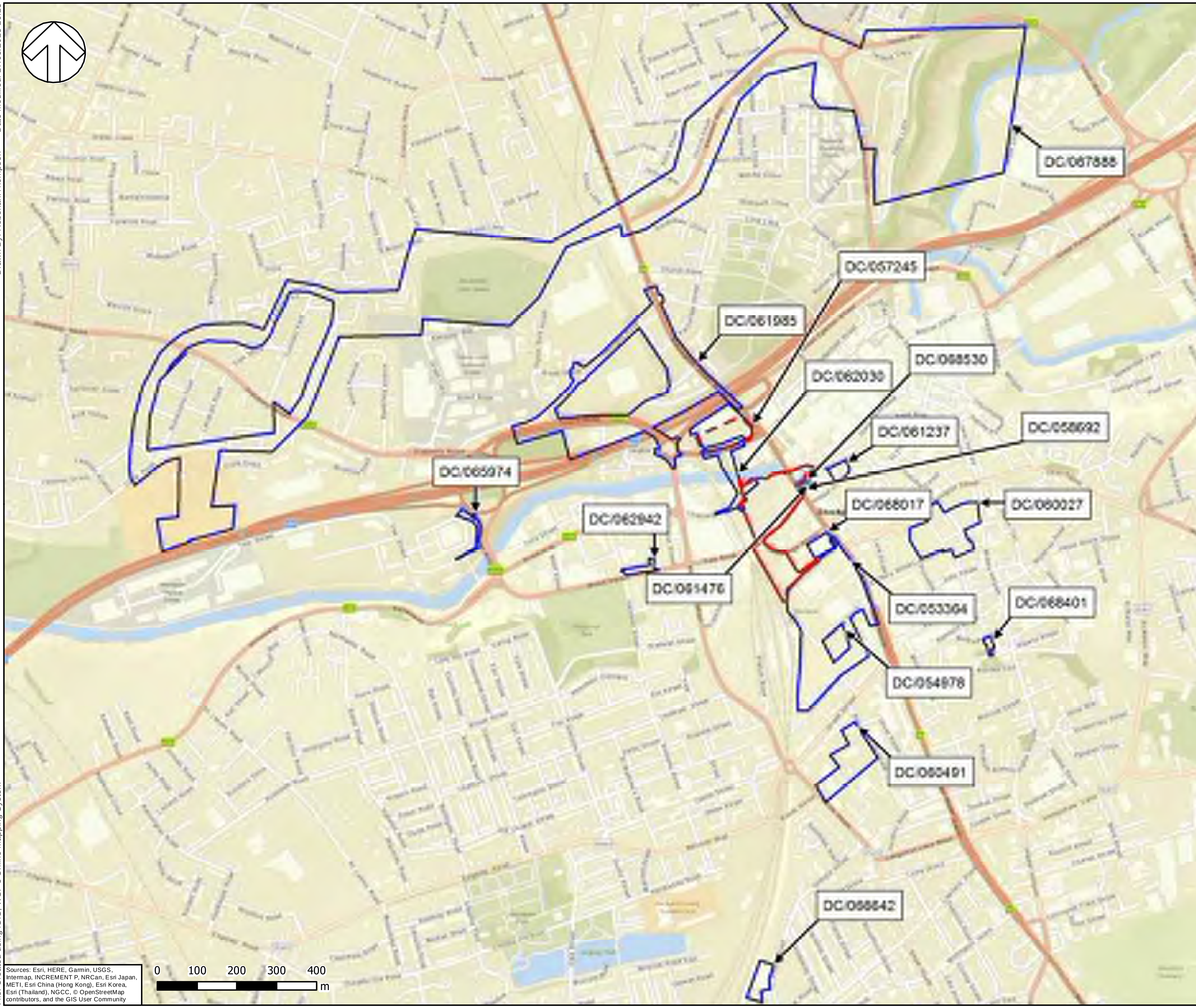
Environmental Constraints Map for Stockport Interchange

FIGURE No:

Figure 1

Figure 2: Local Authority Planning Application Boundaries

File: Created using iGIS, WSP's Online Mapping System   Drawn By: Rebekah.Thompson   Date Modified: 17/05/2018 16:13



Key

- - - Heaton Lane Site Boundary
— — Main Site (Stockport Interchange) Boundary
—— Planning Application Site Boundary (with Reference Number)

wsp

TITLE:

LA Planning Application Boundaries - Stockport Interchange

FIGURE No:

Figure 2

Figure 3: Public Right of Way

Screenshot of PRoW (green line), taken from Bing Maps, OS Layer [Online at: https://www.bing.com/maps?osid=08a02ff3-10af-46af-ba8f-38813269a76c&cp=53.407987~-2.162668&lvl=16&style=s&v=2&sV=2&form=S00027]

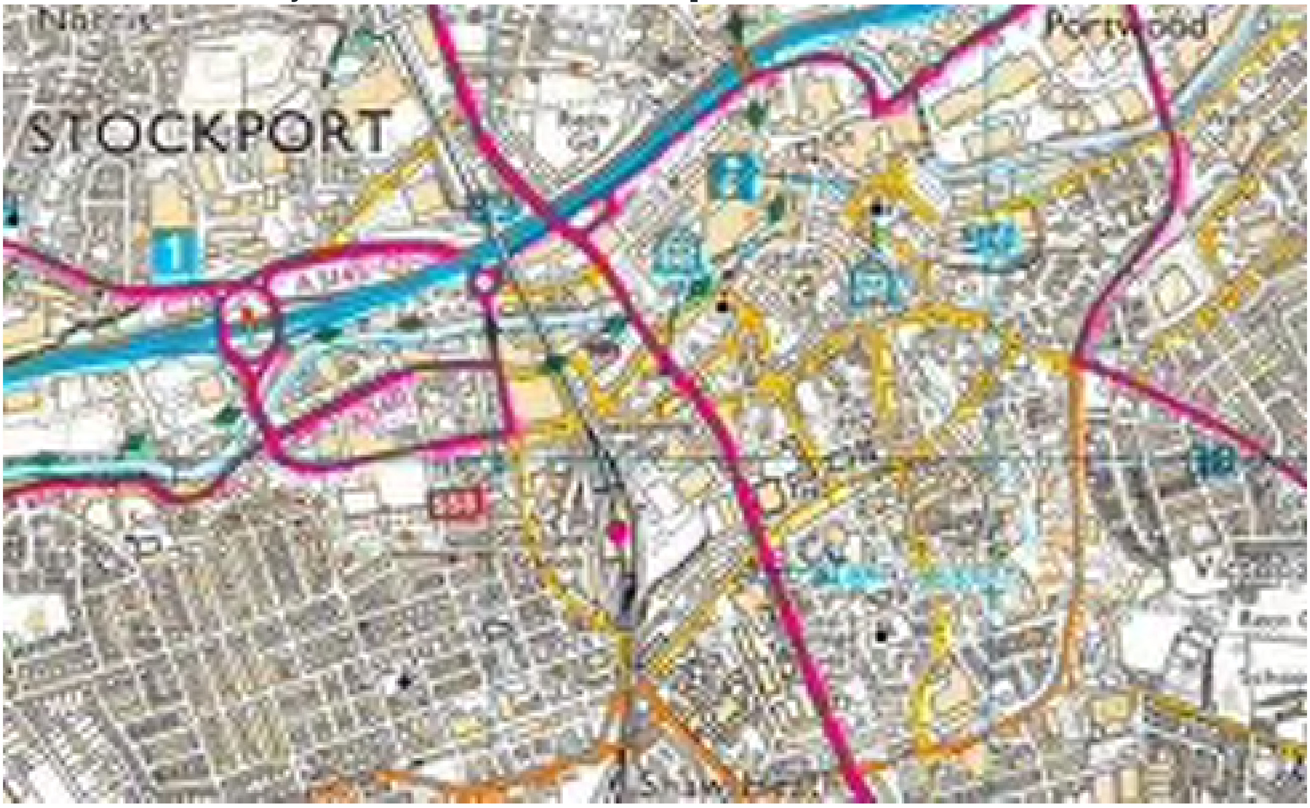


Figure 4: Feasibility Render

Figure 4: Feasibility Render

Figure 5: Phase 1 Habitat Survey Map

Date Modified: 30/06/2017

Drawn By: AZ

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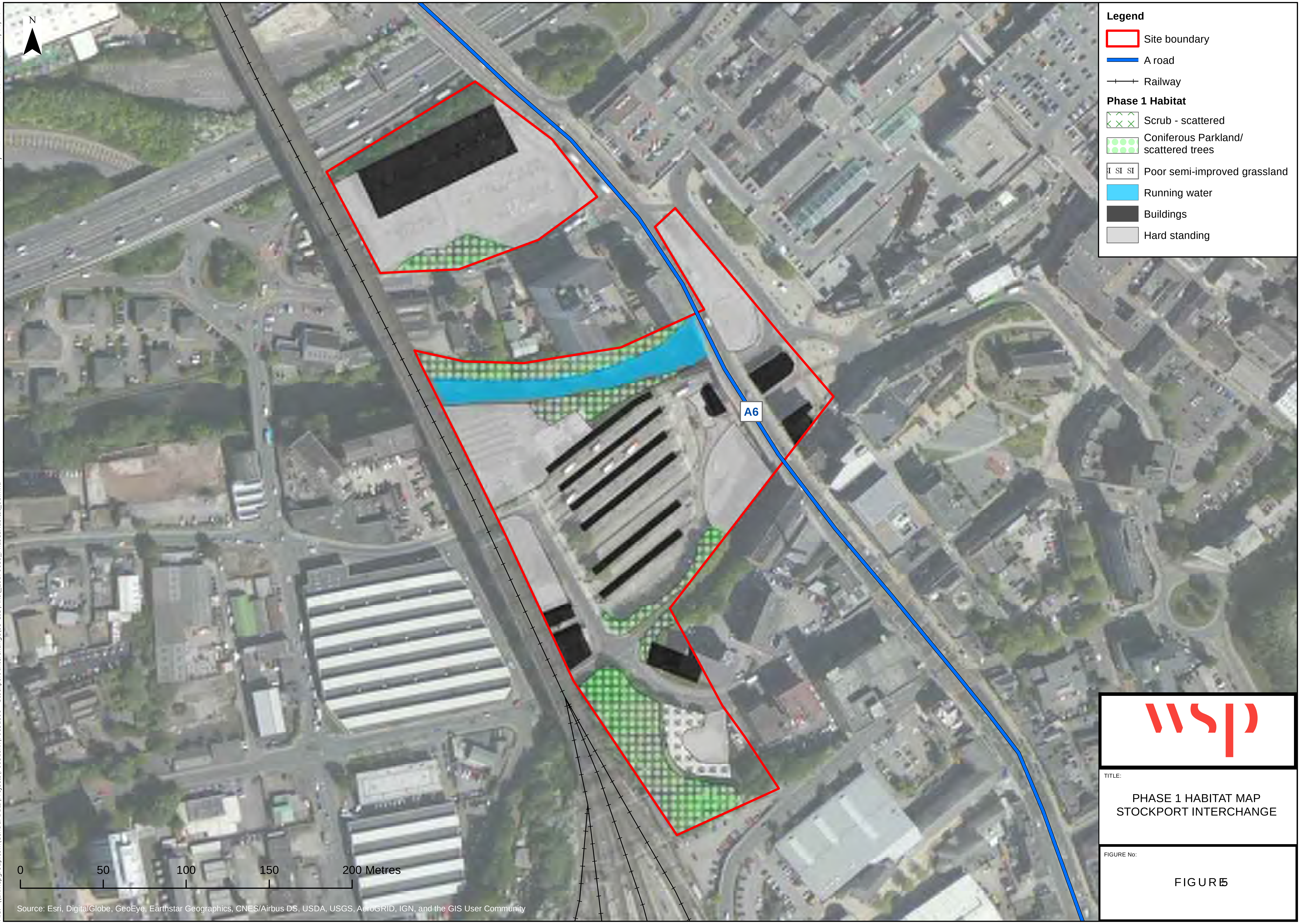

APPENDIX B: SCHEDULE OF MITIGATION

PURPOSE

In line with Regulation 6(2e) of the EIA Regulations project specific measures to avoid and / or prevent significant adverse environmental effects (i.e. mitigation measures) have been considered when appraising likely environmental effects. The EIA Regulations state that the inclusion of such measures and the extent to which they avoid and / or prevent adverse environmental effects should be considered by the local planning authority when formulating a Screening Opinion.

In order to support the local planning authority in completing the Screening Opinion, mitigation measures identified have been collated into a single Schedule of Mitigation, set out below. The aim of the schedule is to provide confidence to the local planning authority that mitigation identified is sufficient to avoid or prevent significant adverse effects.

The Schedule of Mitigation should also be utilised by the applicant and principal contractor to review mitigation commitments.

APPROACH

The schedule puts the mitigation measures into categories of mitigation which are primary, secondary and tertiary, definitions are outlined below.

Mitigation Category	Definition of Mitigation
Primary Mitigation	Inherent mitigation, comprising fundamental aspect of the project design.
Secondary Mitigation	Foreseeable mitigation, require further input and assessment in order to achieve the desired outcome of the efforts.
Tertiary Mitigation	Inexorable mitigation, in that it would be compulsory regardless of environmental impact assessments.

Schedule of Mitigation

Mitigation Measures	Mitigation category	Responsible Person	Relevant Phase	Detail of Mitigation
Demolition Environmental Management Plan (DEMP)	Tertiary	Principal contractor	Demolition	The DEMP and CEMP will be prepared by the principal contractor in advance of demolition / construction works and submitted to the local planning authority for approval. The documents will provide details of all demolition works, extents and activities, as well as provide the overarching details and principles to avoid and effectively manage potential adverse construction impacts upon the environment. The DEMP / CEMP will include all measures in line with all relevant government and industry standards, codes of practice and best practice measures (i.e. The Control of Asbestos Regulations, Statutory Instruments 2012 No. 632 (2012); The Construction (Design and Management) Regulations 2015. Statutory Instruments 2015 No.51). Specific to the Proposed Development, the following measures should be detailed with the DEMP / CEMP: • Traffic Management Plan, providing details of procedure for temporary demolition/construction related traffic; • Confirmation of Working Hours, including timing restrictions for deliveries; • Stakeholder communication method statement or procedure, to outline process for public engagement during the relevant phase; • Details of site layout including, site compound, site securement protocol, laydown/storage areas and other ancillary aspects required for relevant phase; • Site securement procedure and hoarding to be used; • Protection measures for retained features, including any requirements for protected species protective measures of
Construction Environmental Management Plan (CEMP)	Tertiary	Principal contractor	Construction	

				management plans; and • Best Practicable Means and practices to managed environment effects for noise, vibration, lighting, dust, particulate matter and air pollutants.
Protected Species Licenses	Tertiary	Client / appropriate technical specialist / principal contractor	Demolition / Construction	Any works resulting in impacts to protected species will be undertaken by a suitably qualified ecologist in line with any necessary licenses (if required).
Noise Assessment	Secondary	Client / appropriate technical specialist	Construction / Operation	Following recent surveys, a noise assessment will be undertaken to determine noise mitigation requirements (if any) for future residential properties within the Proposed Development, considering all existing and proposed noise sources and in line with relevant standards and guidance (i.e. British Standards, BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings, the World Health Organisation's Guidelines for Community Noise, 2014). A noise assessment detailing the findings of this assessment and committed to certain actions will be included within the planning application
Travel Plan	Secondary	Appropriate technical specialist	Operation	A Travel Plan (TP) will be prepared ,setting out site specific initiatives aimed at improving the availability and choice of travel modes to and from the Proposed Development. The TP will be the mechanism by which overall travel demand will be managed and monitored and will include information on: • Marketing and promotion to ensure sustainable travel opportunities are promoted; • Measures to promote efficient car use such as car sharing and provision of electric vehicle charging points; and

				• Measures to promote public transport use such as provision of a new bus stop facilities and route information.
Vegetation Clearance	Secondary	Principal contractor	Demolition / Construction	Any clearance of vegetation deemed suitable to support nesting birds will be cleared outside of breeding bird season or undertaken under supervision of a suitably qualified ecologist.
Ground Investigations	Secondary	Client / appropriate technical specialist	Demolition / Construction	The necessary level of ground investigation works will be undertaken within the Proposed Development in order to determine the potential presence and extent of contamination. All works during the demolition and construction phase should have due consideration for the investigations.
Pollution Management Plan	Secondary	Principal contractor / appropriate technical specialist	Demolition/ Construction	The principal contractor for each phase of the Proposed Development will prepare a Pollution Management Plan to effectively manage and mitigate the potential release of contaminants during each phase. The plan(s) will be informed by the required level of intrusive ground investigation works undertaken by an appropriate technical specialist.
Site Waste Management Plan (SWMP)	Secondary	Principal contractor	Demolition / Construction	The principal contractor for each phase of the Proposed Development will prepare a suitable waste management plan, identifying how waste produced will be managed in accordance with Department for Environment, Food and Rural Affairs (DEFRA), Waste Duty of Care Code of Practice Presented to Parliament pursuant to Section 34(9) of the Environmental Protection Act 1990 (2016) and The Waste (England and Wales) Regulations 2011 Statutory Instrument 2011 No. 988. The procedures, measures and techniques used for each phase will be fed to and concluded within the Waste Strategy to be sent to SMBC.
Waste Strategy	Secondary	Client / appropriate technical specialist	Operation	A Waste Strategy will be prepared and submitted to SMBC for approval. The strategy will outline the waste handling procedure within the Proposed Development, waste reduction techniques and measures.
Drainage Strategy	Secondary	Appropriate technical	Operation	During the detailed design stage, the project team will prepare a detailed drainage strategy outlining the measures to be adopted as part of the Proposed Development and submitted to SMBC for

		specialist		approval.

APPENDIX C: AECOM GROUND INVESTIGATION REPORT, 2016

Environment

April 2016

Stockport Interchange - Ground Investigation Report

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Appendix D – Soils Screening Assessment

Appendix E – Controlled Waters Screening Assessment

Appendix F – Groundwater Screening Assessment

Introduction

1 Introduction

1.1 Background

AECOM has been commissioned on behalf of Transport for Greater Manchester (TfGM) to prepare a Ground Investigation Report (GIR) for the development of the site known as Stockport Interchange.

The details of the proposed development and proposed planning application boundary are provided in the masterplan provided by TfGM (Appendix A). The scheme includes the building of a new interchange, realignment of the current road layout, expansion of Mersey Square and the construction of a bridge across the River Mersey.

1.2 Scope of Work

Based on the findings of the Desk Study [Ref. 01] (AECOM, 2015) the objectives of this report are to:

- determine the general ground conditions;
- provide geotechnical information to support preliminary design based on the masterplan;
- investigate the potential for soil and/or groundwater contamination;
- investigate the ground gases on-site and determine their impact on the proposed design; and
- determine the level of remediation required for the proposed end-use.

This GIR will present a description of the ground investigation undertaken, findings and assessment of the site work, conclusions and recommendations.

1.3 Sources of Information

Information was obtained from a number of sources regarding the historical and current condition of the site, these included:

- Landmark Envirocheck Report [Ref: 02];
- Environment Agency (EA) Website: www.environment-agency.gov.uk;
- British Geological Survey (BGS) Geological Map Sheet 98 Stockport (Bedrock and Superficial), 1:50,000 scale, 1971 [Ref. 03] and 1977 [Ref. 04];
- BGS Website - Historical Boreholes: www.bgs.ac.uk/geoindex; and
- Zetica Unexploded Ordnance Risk Desk Study [Ref. 05].

1.4 Parties Involved

The parties involved are as follows:

The Client is:

Transport for Greater Manchester.

The Consulting Engineer for the preparation of this report is:

AECOM,

AECOM House,

179 Moss Lane,

Altrincham,

WA15 8FH.

1.5 Limitations

This document has been prepared by AECOM Limited ("AECOM") for sole use of the client company detailed above (the "Company") in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Company.

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The report has been prepared and appropriate recommendations made on the basis of the proposed works described in the background Information section of this report and shown on the Figures. Should the proposed end use of the study area change it will be necessary to re-interpret the results of the assessment.

The information reviewed should not be considered exhaustive and has been accepted in good faith by AECOM as providing a true description of the study area conditions. However, no liability can be accepted for the accuracy of any of the reports prepared for the client or for third parties, or for any associated errors or omissions.

Any risks identified are perceived and based on information reviewed; actual risks can only be assessed following a physical investigation on site.

The effects of ground and water borne contamination on the environment are constantly under review, and authoritative guidance is subject to change from time to time. The conclusions presented herein are based on the guidance available at the time of writing. No liability can be accepted for the retrospective effects of any changes or amendments to the legislation or guidance.

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Capabilities on project:
Environment

Site Details

2 Site Details

2.1 Introduction

This section provides a summary of relevant information as detailed in the AECOM Desk Study (Ref. 01).

2.2 Site Description

The site is an irregular shape and covers approximately 6.5 hectares; the boundary is defined by the red line shown on the masterplan included in Appendix A. The site comprises Stockport bus station, Mersey Square, two surface car parks and associated infrastructure, including the Stockport Viaduct.

Current Ordnance Survey (OS) mapping indicates that the site is located in the mixed commercial, industrial and residential setting of Stockport Town Centre. The River Mersey flows east to west through the site and is culverted under the north eastern section of the site, beneath Mersey Square Road. The northern boundary of the site extends to the M60. Merseyway Shopping Centre forms the eastern site boundary, with Stockport Rail Station forming the southern and south west boundary. The western boundary is the Stockport Rail Viaduct.

Relevant features in the near vicinity of the site are summarised in Table 2.1.

Table 2.1. Features Surrounding the Site.

Direction	Summary
North	River Mersey, commercial buildings, several car parks, M60.
South	Stockport Rail Station, Station Road.
East	Merseyway Shopping Centre, commercial buildings.
West	Stockport Rail Viaduct.

2.3 Site History

The historical Ordnance Survey (OS) maps obtained with the Landmark Envirocheck Report (Ref. 02) date between 1848 and 2015. Development that may have occurred between map editions is recorded as occurring on the latter published map, hence there are some limitations to the accuracy to the date of development unless supplementary evidence is available.

The historical maps show that the site included residential properties with some industrial buildings on the first OS edition in 1848. The historical maps show the site and surrounding area to have become more industrialised over time. The current Stockport bus station was built during the late 1970's.

A summary of the historical land uses is presented in Table 2.2.

Capabilities on project:
Environment

Table 2.2. Historical Land Uses.

Year [scale]	Features on-site	Features off site
1848 (1;10,560)	There is general development recorded across the site, including terraced housing and various commercial and industrial developments. The principal features are as follows: - Wellington Road South runs through the site approximately north to south. - There is a mill in the north eastern part of the site. - A viaduct runs north to south through the western part of the site. - The River Mersey flow east west through the central section of the site.	There is significant residential, commercial and industrial development in the area surrounding the site. The principal features are as follows: - Stockport Gas Works is located 50m north west of the northern boundary. - A foundry is located 50m north of the site boundary. - There is a timber yard 230m north of the north site boundary. - A possible quarry noted is as a “bar” 250m north of the site. - There is a cutting running along the viaduct 200m north west of the site - There is a mill located 230m east of the eastern site boundary. - St Peters Church and cemetery is located 50m south east of the site. - Spring Banks Mill is located 30m south of the southern site boundary. - There is a coal depot 100m south west of the southern site boundary. - Stockport Station is located 250m south of the southern boundary.
1851 (1;1,056)	- Two reservoirs are marked in the centre of the site. - Chester Gate Mill and an associated chimney are located on site. - There is a machine shop recorded in the centre of the site. - Two timber yards are recorded on the northern edge of the site. - There is a print works on the southern part of the site - There a reservoir on the southern boundary of the site. - There is a smithy on the western part of the site. - Part of the Chester Gate Print Works is recorded near the western boundary of the site. A further print works is located in the centre of the site.	The surrounding land use remains a mix of residential (predominantly terraced), industrial and commercial development. There are numerous mills of varying sizes recorded throughout the surrounding area, they have not been recorded individually here. Other notable development includes the following: - A coal yard 250m north of the site. - A dye works adjacent to the north western site boundary - The site noted as “bar” is now called Crowther’s Dam - Gasometers are recorded along the north eastern site boundary. With a further a gasometer 100m east of the site. - A pond 50m east of the eastern site boundary. - Four reservoirs are recorded adjacent to the south eastern boundary of the site. - There is a timber yard 70m east of the south eastern site boundary. - A timber yard, smithy and iron foundry are noted 20m, 50m and 100m west of the site respectively.
1873 (1;1,056)	Generally the site development remains unchanged with the exception of the following key features: - The timber mill in the northern section of the site has been demolished. - The reservoirs at the centre of the site are now recorded as a timber yard. - The chimney next to Chester Gate Mill is no longer marked on the historical maps.	- The gas works to the north of the site has expanded and the dye works and several houses have been demolished in this area. - The coal depot to the north is now housing. - The gasometer 100m from site is no longer shown on the map. - Crowther’s Dam is no long noted on the map. - There are a series of tracks leading to the goods yard 150m north west of the site. - There is a timber yard 10m south of the eastern site boundary adjacent to St Peter’s Church. - The pond is no longer recorded and the area is now noted as a bathhouse.

Capabilities on project:
Environment

Year [scale]	Features on-site	Features off site
		- The rail tracks to the south now cover a larger area. - There is a mill/works 100m south east of the site.
1874 - 1875 (1;2,500)	The site remains generally unchanged.	The surrounding area remains generally unchanged with the exception of the addition of Stockport infirmary 250m south east of the site.
1895 (1;1,056, 1;2,500, & 1;10,560)	There has been some demolition of residential, commercial and industrial properties. The principal changes to site features during this time are as follows: - Wellington Road now has a tramline running north to south - The printing works adjacent to the River Mersey is now noted as a chemical works	- There is now an iron and brass foundry 100m east of the site. - The reservoir on the south eastern boundary is now a coal yard. - The works south east of the site is now a hat works. -
1899 (1;2,500 & 1;10,560)	Generally the site remains unchanged with the exception of the following: - There is a new bridge crossing the River Mersey in the east of the site. - The timber yard at the centre of the site is no longer marked on the site. - There is now a timber yard adjacent to Wellington road 5m north of the south eastern boundary.	- The coal depot to the south is now noted as an electrical works. - There is now a timber yard 230m south west of the site. - The mills adjacent to the south east site boundary are now a hat factory.
1907 (1;2,500)	Generally the site remains unchanged with the exception of the following: - The addition of a tramline in the northern part of the site which leads to a tram depot located just offsite. - There is a fire station located in the north of the site.	Generally the surrounding land remains unchanged with the exception of a tunnel recorded 50m north of the site which is shown to run west to east.
1910 (1;2,500 & 1;10,560)	Generally the site remains unchanged with the exception of a tin works adjacent to Astley Street.	Generally the surrounding land remains unchanged with the exception of the following: - The smithy is no longer marked on the map. - A mechanical works is noted 70m east of the south eastern boundary. - The tanks to the south are no longer marked on the map. - All the timber yards to the west are no longer marked on the map. - There is a clothing works on the western boundary of the site.
1922 (1;2,500)	Generally the site remains unchanged.	Generally the surrounding land remains unchanged with the exception of the following: - The foundry to the north of the site is now noted as a brass and copper foundry. - The timber yard adjacent to St Peters Church is no longer evident. - The mechanical works is now a public library.
1934 (1;2,500 & 1;10,560)	Generally the site remains unchanged with the exception of the following: - The timber yard at the centre of the site has expanded. - The print works at the southern boundary is now noted as exchange	Generally the surrounding land remains unchanged with the exception of the following principal observations: - The gas works is now a tram and bus depot.

Capabilities on project:
Environment

Year [scale]	Features on-site	Features off site
	building. - The reservoir at the south of the site is no longer evident. - The map indicates a slope at the south of the site. -	- The tram depot has expanded. - The mill on the south eastern boundary has been demolished. - There are two saw mills approximately 150m west and south west of the site. - There is hat factory 150m west of the western site boundary. - There is a works 150m south west of the western site boundary.
1959 (1; 2,500)	Generally the site remains unchanged with the exception of the following: - There is a bus station where the tram lines and fire station were at the northern part of the site. - The exchange building has been demolished. - The timber yard is now noted as a works. - The mill is now noted as a works. - The tramline is no longer evident. - There is a car park adjacent to the bus station. - There is a garage next to the work/mill. -	Generally the surrounding land remains unchanged with the exception of the following - Timber yards to the north are no longer evident. - The tram and bus station is now noted as a bus station. - The hat factory is now noted as a depot. - The mill 50m south east of the site is now recorded a depot. - There is garage 30m east of the south east site boundary. - There are now several works adjacent to the western site boundary. - The electrical works has been demolished. - The foundry is no longer marked on the map. - The saw mills are now depots. - The tram depot is now recorded as a bus depot
1965 - 1973 (1;1,250, 1;2,500 & 1;10,000)	Generally the site remains unchanged with the exception of the following: - Several buildings have been demolished in the centre of the site. - By 1971 it appears the River Mersey has been built over and possibly culverted up to Wellington Road. - The bus station has expanded. -	Generally the surrounding land remains unchanged with the exception of the following: - A lubricants works is recorded 150m south west of the site. - The depot next to the south eastern boundary is now noted as Wellington Mill. - Several houses and works have been demolished to the west of the site and the area is now part of a bus depot. - The saw mill 150m west is now a steel warehouse.
1980 (1;250, 1;10,000)	Stockport Bus Station has been constructed and generally appears in its current configuration. The remainder of the site appears relatively unchanged.	The bus depot at Heaton Lane has been demolished. Generally the surrounding land remains unchanged.
1984 - 1991 (1;1,250	A car park and stairs /path have been constructed on the slope in the south of the site. Generally the site remains unchanged. -	Generally the surrounding land remains unchanged with the exception of the following: - The baths are now a leisure centre. - The bus depot is now a multi-storey car park. - There is a garage 50m north west of the site. - The sidings and the coal yards south of the site are no longer evident.
1990 - 1995 (1;1,250 & 1;10,00)	Generally the site remains unchanged.	Generally the surrounding land remains unchanged with the exception of the following: - Highgate House and a substation have been built next to the south eastern boundary of the site. - The garage to the south east of the site has been demolished.

Year [scale]	Features on-site	Features off site
2006 - 2015 (1;10,000)	The site appears to remain relatively unchanged.	- The surrounding area appears to remain relatively unchanged.

2.4 Geology

The published 1:50,000 scale geological map of the area produced by the British Geological Survey (BGS) (Sheet 98, Stockport, 1971 and 1977) indicates that the site is underlain by the geological strata presented in Table 2.3. Made Ground associated with the historical land uses across the site is anticipated to be present at the surface.

Table 2.3. BGS Geological Strata.

Age	Group	Geological Stratum
Devensian	-	Glacial Till
	Glaciofluvial Deposits	Glaciofluvial Sheet Deposits
Quaternary	-	River Terrace Deposits
Triassic	Sherwood Sandstone Group	Chester Pebble Beds Formation

A summary of the geological strata is given below.

2.4.1 Glacial Till

Glacial Till is unsorted, heterogeneous sediment deposited by glaciers. Glacial Till may contain clays, silts, sands, gravels and boulders. The thickness and continuity of the Glacial Till in the vicinity of the site is unknown.

2.4.2 Glaciofluvial Sheet Deposits

The Glaciofluvial Sheet Deposits are sediment deposited by glacial rivers. The strata may consist of sands and gravels with lenses of silt and clay. The thickness and continuity of the Glaciofluvial Sheet Deposits is not known.

2.4.3 River Terrace Deposits

The River Terrace Deposits is sediment deposited by rivers. The stratum consists of sands and gravels with lenses of silt, clay and peat.

2.4.4 Chester Pebble Beds Formation

The strata consists of fine to coarse grained Sandstone, it is commonly pebbly with conglomerates and sporadic siltstones. Thickness is variable but may be up to 1,500m. The geological maps indicate two fault lines crossing the site both running north west to south east.

2.4.5 Made Ground

The review of historical mapping for the site suggests that in addition to these natural strata Made Ground will present at the surface. Made Ground deposits are likely to be of variable composition, depth, nature and distribution.

A number of historical exploratory hole locations are available on the BGS website; these are summarised in Table 2.4.

Capabilities on project:
Environment

Table 2.4. Historical BGS Boreholes.

Borehole Reference NGR Distance from the site (Date)	Stratum	Description	Depth to Top of Stratum (m bgl)	Level of Top of Stratum (m OD)	Thickness (m)
SJ89SE32 389152,390206 On site (Unknown)	**Made Ground**	Made Ground	G.L	42.67	0.3
	Glaciofluvial Deposits	Red Sand	0.3	42.37	0.91
	Glaciofluvial Deposits	Grey Sand	1.21	41.46	0.92
	Glaciofluvial Deposits	Gravel	2.13	40.54	1.52
	Chester Pebble Beds Formation	Red Sandstone rock	3.65	39.02	5.8
SJ89SE789 389270, 390090 On site (31/3/1988)	**Made Ground**	Medium dense brown clayey silty sandy brick gravel	GL	Unknown	1.0
	Glaciofluvial Deposits	Medium dense reddish brown very silty gravelly SAND	1.0	Unknown	0.5
	Sandstone	Reddish brown slightly to moderately weather SANDSTONE	1.5	Unknown	1.5
SJ89SE790 389270, 390120 On site (1/4/1988)	**Made Ground**	Medium dense brown silty brick gravel and cobbles	GL	Unknown	2.4
	Chester Pebble Beds Formation	Reddish brown slightly to moderately weathered SANDSTONE	2.4	Unknown	1.25
SJ89SE91 389230,390120 On site (1/4/1988)	**Made Ground**	Loose brown brick gravel and cobbles	GL	Unknown	1.3
	River Terrace deposits	Soft brown CLAY	1.3	Unknown	0.6
	Glaciofluvial Deposits	Dense to very dense reddish brown very silty sandy GRAVEL	1.9	Unknown	0.9
	Chester Pebble Beds Formation	Reddish brown slightly to moderately weathered SANDSTONE	2.8	Unknown	3.3
SJ89SE792 389230, 390110 On Site (31/3/1988)	**Made Ground**	Loose dark grey to dark brown silty sandy ash and brick gravel and cobbles (rubble)	GL	Unknown	1.2
	Made Ground	Very loose dark grey to dark brown silty sandy ash and brick gravel and cobbles (rubble) Made round with some to occasion off white gravel sized particles with a limey odour possible chemical waste	1.2	Unknown	3.3
	Chester Pebble Beds Formation	Reddish brown slightly to moderately weathered SANDSTONE	4.5	Unknown	3.1

2.5 Mining and Quarrying

The Coal Authority website (www.coal.gov.uk) indicates that the site is outside of a Coal Mining Reporting Area. Given the urban nature of the site, it is unlikely to be impacted by any historical underground or surface mining activity.

Information included in the Envirocheck Report [Ref. 02] and on the EA website indicates there are four closed clay/sand pits between 650 and 860m from the site. These are located to the east and west/northwest of the site north of the River Mersey.

2.6 Hydrology and Hydrogeology

The EA website shows the Chester Pebble Beds Formation is classified as a Principal Aquifer. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The Glacial Fluvial Deposits are classed as a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The Glacial Till is classed as an Unproductive Strata. These are drift deposits with low permeability that have negligible significance for water supply or river base flow.

The site is not located within a Groundwater Source Protection Zone.

The nearest surface water course is the River Mersey which is culverted under the eastern section of the site and runs from east to west. The EA graded the Water Quality as Fair.

The River Tame lies to the north east of the site running from north east to south west. The River Tame meets the River Goyt, approximately 750m north east of the site, to form the River Mersey, which flows from east to west through the site.

A single surface water abstraction point has been identified within 1km of the site. The abstraction is located approximately 850m to the north east and is operated by Salpa Kay Ltd for cooling purposes, with the abstraction taken from the River Tame.

The indicative floodplain map for the area, published by the EA, shows that the site lies within the predicted flood plain of River Mersey, Flood Risk Zone 2. Therefore the site is considered to be susceptible to fluvial flooding.

2.7 Preliminary Risk Assessment

2.7.1 Introduction

This section is aimed at identifying possible risks, if any, arising from substances used or deposited on-site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered. It is based on the proposed site redevelopment which will comprise a new interchange which a rearrangement of the current road layout including the building of a new bridge across the River Mersey and an expansion of Mersey Square as identified in Section 1.1

The legislative framework for land contamination risk assessment and the principle of contaminant linkages to derive a Conceptual Site Model (CSM) are described in Appendix B.

2.8 Potential Sources of Contamination

2.8.1 Historical Usage

A review of historical OS maps of the area revealed that the site was formerly occupied by a combination of residential commercial and industrial development and associated infrastructure. Industrial development included. but was not limited to. mills, gas works, hat manufacturers, print works and timbers yards. Demolition and redevelopment of sections of the site is also recorded. Possible releases of contamination may therefore have historically taken place on the site and may have included the following:

- Petroleum hydrocarbons;
- Solvents (including chlorinated hydrocarbons);
- Phenols;
- Polycyclic Biphenyls (PCBs);
- Organic and inorganic pigments;
- Inorganic compounds including cyanide (gas work waste);
- Polycyclic aromatic hydrocarbons (PAHs);
- Heavy metals (including mercury and arsenic);
- Sulphates; and
- Asbestos.

In addition to the schedule given above, the land may have become contaminated by filling and/or other construction activities, or by illegal dumping. Soil gases and or other mobile contaminants may also potentially be present.

2.8.2 Recent and Current Usage

The current site use is an operational bus station and commercial properties, there is the possibility that there will be release of hydrocarbons into the ground.

Contamination may have arisen through leaks and spills of fuels and oils around storage areas where bunding has not been provided.

2.8.3 Off Site Sources of Contamination

The site is located in an urban area which includes a variety of historical and recent potentially contaminating land uses. It is possible that any potential contamination associated with these land uses has resulted in the contamination of soils and groundwater and resulted in the generation of potential ground gas. These sources have the potential to migrate onsite via aerial deposition and lateral sub-ground migration of contaminated groundwater and/or ground gas. As such off site sources of contamination may have the ability to effect the site and future developments.

The landfill (former clay/sand pit) is considered to be of sufficient distance, over 600m to the north east, from the site and is not to be considered a potential source of contamination.

2.8.4 Summary

The potential sources of contamination can be summarised as follows:

S1 – Potentially contaminated Made Ground and shallow natural soils; and

S2 – Potentially contaminated groundwater flowing onto site from off site sources;

2.9 Potential Pathways

Potential pathways for contamination present include the following:

P1 – Direct contact with soil (ingestion and dermal);

P2 – Inhalation of dust and/or vapours;

P3 – Ingress and /or accumulation of ground gas /vapours;

P4 - Inhalation of ground gas;

P5 – Surface water run-off;

P6 – Leaching of contaminants and vertical migration into groundwater;

P7 – Lateral migration of groundwater providing base flow to watercourses;

P8 – Direct contact of contaminated ground with in-ground structures and ecological receptors; and

P9 – Plant uptake.

2.10 Potential Receptors

Human Health Receptors

R1 – Construction workers;

R2 – Maintenance workers;

R3 – Final end users; and

R4 – Adjacent site users.

Controlled Waters

R5 – Primary /Secondary Aquifers underlying the site; and

R6 – Surface Water in the vicinity of the site (River Mersey).

Ecological Receptors

R7 – Future planting and landscaping.

Property

R8 – Future proposed services and structures.

2.11 Preliminary Risk Assessment

A qualitative 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human, environmental, or controlled water receptors from contamination sources on or in the vicinity of the site, via transport pathways. Risks to receptors have been assessed using the guidelines given in CIRIA document 552 'Contaminated Land Risk Assessment, A Guide to Good Practice' (Ref. 06), where the probability and consequences of contamination risks being realised are evaluated. The tables presented in Appendix B summarise the elements of the risk assessment process.

A Conceptual Site Model (CSM) illustrating plausible contaminant linkages has been formulated for this site. The qualitative risk assessment of the possible linkages of the above sources (S1 to S2), transport pathways (P1 to P9) and receptors (R1 to R8) is provided in the Table 2.5.

Table 2.5. Preliminary Risk Assessment.

Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID
S1: Potentially contaminated Made Ground and shallow natural soils	P1: Direct contact with soil (ingestion and dermal)	R1: Construction workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated, appropriate mitigation measures will be required, including the use of PPE and good hygiene practises, to ensure that health and safety risks are minimised during construction.	1
		R2: Maintenance workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated and remediation is not deemed necessary, appropriate mitigation measures will be required, to ensure that health and safety risks to maintenance workers are managed by appropriate facility health and safety plans.	2
		R3: Final end users	Medium	Unlikely	Low Risk	It is assumed that the site will be covered in either structures and /or hardstanding, therefore there will be no pathway between end users and potentially contaminated soils.	No contaminant linkage
	P2: Inhalation of dust and / or vapours	R1: Construction workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated, appropriate mitigation measures will be required, including the use of PPE and good hygiene practises, to ensure that health and safety risks are minimised during construction.	3
		R2: Maintenance workers	Medium	Likely	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and groundwater. If the site is contaminated and remediation is not deemed necessary, appropriate mitigation measures will be required, to ensure that health and safety risks to maintenance workers are	4

Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID
						managed by appropriate facility health and safety plans.	
		R3: Final end users	Medium	Likely	Moderate	Vapours may migrate into building via preferential pathways in service trenches and through foundations. It is assumed that the site will be covered in either structures and /or hardstanding, therefore there will be no pathway between end users and potentially contaminated dust. An intrusive ground investigation will be necessary to determine the potential for volatile contaminants in soils and groundwater.	5
		R4: Adjacent site users	Medium	Low Likelihood	Moderate / Low Risk	Adjacent site users may be at risk during the construction phase, when potentially contaminated soils will be excavated and stockpiled. If necessary implement appropriate mitigation measures during the construction phases to minimise the risk to adjacent site users from wind blow dust. An intrusive ground investigation will be necessary to quantify and characterise possible contamination.	**6**
	P4: Inhalation of ground gas	R1: Construction workers	Severe	Likely	High Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases. If the site is contaminated, appropriate mitigation measures will be required including the use of PPE and good hygiene practises, to ensure that health and safety risks are minimised during construction.	**7**
		R2: Maintenance workers	Severe	Likely	High Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases. If the site is contaminated and remediation is not deemed necessary, appropriate mitigation measures will be required, to ensure that health and safety risks to maintenance workers are managed by appropriate facility health and safety plans.	**8**

Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID
		R3: Final end users	Severe	Likely	High Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases.	**9**
	P6: Surface water run-off and/or direct percolation from surface	R6: Surface water (River Mersey)	Medium	Low Likelihood	Moderate /Low Risk	Exposure of potentially contaminated soils during the construction phase may results in contaminated run-off entering the river. Following construction it is assumed that the site will be covered in hard standing minimising the risk of contaminated run off. An intrusive ground investigation may be necessary to characterise possible contamination in the soils and allow appropriate mitigation to be implemented during the construction phase.	**10**
	P5: Leaching of contaminants	R5: Principal Aquifer/Secondary Aquifer	Medium	Low Likelihood	Moderate /Low Risk	Leaching of contaminants may occur during the construction phase. Mitigation measures may be necessary during the construction phase to minimise the risk of leaching. It is assumed that following construction the site will be covered in relatively impermeable hard standing. An intrusive ground investigation may be necessary to characterise possible contamination in the soils and groundwater.	**11**
	P8: Direct contact with in-ground structures and services.	R8: Proposed services and structures	Mild	Likely	Moderate /Low Risk	An intrusive ground investigation will be necessary to further quantify and characterise possible contamination.	**12**
	P9: Plant uptake	R7: Proposed planting	Minor	Likely	Low Risk	An intrusive ground investigation will be necessary to further quantify and characterise possible contamination.	**13**
	P8: Migration and accumulation of gases	R8: Proposed services and structures	Severe	Low Likelihood	Moderate Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination including chemical testing of soils and the monitoring of potential ground gases.	**14**

Source	Transport Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Justification	Contaminant Linkage ID
S2: Potentially contaminated groundwater	P7: Vertical and lateral migration of groundwater	R5: Principal Aquifer/Secondary Aquifer	Medium	Low Likelihood	Moderate /Low Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination in groundwater.	**15**
	P7: Vertical and lateral migration of groundwater	R6: Surface waters	Medium	Low Likelihood	Moderate /Low Risk	An intrusive ground investigation will be necessary to quantify and characterise possible contamination in groundwater.	**16**

Ground Investigation

3 Ground Investigation

3.1 Overview

An intrusive ground investigation was carried out by Geotechnics Ltd between 30 November and 18 December 2015. The investigation comprised the following elements:

- 21 No. boreholes progressed to a depth between 0.5 and 6.5m below ground level (m bgl) using cable percussion techniques;
- 10 No. boreholes extended by up to 15m into bedrock, to depths between 7.8 and 22.3m bgl, using rotary coring techniques;
- 13 No. hand dug trial pits excavated to depths between 0.24 and 1.30m;
- 10 No. dynamic probes progressed to depths between 3.45 and 4.98m;
- 19 No. window samples undertaken to between 0.30 and 5.45m bgl;
- 24 No. exploratory holes (9 No. in boreholes, 15 No. in window sample holes) had 50mm dual gas and groundwater monitoring wells installed; and
- 3 No. gas and groundwater monitoring rounds.

The findings of the ground investigation (GI) are presented in Geotechnics' Ground Investigation Factual Report for Stockport Bus Station [Ref. 07] (hereafter, Factual Report), included in Appendix C. The exploratory hole location plan is shown on Drawing 60340298-ACM-00-GEO-DR-0001, with the geological sections presented on Drawing 60340298-ACM-00-GEO-DR-0002.

3.2 Boreholes

A summary of the boreholes is presented in Table 3.1.

Table 3.1. Borehole Summary.

Borehole	Drilling method	Completion Depth (m bgl)	Borehole Level (m OD)	Installation details	Response Zone (m bgl)	Water Strike (m bgl)	
						Initial strike	After 20 mins
BH101	CP/RC	15.30	45.22	50mm dia. dual groundwater/ground gas standpipe.	5.00-7.00	1.20	No rise
BH102	CP/RC	14.70	43.35	50mm dia. dual groundwater/ground gas standpipe.	8.00-10.00	-	-
BH103	CP/RC	14.70	42.42	50mm dia. dual groundwater/ground gas standpipe.	11.00-14.00	-	-
BH104	CP/RC	15.00	42.47	50mm dia. dual groundwater/ground gas standpipe.	1.00-3.50	-	-
BH105	CP/RC	15.20	42.62	50mm dia. dual groundwater/ground gas standpipe.	9.50-12.00	-	-
BH106	CP/RC	15.00	42.45	50mm dia. dual groundwater/ground gas standpipe.	5.00-7.00	-	-
BH107 *	CP/RC	7.80	42.27	No installation.	-	-	-
BH108	CP/RC	22.30	42.72	50mm dia. dual groundwater/ground gas standpipe.	18.00-21.00	-	-
BH109	CP/RC	20.70	42.36	50mm dia. dual groundwater/ground gas standpipe.	18.00-20.00	-	-
BH111	CP	1.55	50.92	No installation.	-	-	-
BH112	CP/RC	14.80	43.70	50mm dia. dual groundwater/ground gas standpipe.	12.80-14.80	-	-
CT1	N/A	1.20	42.24	No installation.	-	-	-
CT1A	CP	4.32	42.19	No installation.	-	-	-
CT3	CP	4.35	42.11	No installation.			

CT4	CP	3.30	42.07	No installation.	-	-	-
CT5	CP	5.15	42.73	No installation.	-	-	-
CT6	CP	0.50	42.60	No installation.	-	-	-
CT6A	CP	1.00	42.59	No installation.	-	-	-
CT6B	CP	5.50	42.66	No installation.	-	-	-
CT7	CP	5.50	42.75	No installation.	-	-	-
CT8	CP	6.50	42.72	No installation.	-	-	-

CP= Cable Percussion, RC= Rotary Coring.

* BH107 terminated at 9.1m bgl, after encountering a void from 7.8m bgl. The void was later identified as a sewer. The hole encountered Made Ground from surface to 0.9m bgl, Glacial Sand and Gravel from 0.9 to 3.0m bgl, weathered Sherwood Sandstone 3.0 to 4.0m bgl, Sherwood Sandstone (cored) from 4.0 to 7.5m bgl and tunnel brick lining from 7.5 to 7.8m bgl.

3.3 Window Samples

A summary of the window sample holes is presented in Table 3.2.

Table 3.2. Window Sample Summary.

Window Sample	Depth (m bgl)	Ground Level (m OD)	Installation details	Response Zone (m bgl)	Water Strike (m bgl)	
					Initial strike	After 20 mins
WS201	4.27	45.61	50mm dia. dual groundwater/ground gas standpipe.	3.50-4.00	-	-
WS203	3.34	43.01	50mm dia. dual groundwater/ground gas standpipe.	2.00-3.00	-	-
WS204	2.86	42.85	50mm dia. dual groundwater/ground gas standpipe.	1.50-2.45	-	-
WS205	2.38	42.39	50mm dia. dual groundwater/ground gas standpipe.	1.50-2.00	-	-

Window Sample	Depth (m bgl)	Ground Level (m OD)	Installation details	Response Zone (m bgl)	Water Strike (m bgl)	
					Initial strike	After 20 mins
WS206	2.34	48.13	50mm dia. dual groundwater/ground gas standpipe.	1.00-2.00	-	-
WS208	3.20	42.35	50mm dia. dual groundwater/ground gas standpipe.	1.70-2.80	-	-
WS209	3.26	42.67	50mm dia. dual groundwater/ground gas standpipe.	1.00-3.00	-	-
WS210	5.09	44.43	50mm dia. dual groundwater/ground gas standpipe.	3.00-5.00	-	-
WS211	4.67	44.88	50mm dia. dual groundwater/ground gas standpipe.	1.00-2.00	-	-
WS212	4.43	45.74	50mm dia. dual groundwater/ground gas standpipe.	2.50-3.50	-	-
WS214	5.45	46.35	50mm dia. dual groundwater/ground gas standpipe.	0.50-1.00	-	-
WS217	2.68	42.30	50mm dia. dual groundwater/ground gas standpipe.	1.50-2.50	-	-
WS218	1.70	42.75	No installation.	-	0.9	0.8
WS218A	3.17	42.71	50mm dia. dual groundwater/ground gas standpipe.	1.00-2.50	0.9	Damp
WS219	2.45	45.13	No installation.	-	-	-
WS220	4.07	44.69	50mm dia. dual groundwater/ground gas standpipe.	1.20-1.70	-	-
WS221	0.30	51.03	No installation.	-	-	-
WS223	3.72	43.39	50mm dia. dual groundwater/ground gas standpipe.	0.50-1.40	1.20	Slow inflow
WS224	1.70	53.31	No installation.	-	-	-

3.4 Dynamic Probe

A summary of the dynamic probe holes is presented in Table 3.3.

Table 3.3. Dynamic Probe Summary.

Dynamic Probe	Completion Depth (m bgl)	Ground Level (m OD)
DP1	3.40	42.30
DP2	3.80	42.13
DP3	3.90	42.13
DP4	4.30	42.07
DP5	3.90	42.73
DP6	4.70	42.62
DP7	4.40	42.59
DP8	4.00	42.85
DP9	4.10	42.71
DP10	4.90	42.65

3.5 Trial Pits

A summary of the hand dug trial pits is presented in Table 3.4.

Table 3.4. Trial Pit Summary.

Trial Pit	Depth (m bgl)	Ground Level (m OD)	Stability of Trial Pit Walls	Water Strike (m bgl)	
				Initial strike	After 20 mins
HP01	1.2	48.58	Stable	-	-
HP02	1.2	52.84	Stable	-	-
TP1	0.65	42.25	Stable	-	-
TP2	1.10	42.09	Stable	-	-
TP3	0.85	42.07	Stable	-	-
TP4	0.80	42.12	Stable	-	-
TP5	1.20	42.16	Stable	-	-
TP6A	1.25	-	Stable	-	-
TP6B	0.40	-	Stable	-	-
TP7A	1.30	-	Stable	-	-
TP7B	0.33	-	Stable	-	-
TP8	0.80	42.80	Stable	-	-
TP9	0.24	42.79	Stable	-	-

3.6 In-situ Testing

Standard Penetration Tests (SPTs) were undertaken in the cable percussion holes, rotary holes and window sample holes. The tests were undertaken generally at 1m intervals within the first 5m in soils and weathered Sherwood Sandstone and in rotary holes where core recovery was less than 80%.

Hand shear vane tests were not undertaken due to the granular nature of the Made Ground.

3.7 Laboratory Testing

3.7.1 Geotechnical Testing

Soil samples were obtained from the boreholes, window samples and within the trial pits. Selected soil samples were scheduled for a range of the following geotechnical tests;

- Natural moisture content (12 No.);
- Atterberg Limits (11 No.);
- Particle Size Distribution (11 No.);
- pH (35 No.);
- Organic matter content, Total Acid Soluble Sulphate (Total Sulphate BRE) and Water Soluble Sulphate (Sulphate as SO4 (2:1 Ext)) (35 No.);
- Dry Density, Moisture Content Relationship (1 No.);
- Unconfined Compressive Strength (No. TBC.); and
- Point Load Testing (54 No.).

3.7.2 Contamination Testing

Soil samples for contamination testing were taken from the exploratory holes at 0.3m bgl, 0.5m bgl, and 1.0m bgl, and thereafter in metre intervals within the Made Ground deposits and strata where visual or olfactory evidence of contamination was encountered. Water samples from boreholes were obtained during post investigation groundwater and gas monitoring visits.

Based on the potential contaminants identified on site and with AECOMs Desk Study (Ref. 12), selected soil and groundwater samples were analysed by Jones Laboratories for the determinants as listed in Table 3.5.

Table 3.5. Chemical Testing Suites.

Determinand	Total Soils analytical suite	Total Leachate analytical suite	Total Waters analytical suite
Arsenic	✓	✓	✓
Cadmium	✓	✓	✓
Chromium (Total)	✓	✓	✓
Chromium III	✓	✓	✓
Chromium VI	✓	✓	✓
Copper	✓	✓	✓
Lead	✓	✓	✓
Nickel	✓	✓	✓
Mercury	✓	✓	✓
Selenium	✓	✓	✓
Zinc	✓	✓	✓
Vanadium	✓	✓	✓
pH	✓	✓	✓
Total/Dissolved Organic Carbon	✓	✓	✓
Cyanide (total)	✓	✓	✓
TPH UK-CWG Banding incl. BTEX *	✓	✓	✓
PAH Speciated 16 UESPA	✓	✓	✓
Phenols	✓	✓	✓
PCBs (7 congeners)	✓	✓	✓
Asbestos Screen	✓		
Asbestos Quantification	✓		
Chloride	✓		
VOCs	✓	✓	✓
SVOCs (incl. 16 USEPA speciated PAHs and total phenols)	✓	✓	✓
Boron (Water Soluble)	✓		
Sulphate (total)	✓		
Sulphur (total)	✓		
Ammoniacal Nitrogen			✓
Sulphate (Soluble)			✓
Sulphide		✓	✓
SVOCs (excl. 16 USEPA speciated)		✓	✓
Total	**41 Samples**	**17 Samples**	**9 Samples**

3.8 Gas and Groundwater monitoring.

A summary of the installation details is included in Table 3.1 and 3.2.

Gas and groundwater monitoring was completed on 9 February 2016. To date, monitoring of groundwater and ground gas has been undertaken at the time of installation and on three occasions post site works, on 11 and 25 January and 9 February 2016.

A Gas Data LMSxi portable gas analyser was used to record the levels of oxygen, carbon dioxide, methane, carbon monoxide and hydrogen sulphide. In addition differential pressure and flow rates were recorded at each reading.

Ground Conditions and Material Properties

4 Ground Conditions and Material Properties

4.1 Introduction

The following section provides a review of the results of the ground investigation information. The factual data is included within Geotechnics' Factual Report (Ref. 07).

A summary of the ground conditions encountered across previous ground investigation works undertaken in the wider area surrounding the site is presented as part of the AECOM Desk Study (Ref. 01).

Geological long sections across the proposed Stockport Interchange development and proposed bridge are shown on Drawing 60340298-ACM-00-GEO-DR-0002.

4.2 Stratigraphy

A summary of the ground conditions encountered across the site is presented in Table 4.1.

Table 4.1. Ground Conditions Encountered during the Ground Investigation.

Geological Unit	Typical Description	Range of depths to top of stratum (m bgl)	Range of levels to top of stratum (m OD)	Range of thickness (m)	Comments
Made Ground – Other [1]	Grey concrete paving slab. Black tarmacadam. Grey subangular granite cobble setts	0.00 to 0.95	41.64 to 51.03	0.05 to 1.20	Widespread.
Made Ground - Cohesive	MADE GROUND: Soft brown sandy gravelly clay, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	0.30 to 1.00	42.70 to 50.62	0.30 to 1.20	Four holes.
Made Ground - Granular	MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone with a medium angular cobble content. (Sub base). MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick. Some wood.	0.00 to 2.60	41.65 to 53.31	0.05 to 4.95	Widespread.
Alluvial Clay	Soft dark brown and black very organic CLAY, locally sandy silt, with organic remains.	1.40 to 1.60	41.99 to 42.10	0.40 to 0.60	Two holes.
Glacial Clay	Soft brown slightly gravelly sandy CLAY, locally silt. Gravel is subangular to subrounded fine to	1.30 to 2.40	41.05 to 43.62	0.40 to 1.50	Four holes.

Geological Unit	Typical Description	Range of depths to top of stratum (m bgl)	Range of levels to top of stratum (m OD)	Range of thickness (m)	Comments
	coarse of various lithologies.				
Glacial Sands and Gravels [1]	Dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of limestone, quartzite, granite and basalt. Dark brown gravelly fine to medium SAND. Gravel is fine to coarse subangular to subrounded of various lithologies.	0.50 to 3.20	38.91 to 52.11	1.0 to 1.72	Widespread.
Weathered Sherwood Sandstone [1]	Extremely weak to very weak dark red fine to medium grained SANDSTONE recovered as silty sand. Very dense reddish brown fine to coarse SAND.	0.85 to 5.00	37.72 to 50.07	0.12 to 2.35	Widespread.
Sherwood Sandstone [1]	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are subhorizontal, very closely spaced, rough and clean. Very weak to medium strong reddish brown medium grained SANDSTONE with abundant micaceous minerals and rare fine to coarse rounded gravel. Discontinuities are very closely to medium spaced horizontal to subvertical smooth planar and undulating.	3.40 to 6.55	35.81 to 41.16	9.35 to 16.15 (unproven)	Widespread.

[1] Strata not fully explored in some exploratory holes

4.2.1 Made Ground - Other

Made Ground – Other was recorded from the surface in nearly all exploratory holes across the site. The descriptions are generally either concrete/paving slabs or black tarmacadam. The material ranged in thickness between 0.05 and 1.20m. The thickest deposit was in exploratory hole CT1 where black tarmacadam (0.1m thick) was underlain by a strata described as 'brick wall onto obstruction' to the base of the hole at 1.20m. The full thickness of the strata was not proved.

The Made Ground - Other material has not been subject to any field or laboratory testing and is not discussed further.

Surface deposits of Made Ground – Other are expected to be removed during site works. It is likely that this material when crushed and screened will be suitable for re-use as capping or as an aggregate in the pavement construction, subject to appropriate testing.

4.2.2 Made Ground – Cohesive

Made Ground – Cohesive was recorded in four holes from 0.3 to 2.00m depth. The material is generally described as soft/firm brown slightly gravelly/gravelly slightly sandy/ sandy clay. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete. The material was recorded in four holes, BH111, BH112, WS201 ans WS211. These are located across the site with WS211 located to the north east, BH112 located to the east, WS201 to the south west and BH111 to the south. There does not appear to be any geographical link with the locations.

Laboratory testing was undertaken on one sample from WS201 from 1.2 to 1.65m bgl. Moisture content and Atterberg Limit testing was undertaken with the sample recorded to have a moisture content of 33% and liquid limit of 33%. The determination for the plastic limit found the sample to be non-plastic. Although the sample was described as a clay, the laboratory described the sample as brown sandy gravely silt (noted the in the stratum description).

Two SPTs were undertaken in the Made Ground – Cohesive. The first in BH112 at 1.2m recorded a value of 4 and the second in WS201 also at 1.2m bgl recorded a value of 28. The SPT values are very different as are the locations of the holes; no trend or inference of the results is noted, besides the variability of the material.

A review of the suitability of the Made Ground – Cohesive for re-use should be undertaken during detailed design and once an earthworks specification has been prepared. The current design does not have any significant earthworks. However, based on the descriptions from the ground investigation and due to the limited presence of the material across the site, the volume of material may not be economic to separate out for re-use.

4.2.3 Made Ground – Granular

Made Ground – Granular was recorded from the surface to 2.6m bgl in the majority of exploratory holes. The maximum thickness of 4.95m was recorded in BH108 from 0.05 to 5.00m depth; with the majority of the fill described as 'loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay'.

The material is generally described as one of the following three sub-divisions

- a sub-base with a general description of grey sandy angular to subangular fine to coarse gravel of limestone/dolerite with a medium angular cobble content;
- a sand with a general description of dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of granite, concrete, timber and plastic; or
- a gravel with a general loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay.

Other minor constituents noted include ash, clinker, glass and wood.

A strong hydrocarbon odour and organic remains were recorded in a clayey gravelly sand stratum in WS211 from 1.20 to 1.80m bgl. The hole is located to the north east of the site. Black organic matter is recorded in WS212 and WS220 from 1.50 to 1.70m bgl and from 1.20 to 1.70m bgl respectively. The strata are both described as gravelly sand. WS212 is located to the north of the site and WS220 to the west of the site.

Engineering properties of Made Ground – Granular cannot be relied upon and are not discussed in detail in this report. However, material described as sub-base should be able to be re-used a sub-base, depending upon environmental testing.

Laboratory testing was undertaken on five samples described as Made Ground – Granular. Moisture content and Atterberg Limit testing was undertaken, with the results presented in Table 4.2.

Table 4.2. Laboratory Testing Summary – Made Ground Granular.

Exploratory Hole	Depth (m bgl)	Strata Description	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)
BH108	2.00 to 2.50	MADE GROUND: Loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay.	22.2	34	NP
	3.00 to 3.45		16.3	32	NP
WS208	1.20 to 1.65	MADE GROUND: Dark brownish grey gravelly sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.	12.4	29	NP
WS220	1.30 to 1.70	MADE GROUND: Very loose/loose dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of brick and concrete.	33.2	69	NP
WS223	1.20	MADE GROUND: Loose brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of sandstone and fragments of brick.	19.9	29	NP

The results show a range in moisture content between 12.4% in WS208 and 33.2% in WS220. Liquid limits are generally between 29 and 34%, with one higher value of 69% in WS220. Black organic matter was identified in WS220 from 1.20 to 1.70m bgl and may account for the significantly higher liquid limit.

SPTs were undertaken in Made Ground – Granular, 37 No., see Figure 1. The values ranged between 0 and >50, indicative of very loose to very dense material. 19 tests were <10 blows indicating that the material was very loose/loose. The majority of the 19 tests were undertaken at the base of inspection pits and some disturbance of the material at the base of the pit may have caused the lower numbers. 6 tests were 50 or greater indicating very dense conditions or the presence of an obstruction. The remaining 12 tests fell between 10 and 44 blows, i.e. indicative of medium dense or dense material.

The range of SPT values indicates that the Made Ground - Granular material is unlikely to have been compacted or engineered and as such the SPT values are likely to represent the local level of compaction; indicating that the relative density of the Made Ground - Granular across the site is likely to vary significantly.

A review of the suitability of the Made Ground – Granular for re-use should be undertaken during detailed design and once an earthworks specification has been prepared. The current design does not have any significant earthworks. The material described as sub-base may be able to be re-used, but as it is not present across the site as a thick stratum, the volume of material may not be economic to separate out for re-use. The Made Ground – Granular material should be assessed when excavated and may be able to be re-used as a general fill, depending upon environmental and geotechnical testing.

4.2.4 Alluvial Clay

Alluvial Clay was encountered in two exploratory holes, BH112 and WS223. Alluvial clay has been identified as natural clay deposits with the presence of organic material. The strata in BH112, 1.60 to 2.0m bgl, is described as ‘soft dark brown and black very organic CLAY, locally sandy silt, with organic remains’ and the strata in WS223, 1.40 to 2.00, is described as ‘firm grey mottled dark brown slightly gravelly slightly sandy CLAY with organic traces. Gravel is subangular to subrounded fine to coarse of various lithologies’.

BH112 is located to the east of the site and WS223 is located in the centre of the site.

Laboratory testing was undertaken on one sample from BH112 at 1.80m depth. A moisture content of 109% was determined and a liquid limit of 77%. The plastic limit was not determined and the sample classed as non-plastic. The higher moisture content and liquid limit is indicative or the presence of organic material.

SPTs were not undertaken in the material.

The alluvial clay material was only encountered in two locations. As the volume of this material is likely to be low, and its organic matter high, then where the material is encountered it should be removed and replaced with suitably compacted fill.

4.2.5 Glacial Clay

Glacial Clay was encountered in five exploratory holes, BH101, WS201, WS208, WS211 and WS212, generally above the weathered Sherwood Sandstone, except for WS2211 where is was encountered within the Glacial Sand and Gravel. It was overlain by Made Ground in WS210 and WS208 and by Glacial Sand and Gravel in BH101 and WS212.

This stratum was typically described as soft to stiff grey/greyish brown/brown slightly gravelly sandy clay, locally silty / laminated. It was encountered at depths from 1.3m (WS208) to 3.8m (WS211). The thickness of strata ranged from 0.20m (WS211) to 1.50m (WS201). The materials have been classified together based on their descriptions as clay and the absence of organic material.

The strata are described as ‘locally silt’ in BH101, WS211and WS212. BH101, WS211and WS212 are located in the centre, east and north east respectively, and not geographically close to each other. BH101 and WS201 are located close to each other and both have clay between 2.0 and 3.0m bgl; BH101 from 1.6 to 3.00m bgl and WS201 from 2.0 to 3.5m bgl. However the sample in BH101 is described as laminated and locally silt, and the sample in WS201 in not described as either laminated or silty.

Laboratory testing was undertaken on four samples described as Glacial Clay. Moisture content and Atterberg Limit testing was undertaken, with the results presented in Table 4.3.

Table 4.3. Laboratory Testing Summary – Glacial Clay.

Exploratory Hole	Depth (m bgl)	Strata Description	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)
BH101	2.20 to 2.65	Firm grey thinly laminated sandy CLAY, locally silt.	23.3	26	NP
WS201	2.40 to 3.00	Firm greyish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of various lithologies.	22.9	33	18
WS211	3.80 to 4.00	Soft dark grey sandy CLAY, locally silt.	42.5	38	NP
WS212	3.00 to 3.45	Soft brown slightly gravelly sandy CLAY, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies.	21.9	37	NP

The results show a narrow range in moisture content generally between 21.9% in WS212 and 23.3 in BH101. The tested sample from WS211 had a significantly higher moisture content of 42.5%. Liquid limits are between 26 and 38%. Three of the four samples were described as non-plastic, with one plastic limit determined; 18% for WS201. This classifies the sample in WS201 as a clay with low plasticity. Correlation of the laboratory data for undrained shear strength data infers a strength for the sample in WS201 of low strength, i.e. between 20 and 40kPa.

Four SPTs were undertaken in the Glacial Clay. The values ranged between 5 (BH101 at 2.20m) and 25 (WS212 at 3.00m); with the other tests both undertaken in WS201 being 10 (3.00m) and 11 (2.00m). The lower SPT value of 5 in BH101 at 2.20m bgl was undertaken with a water level of 1.5m bgl. This water level may have led to an imbalance of water pressures leading to local softening of the soils at the testing level.

Empirical relationships (cu=f1*N values from Stroud, 1975 [Ref. 08]) have been applied to derive the undrained shear strength (cu) of the Glacial Clay from SPT N values. A conservative factor, f1, of 5 has been used, considering the plasticity index values recorded during the laboratory testing. cu values were also derived from empirical correlations with Liquidity Index (Wroth, 1979 [Ref. 09]).

The cu values range between 25kPa (SPT correlation in BH101) and 125kPa (SPT correlation in WS212). The other values 33 (Liquidity Index), 50 and 55kPa (both SPTs) indicate the material is generally a low to medium strength material (20 to 40kPa and 40 to 75kPa respectively).

BS8004 (2015) [Ref. 10] presents a correlation between plasticity index and values of phi cv. For the plasticity index of 15 determined in WS201 a phi cv value of 27.3° is determined. As only one phi cv value is determined and due to the limited presence of the Glacial Clay across the site recommendations are not discussed. As the volume of this material is likely to be low, then where the material is encountered, and depending upon location, it should be removed and replaced with suitably compacted fill.

4.2.6 Glacial Sands and Gravel

Glacial Sands and Gravels were recorded in nearly all exploratory holes, generally beneath the surface Made Ground and above the weathered Sherwood Sandstone.

The stratum is typically comprised of a very loose to very dense brown / yellowish brown / reddish brown / grey slightly gravelly / gravelly, sometimes clayey, fine to medium sand. The material was also described as a sandy / very sandy gravel. It was encountered at depths ranging between 0.50 and 3.2m bgl, with thicknesses proved ranging between 0.5 and 3.0m. Where sands were recorded, which would generally be interpreted as weathered Sherwood Sandstone, if the descriptions of the gravels, if present, included anything apart from sandstone, i.e. granite, limestone, mixed lithologies, etc. these were interpreted as Glacial Sand and Gravel.

Figure 1 presents the SPT 'N' values for the strata, with SPT'N' values ranging between 4 and >50, with a mean of 31 (>50 blows assumed to be 50 blows). Of the 49 tests undertaken 8 were <10, 15 between 10 and 30, 9 between 30 and 50, and 17 were 50 or greater. Low SPT 'N' valued may an indication of the presence of water. Only in BH101 at 1.2m bgl where an SPT test recorded 6 blows is a waterstrike recorded; the waterstrike was also recorded at 1.2m bgl with no water level rise recorded. The SPT test of 4 blows in WS214 at 3.0m bgl, may have been affected by the layer of dark brown mottled black sand with black organic remains present between 3.70 and 4.00 m depth. The remaining tests all show a large scatter of values indicated by the range from 4 to >50. In general the deposits are generally spread between being medium dense (10 to 30 blows), dense (30 to 50 blows) or very dense (>50 blows).

The drained internal (peak) angle of friction for the material has been estimated from uncorrected SPT N values by applying the correlation proposed by Peck et al. (1974) [Ref. 11]. The values range between 28° and 40°, with a mean of 36°. A conservative value of 34° will be used in design to account for variability of the material.

4.2.7 Weathered Sherwood Sandstone

Weathered Sherwood Sandstone was recorded in nearly all exploratory holes above the Sherwood Sandstone; it was generally found below Glacial Sand and Gravel, but also directly below Made Ground.

The stratum is typically described as extremely weak / weak dark red fine to medium grained sandstone recovered as silty sand. The material was also described as loose to very dense sometime clayey sometimes gravelly sand. It was encountered at depths ranging between 0.85 and 5.0m bgl, with thicknesses proved ranging between 0.12 and 2.35m.

Figure 1 presents the SPT 'N' values for the strata, with SPT'N' values ranging between 2 and >50, with a mean of 44. 44 SPTs were undertaken with 37 tests 50 or greater and three tests <10 blows. The lowest values of 2 was recorded in WS214 at 4.0m bgl at the base of a layer described as dark brown mottled black sand with black organic remains present between 3.70 and 4.00 m depth. This is likely to have affected the SPT result. Low SPT 'N' values maybe also be an indication of where the holes were not completely topped up with water during drilling, and may not be representative of the strata.

The drained internal (peak) angle of friction for the soil mass has been estimated from uncorrected SPT N values by applying the correlation proposed by Peck et al. (1974) [Ref. 11]. The values range between 27° and 41°, with a mean of 39°. A conservative value of 36° will be used in design to account for variability of the material.

4.2.8 Sherwood Sandstone

Sherwood Sandstone was recorded below weathered Sherwood Sandstone in nearly all exploratory holes. The exception is BH111, which encountered weathered Sherwood Sandstone from 0.85 to 1.55m bgl. BH111 is located to the south of the proposed development and rotary coring was not undertaken.

The strata is typically described as extremely weak to weak greyish / reddish brown fine to coarse sandstone with occasional subrounded fine to coarse gravel. Discontinuities are subhorizontal, very closely spaced, rough and clean. The material was also described as a gravelly sand where it was recovered in a weathered state. It was encountered at depths ranging between 3.40 and 6.55m bgl, with cored thicknesses ranging between 9.35 and 16.15m. The base of the sandstone was not proved.

The stratum was also described as mudstone in two boreholes; BH104 from 9.10 to 9.80m bgl (32.67 to 33.37m OD) and BH108 from 6.15 to 6.82m bgl (35.90 to 36.57m OD). BH104 is located to the west of the site and BH108 was undertaken on the south bank of the River Mersey. Given the local occurrence and thickness of the mudstone, it has been included as part of the Sherwood Sandstone stratum.

Figure 1 presents the SPT ‘N’ values for the strata, with SPT ’N’ values all 50 or greater. Assuming the bedrock is a very dense soil, the drained internal (peak) angle of friction for material has been estimated from uncorrected SPT N values by applying the correlation proposed by Peck et al. (1974) [Ref. 11]; the value is 41°. A conservative value of 40° will be used in design to account for variability of the material.

BS5930 (2015) [Ref. 12] indicates unconfined compressive strengths of 0.6 to 1MPa for rocks described as extremely weak, increasing to 1 to 5MPa for rocks described as very weak, 5 to 25MPa for rocks described as weak, 25 to 50MPa for rocks described as medium strong, increasing to 50 to 100MPa for rocks described as strong and 100 to 250MPa for rocks described as very strong.

Rock strength testing was undertaken on selected samples. UCS testing has been undertaken on nine rock core samples. Six of the nine tests were undertaken beneath the footprint of the proposed River Mersey crossing, BH108 and BH109. The sample strengths ranged between 4MPa (BH108 at 19.0m bgl, BH109 at 9.4m bgl and BH112 at 9.6m bgl) and 12MPa (BH105 at 13.0m bgl), i.e. indicating very weak to weak rock strengths. The tests were undertaken at as received moisture contents, which ranged between 11.7 and 16.1%.

Point load testing was also performed on rock core samples. Testing was undertaken at 24 locations; with testing undertaken in the diametral direction, i.e. parallel to planes of weakness and axial direction, i.e. perpendicular to planes of weakness. The reported Is50 values are summarised in Table 4.4.

Table 4.4. Laboratory Testing Summary – Sherwood Sandstone.

Test Type / Direction	Is50 (MN/m^2)		
	Min	Max	Average
D / PL	0.016	0.162	0.06
A / PD	0.039	0.281	0.13

Notes:

Test Type D - diametral

A – axial

Direction PL – parallel to planes of weakness

PD – perpendicular to planes of weakness

Point load testing was completed on samples of rock core. The tests were performed at as received moisture contents. The point load strength test is frequently used to determine crushing strength through established empirical relationships like those proposed by Broch and Franklin (1972) [Ref. 13]. Johnston (1991) [Ref. 14] suggests typical multiplication factors to convert from point load strength index to uniaxial compressive strength; typical values between 20 and 25 are applied to diametral tests for unweathered rocks. For weak and destructured rocks, values as low as 7 to 15 are often adopted. CIRIA 181 [Ref. 15] states that the development of site specific or formation specific correlations based on UCS and $Is_{(50)}$ values is essential. An assessment of the UCS and point load data has been undertaken for the available information. A correlation factor of 20 has been assumed. This correlation calculates rock strengths in the range 0.78 to 5.6MPa with an average of 2.6MPa. 22 of the 31 samples (71%) have values between 1 and 3MPa. The rock description are predominantly extremely weak, i.e. 0.6 to 1MPa. The point load tests for the sandstone indicate strengths that are higher than anticipated from the sample descriptions.

Maximum past pre-consolidation pressures, pc' for the materials has not been determined; a conservative value of 150kPa is adopted for design.

4.3 Geotechnical Parameters

The geotechnical parameters used in design are presented in Table 4.5.

Table 4.5. Summary of Geotechnical Parameters

	Parameter							
	γ_b	c_u	c'	ϕ'_{crit}	ϕ'_{peak}	C_c	C_s	UCS
Geological Unit	kN/m^3	kPa	kPa	°	°	-	-	MPa
Made Ground - Other	-	-	-	-	-	-	-	-
Made Ground - Cohesive	-	-	-	-	-	-	-	-
Made Ground - Granular	19	N/A	0	-	30	0.10	0.010-	N/A
Alluvial Clay	-	-	-	-	-	-	-	-
Glacial Clay	20	40	0	26	-	0.20	0.020	N/A
Glacial Sand and Gravel	20	N/A	0	-	34	0.10	0.010	N/A
Weathered Sherwood Sandstone	22*	N/A	0	-	36	0.05	0.005	N/A
Sherwood Sandstone	24*	N/A	0	-	40	0.01	0.001	0.6

* Assumed value.

4.4 Organic Matter Content

Organic matter content was determined on 36 samples; with values ranging between <2 and 56.5%. A summary of the testing is presented in Table 4.6.

Table 4.6. Summary of Organic Matter Testing.

Strata (No.)	Organic Matter Content (%)		
	Min	Maximum	Average
Made Ground – Cohesive (2)	1.3	14.1	7.7
Made Ground – Granular (27)	<0.2	56.5	10.2
Alluvial Clay (1)	21.7	21.7	21.7
Glacial Sand and Gravel (6)	<0.2	3.1	1.6
All Samples (36)	<0.2	56.5	9.8

A summary of the organic contents greater than 10% and their exploratory hole log descriptions are presented below:

- 56.5% - WS212 1.5 to 1.7m bgl - MADE GROUND: Loose dark brown gravelly fine to medium sand with black organic matter. Gravel is angular to subangular fine to coarse of various lithologies.
- 30.9% - WS211 0.2 to 0.5m bgl - MADE GROUND: Dark brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.
- 21.7% - BH112 1.8m bgl - Soft dark brown and black very organic CLAY, locally sandy silt, with organic remains.
- 18.3% - CT8 1.2 to 1.65m bgl - MADE GROUND: Loose blackish brown sandy fine to coarse angular to subangular gravel of brick, concrete and ash with a high cobble content and a high boulder content.
- 15.1% - WS214 0.5 to 1.0m bgl - MADE GROUND: Dark brown gravelly fine to coarse sand with ash. Gravel is subangular to subrounded fine to coarse of various lithologies, ceramic, brick fragments and concrete.
- 14.8% - WS209 0.6 to 1.0m bgl - Medium dense reddish brown gravelly fine to coarse SAND with a low cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of various lithologies.
- 14.6% - BH108 0.8m bgl - MADE GROUND: Loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. With a medium angular cobble content of brick and pockets of clay.
- 14.1% - WS201 1.0 to 1.2m bgl - MADE GROUND: Soft brown sandy gravelly clay, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.
- 12.1% - WS214 0.5 to 1.0m bgl - MADE GROUND: Dark brown gravelly fine to coarse sand with ash. Gravel is subangular to subrounded fine to coarse of various lithologies, ceramic, brick fragments and concrete.

Only two samples specifically mention organic content; WS212 – 56.5%, BH112 – 21.7%; this is considered unusual given the high organic matter values. This means that either the organic content was not obvious to the logging engineer or the sample was mis-logged. Any organic matter or material containing organic matter encountered on site should be removed and replaced with suitable material.

4.5 Groundwater

Groundwater monitoring installations are installed in nine boreholes and fifteen window sample holes. Details of the recorded groundwater levels are presented in Table 4.7.

Table 4.7. Groundwater Level Monitoring Results.

Exploratory Hole	Ground Level (m OD)	Response Zone (m bgl)	Response Zone Stratum	Installation Details	Ground Water Depth (m bgl) and Level (m OD)					
					11/01/16	25/01/16	09/02/16	22/02/16	08/03/16	18/03/16
BH101	45.22	5.00-7.00	Sherwood Sandstone	50mm standpipe	6.17	5.83	5.79	5.54	6.03	5.72
					39.05	39.39	39.43	39.68	39.19	39.50
BH102	43.35	8.00-10.00	Sherwood Sandstone	50mm standpipe	5.42	5.46	5.35	5.45	5.47	5.52
					37.93	37.89	38.00	37.90	37.88	37.83
BH103	42.42	11.00-14.00	Sherwood Sandstone	50mm standpipe	6.60	6.20	6.50	6.66	6.67	6.73
					35.82	36.22	35.92	35.76	35.75	35.69
BH104	42.47	1.00-3.50	Glacial Sand and Gravel	50mm standpipe	3.56	DRY	3.57	DRY	DRY	DRY
					38.91	-	38.90	-	-	-
BH105	42.62	9.50-12.00	Sherwood Sandstone	50mm standpipe	6.41	6.49	6.40	6.48	6.50	6.56
					36.21	36.13	36.22	36.14	36.12	36.06
BH106	42.45	5.00-7.00	Sherwood Sandstone	50mm standpipe	5.41	5.46	5.20	5.45	5.50	5.54
					37.04	36.99	37.25	37.00	36.95	36.91
BH108	42.72	18.00-21.00	Sherwood Sandstone	50mm standpipe	6.68	6.86	6.35	6.72	6.84	6.95
					36.04	35.86	36.37	36.00	35.88	35.77
BH109	42.36	18.00-20.00	Sherwood Sandstone	50mm standpipe	5.18	5.29	4.83	5.16	5.24	5.37
					37.18	37.07	37.53	37.20	37.12	36.99
BH112	43.70	12.80-14.80	Sherwood Sandstone	50mm standpipe	5.02	5.05	4.96	5.07	5.06	5.09
					38.68	38.65	37.74	38.63	38.64	38.61
WS201	45.61	3.50-4.00	Weathered Sherwood Sandstone	50mm standpipe	3.85	DRY	DRY	DRY	DRY	DRY
					41.76	-	-	-	-	-
WS203	43.01	2.00-3.00	Glacial Sand and Gravel	50mm standpipe	CAR	DRY	CAR	2.66	2.67	2.62
								40.35	40.34	40.39
WS204	42.85	1.50-2.45	Made Ground Granular/ Weathered Sherwood Sandstone	50mm standpipe	2.45	DRY	DRY	DRY	CAR	DRY
					40.40	-	-	-	-	-
WS205	42.39	1.50-2.00	Made Ground Granular/ Glacial Sand and Gravel	50mm standpipe	1.94	DRY	DRY	DRY	DRY	1.93
					40.45	-	-	-	-	40.46
WS206	48.13	1.00-2.00	Made Ground Granular	50mm standpipe	1.82	DRY	DRY	DRY	DRY	DRY
					46.31	-	-	-	-	-

Exploratory Hole	Ground Level (m OD)	Response Zone (m bgl)	Response Zone Stratum	Installation Details	Ground Water Depth (m bgl) and Level (m OD)					
					11/01/16	25/01/16	09/02/16	22/02/16	08/03/16	18/03/16
WS208	42.35	1.70-2.80	Weathered Sherwood Sandstone	50mm standpipe	2.72	DRY	DRY	DRY	DRY	DRY
					39.63	-	-	-	-	-
WS209	42.67	1.00-3.00	Glacial Sand and Gravel	50mm standpipe	2.91	DRY	DRY	DRY	DRY	DRY
					39.76	-	-	-	-	-
WS210	44.43	3.00-5.00	Glacial Sand and Gravel	50mm standpipe	5.00	DRY	DRY	DRY	DRY	DRY
					39.43	-	-	-	-	-
WS211	44.88	1.00-2.00	Made Ground Granular	50mm standpipe	1.87	1.92	1.90	1.87	1.87	1.90
					43.01	42.96	42.98	43.01	43.01	42.98
WS212	45.74	2.50-3.50	Glacial Clay	50mm standpipe	3.16	3.20	3.20	3.18	3.18	3.16
					42.58	42.54	42.54	42.56	42.56	42.58
WS214	46.35	0.50-1.00	Made Ground Granular	50mm standpipe	0.93	DRY	DRY	DRY	DRY	DRY
					45.42	-	-	-	-	-
WS217	42.30	1.50-2.50	Glacial Sand and Gravel	50mm standpipe	2.50	DRY	DRY	DRY	DRY	DRY
					39.80	-	-	-	-	-
WS218A	42.71	1.00-2.50	Made Ground Granular/ Glacial Sand and Gravel	50mm standpipe	2.50	DRY	DRY	DRY	DRY	DRY
					40.21	-	-	-	-	-
WS220	44.69	1.20-1.70	Made Ground Granular	50mm standpipe	1.60	1.65	1.60	1.65	1.67	1.67
					43.09	43.04	43.09	43.04	43.02	43.02
WS223	43.39	0.50-1.40	Made Ground Granular	50mm standpipe	1.60	1.60	1.50	1.53	DRY	DRY
					41.79	41.79	41.89	41.86	-	-

4.6 Aggressiveness of Ground to Concrete

BRE testing was undertaken on 35 samples recovered during the ground investigation. The samples tested include material classified as Made Ground Cohesive, Made Ground Granular and Glacial Sand and Gravel; due to the test result values they have all been classified together. A summary of the results is presented in Table 4.8.

Table 4.8. Summary of Sulphate (2:1 water:soil extract) & pH Results.

Determinand		Count	Min	Max
pH	Soils	35	7.86	12.40
Sulphate as SO4 (2:1 Ext) (g/l)	Soils	35	<0.0015	1.76 (0.31)*
Total Acid Soluble Sulphate (%)	Soils	35	<0.01	2.26

*The water soluble sulphate as SO4 results generally classify for sulphate class DS-1, i.e. <0.5g/l [Ref. 16]. However, one sample, WS212 at 1.5 to 1.7m bgl, has a sulphate at SO4 value >1.5g/l. This value (1.76g/l) infers a sulphate class of DS-3. The remainder of the samples have a maximum sulphate as SO4 of 0.31g/l, indicating a sulphate class of DS-1.

WS212 is located to the north east of the site and the sample is taken from a stratum described as ‘MADE GROUND: Loose dark brown gravelly fine to medium sand with black organic matter. Gravel is angular to subangular fine to coarse of various lithologies’.

WS212 is located away from the Interchange development area, presumably in an area of pavement widening. Made Ground adjacent to any concrete in this area should be removed and replaced with clean compacted granular fill.

The recorded pH values are all >7.5; therefore the site classifies as an ACEC Class of AC-1 [Ref. 16].

Contamination Assessment

Capabilities on project:
Environment

5 Contamination Assessment

5.1 Introduction

This assessment has been carried out in order to identify potential contamination issues associated with the proposed development of the site. As outlined in Section 1, the objective of the assessment was to obtain ground condition information to inform the design of the proposed modifications to the site. It should be noted that the risk assessment may require updating should there be any changes to the overall design.

5.2 Basis of Assessment

5.2.1 Human Health

AECOM has a prescribed methodology for assessing risks to human health at a generic level termed 'generic quantitative risk assessment' (GQRA) or 'Stage 2' in CLR11.

For sites where the conceptual site model has identified one or more complete contaminant linkage to human health it is often necessary to clarify the risk posed by that contaminant linkage by comparison of reported concentrations with guideline values that represent acceptable concentrations.

The procedures outlined in Environment Agency Science Reports SC050021/SR2 (Ref.17), SR3 (Ref. 18), SR4 (Ref. 19) and SR7 (Ref. 20) have been adopted in conjunction with the amendments to generic land-use exposure models published in DEFRA research report SP1010 (Ref. 21) detailing the derivation of Category 4 Screening Levels (C4SSL) to select and develop generic assessment criteria (GAC) for soil. This approach has also been adapted to develop assessment criteria for groundwater and soil vapour.

AECOM utilises a hierarchy of published sources for Stage 2 generic assessment criteria for soil. The hierarchy of published sources are as follows:

- Land Quality Management (LQM) / Chartered Institute of Environmental Health (CIEH) Suitable for Use Levels (S4UL) for Sandy loam soil;
- CL:AIRE Environmental Industries Commission (EIC) GAC;
- AECOM derived GAC (AGAC);
- Dutch Intervention Values (IV) and Serious Risk Concentrations (SRC); and
- United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSL).

No LQM or EIC values are available for lead, and therefore the published C4SLs for lead are the default soil GAC. Further consideration of Defra SP1010 C4SLs for other substances is made where appropriate, subject to the current limited availability to six substances.

There are no published sources of relevant GAC for non-potable groundwater and soil vapour.

Application of GAC to Site Data

A typical first step is to compare individual soil, groundwater, and/or soil vapour concentrations to the GAC in order to establish whether further more detailed assessment and/or potentially remediation is required. This comparison can be expressed numerically as a Hazard Quotient (HQ):

HQ=Sample Concentration GAC

Dependent on the assessment assumptions and uncertainties, a HQ< 1 indicates an acceptable level of risk from the substance being evaluated. The assessment of cumulative risk from multiple substances is not required at a GQRA level with the exception of TPH. In accordance with Environment Agency science report P5-080/TR3 (Ref.

22),a hazard index (HI) is calculated for each individual sample based on the summation of the HQ for each TPH fraction.

Statistical analysis may be warranted, if justified by the available data, to support initial GAC comparisons to individual reported concentrations.

In accordance with Environment Agency guidance co-authored by AECOM, GAC can be used as a starting point for evaluating long-term risks to human health from substances in soil. They address one specific consideration – long-term adverse effects on human health – and are designed to indicate where long-term (chronic) human health soil exposure risks are considered to be tolerable or minimal. They do not represent the “trigger” for an unacceptable risk under Part 2A of EPA 1990, and they do not address risk related to construction workers, acute exposure, ecology, controlled waters or building materials, they do not inform on the geotechnical suitability of the soil, and they do not inform on the aesthetic quality of the soil – both visual and olfactory. Therefore the GAC have not been explicitly derived to define remediation standards and are just one component in the assessment of whether soil is suitable for use.

It is good practice to use multiple lines of evidence to support GQRA conclusions.

Proposed Land Use Scenario

The proposed development is modifications to the existing Stockport bus station, on this basis a commercial end use has been specified as the most suitable AGAC.

Exposure Scenario Modelling Parameters

The following default exposure pathways have been modelled by specifying a commercial end use:

Soil and indoor dust ingestion;
Soil and indoor dust dermal contact;
Dust inhalation (indoor and outdoor);
Soil vapour inhalation (indoor and outdoor); and
Groundwater vapour inhalation (indoor and outdoor).

5.2.2 Controlled Waters

The recorded leachable soil concentrations have been assessed in accordance with the Environment Agency “Technical advice to third parties on Pollution of Controlled Waters for Part IIA of the Environmental Protection Act 1990, V.2” [Ref. 23] and The River Basin Districts Typology, Standards and Groundwater threshold values (Water framework Directive) (England and Wales) Directions 2010 [Ref. 24].

Section 2.6 identifies the site as being located above a Principal (bedrock) and Secondary A Aquifer (superficial deposits). The most stringent of the UK Drinking Water Standards (DWS) and Environmental Quality Standards for freshwater (EQS-F) have been used to assess the leachable soil concentrations and groundwater testing results.

The UK DWS are derived from (Water Supply (Water Quality) Regulations 1989 & 2000) and the EQS are listed under the Surface Waters (Dangerous Substances) (Classification) Regulations (1989, 1997, and 1998).

5.2.3 Ecological Systems

It is understood that planting and landscaping is not proposed as part of the development. However, should planting and /or landscaping be incorporated in the future, a landscape architect should be provided with the chemical analysis in order to establish suitable plant species. Ecological receptors are not considered further.

5.2.4 Property: Buildings and Services

It is recommended that the potential risk to water supply pipes and any necessary mitigation measures should be determined in accordance with the water supply company's risk assessment guidelines. Agreement with the local water supply company should be sought prior to placement of water supply pipes.

The recorded ground gas concentrations were assessed against the guidelines presented in CIRIA Report C665 (2007) [Ref. 25] '. Assessing risks posed by hazardous ground gases to buildings' and BS8485 'Code of practice for the characterisation and remediation from ground gas in affected developments' [Ref. 26].

5.3 Total Soil Concentrations

The majority of determinants were detected in concentrations below the commercial end use screening criteria for soils. However several determinants exceeded the chosen screening criteria, including Phenols, PAHs, SVOCs and VOCs. All of these exceedances occurred in Made Ground. A summary of the exceedances found in the Made Ground is included as Table 5.1. The full screening assessment for total soils is included in Appendix D.

Table 5.1. Summary of Elevated Total Soil Concentrations.

Determinant	Unit	Minimum	Maximum	Count	Screening Value	Exceedances in Made Ground	Exceedances in Natural Strata
Phenols							
4-Methylphenol	µg/kg	<LOD	2907	40	LOD	4	0
Poly Aromatic Hydrocarbons							
Benzo (a) Anthracene	mg/kg	<LOD	591.71	35	170	1	0
Benzo (a) Pyrene	mg/kg	<LOD	649.52	35	35	2	0
Benzo(b)fluoranthene	mg/kg	<LOD	577.17	35	44	1	0
Chrysene	mg/kg	<LOD	628.96	35	350	1	0
Dibenzo (ah) Anthracene	mg/kg	<LOD	58.58	35	3.5	2	0
SVOCs							
Carbazole	µg/kg	<LOD	50353	22	LOD	12	0
Benzo(b)fluoranthene	mg/kg	<LOD	577.17	35	44	1	0
VOCs							
Trichloroethene (TCE)	µg/kg	<LOD	11	22	LOD	1	0
4-Isopropyltoluene	µg/kg	<LOD	10	22	LOD	1	0
Isopropylbenzene	µg/kg	<LOD	16	22	LOD	2	0
Dichloromethane (DCM)	µg/kg	<LOD	100	22	LOD	2	0

Asbestos was encountered in the form of chrysotile in exploratory holes BH112, WS201 and WS206 at 0.20m bgl, 0.50m bgl and 0.50m bgl respectively. Asbestos quantification on these samples found that the level of asbestos was below the laboratory limit of detection.

5.4 Controlled Waters

5.4.1 Leachate Concentrations

The majority of the determinants were detected below the Screening Criteria in the majority of the samples. However, several determinants exceeded the chosen screening criteria for metals, non-metals, TPH compounds, PAH's and SVOCs. The details are summarised as Table 5.2 and the complete screening assessment is included as Appendix E.

Table 5.2. Summary of Elevated Leachate Concentrations.

Determinant	Unit	Minimum	Maximum	Total No. of Tested Samples	Screening Value	Exceedances in Made Ground	Exceedances in Natural Strata
Metals							
Arsenic	µg/l	<LOD	79.1	18	10	6	0
Hexavalent Chromium	mg/l	<LOD	0.02	8	0.0034	2	0
Chromium III	mg/l	<LOD	0.013	8	0.0047	4	0
Chromium	µg/l	<LOD	25.4	18	4.7	8	0
Copper	µg/l	<LOD	22	18	1	2	0
Lead	µg/l	<LOD	23	18	1.2	5	0
Nickel	µg/l	<LOD	6	18	4	3	0
Vanadium	µg/l	<LOD	39.8	15	10.9	2	0
Non Metals							
Total Cyanide	mg/l	<LOD	0.08	12	0.001	1	0
TPH compounds						1	
Aliphatics >C21-C36	µg/l	<LOD	120	18	LOD	1	0
Aliphatics >C35-C44	µg/l	<LOD	20	18	LOD	1	0
Aromatics>EC12-EC17	µg/l	<LOD	170	18	90	1	0
Aromatics>EC16-EC22	µg/l	<LOD	790	18	90	1	0
Aromatics>EC21-EC36	µg/l	<LOD	1330	18	90	1	0
Aromatics >EC35-EC44	µg/l	<LOD	270	18	90	1	0
Poly Aromatic Hydrocarbons							
Anthracene	µg/l	<LOD	0.32	12	0.1	1	0
Benzo(a)pyrene	µg/l	<LOD	1.82	12	0.00017	10	0
Benzo(k)fluoranthene	µg/l	<LOD	0.91	12	0.017	9	0
Benzo(bk)fluoranthene	µg/l	<LOD	3.24	12	0.017	11	0
Benzo(b)fluoranthene	µg/l	<LOD	2.33	12	0.017	10	0
Benzo(ghi)perylene	µg/l	<LOD	0.65	12	0.0082	9	0
Dibenzo(ah)anthracene	µg/l	<LOD	0.16	12	0.07	1	0
Fluoranthene	µg/l	<LOD	2.93	12	0.0063	11	0
Indeno(123cd)pyrene	µg/l	<LOD	0.71	12	LOD	9	0
SVOCs						1	
Carbazole	µg/l	<LOD	8	18	LOD	1	0

Capabilities on project:
Environment

5.4.2 Groundwater Concentrations

The majority of determinants were detected below the selected screening criteria. However, several of the groundwater determinants exceeded the screening criteria; these are summarised in Table 5.3. The complete screening assessment for groundwater samples is included in Appendix F.

Table 5.3. Summary of Elevated Groundwater Concentrations from Water Samples from Site.

Determinant	Unit	Minimum	Maximum	Total No. of Tested Samples	Screening Value	Exceedances in Made Ground	Exceedances in Natural Strata
Nickel	µg/l	<LOD	8	9	4	0	3
TPH compounds						1	
Aliphatics > C12-C17	µg/l	<LOD	1280	9	300	0	1
Aliphatics > C16-C22	µg/l	<LOD	10	9	LOD	0	1
Aliphatics > C35-C44	µg/l	<LOD	1299	9	LOD	0	1
VOCs						1	
Chloroform	µg/l	<LOD	5	9	2.5	0	1

5.5 Ground Gas

The ground gas assessment is based on the 3 No. ground gas monitoring visits undertaken to date. The maximum recorded and the maximum concentration of either methane or carbon dioxide has been used to derive the gas screening values in combination with the rate of flow at the time of each measurement.

The results of the ground gas assessment is summarised in Table 5.4.

Table 5.4. Summary of Ground Gas Assessment.

Exploratory Hole	Date	Flow rate (l/h)	Barometric Pressure (mb)	Max 02%	C0	H2S	Peak CH4 (% vol)	GSV (l/hr)	Characteristic Situation CH4	Peak CO2 (% vol)	GSV	Characteristic Situation CO2
BH101	11/01/2016	-2.0	969	21	<1	<1	0.0	0	1	0.1	0.002	1
	25/01/2016	-0.5	1001	16.7	<1	<1	0.0	0	1	4	0.02	1
	09/02/2016	-2.1	969	17.6	<1	<1	0.0	0	1	3.8	0.0798	2
BH102	11/01/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	21.1	<1	<1	0.0	0	1	0.1	0.0001	1
BH103	11/01/2016	-0.1	969	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	1.0	1001	20.8	<1	<1	0.0	0	1	0.1	0.001	1
	09/02/2016	6.4	969	20.6	<1	<1	0.0	0	1	0.1	0.0064	1
BH104	11/01/2016	0.1	969	18.9	<1	<1	0.0	0	1	2.2	0.0022	1
	25/01/2016	1.2	1001	19.5	<1	<1	0.0	0	1	1.5	0.018	1
	09/02/2016	0.1	969	19.1	<1	<1	0.0	0	1	2.4	0.0024	1
BH105	11/01/2016	0.4	969	21	<1	<1	0.0	0	1	0.1	0.0004	1
	25/01/2016	0.3	1001	20.7	<1	<1	0.0	0	1	0.1	0.0003	1
	09/02/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
BH106	11/01/2016	-0.9	969	20.9	<1	<1	0.0	0	1	0.1	0.0009	1
	25/01/2016	-0.5	1001	20.6	<1	<1	0.0	0	1	0.1	0.0005	1
	09/02/2016	-0.2	969	18.8	<1	<1	0.0	0	1	0.7	0.0014	1
BH108	11/01/2016	0.1	969	20.5	<1	<1	0.0	0	1	0.5	0.0005	1
	25/01/2016	0.1	1001	20.7	<1	<1	0.0	0	1	0.3	0.0003	1
	09/02/2016	0.1	969	19.9	<1	<1	0.0	0	1	1.9	0.0019	1
BH109	11/01/2016	-0.1	969	20.5	<1	<1	0.0	0	1	1.3	0.0013	1
	25/01/2016	0.1	1001	20.5	<1	<1	0.0	0	1	0.4	0.0004	1
	09/02/2016	0.1	969	18.4	<1	<1	0.0	0	1	2.4	0.0024	1
BH112	11/01/2016	-0.1	969	21.1	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	21.1	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	21.2	<1	<1	0.0	0	1	0.1	0.0001	1
WS201	11/01/2016	-0.3	969	21	<1	<1	0.0	0	1	0.1	0.0003	1
	25/01/2016	0.1	1001	18.2	<1	<1	0.0	0	1	3.6	0.0036	1
	09/02/2016	0.1	969	16.5	<1	<1	0.0	0	1	6.1	0.0061	2

Capabilities on project:
Environment

Exploratory Hole	Date	Flow rate (l/h)	Barometric Pressure (mb)	Max 02%	C0	H_2S	Peak CH_4 (% vol)	GSV (l/hr)	Characteristic Situation CH_4	Peak CO_2 (% vol)	GSV	Characteristic Situation CO_2
WS203	11/01/2016	Location not monitored on this date – access to exploratory hole blocked.										
	25/01/2016	0.1	1001	14.4	<1	<1	0.0	0	1	2	0.002	1
	09/02/2016	Location not monitored on this date – access to exploratory hole blocked.										
WS204	11/01/2016	0.1	969	11.8	<1	<1	0.0	0	1	7.1	0.0071	2
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	19.9	<1	<1	0.0	0	1	1.8	0.0018	1
WS205	11/01/2016	0.1	969	21	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	18.4	<1	<1	0.0	0	1	2.3	0.0023	1
WS206	11/01/2016	-0.3	969	20.5	<1	<1	0.0	0	1	0.4	0.0012	1
	25/01/2016	0.1	1001	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	21.1	<1	<1	0.0	0	1	0.2	0.0002	1
WS208	11/01/2016	0.1	969	18.6	<1	<1	0.0	0	1	2.5	0.0025	1
	25/01/2016	0.1	1001	20.7	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	18.5	<1	<1	0.0	0	1	3.6	0.0036	1
WS209	11/01/2016	0.1	969	19.6	<1	<1	0.0	0	1	2.6	0.0026	1
	25/01/2016	0.1	1001	19.8	<1	<1	0.0	0	1	2.3	0.0023	1
	09/02/2016	0.1	969	20.3	<1	<1	0.0	0	1	1.8	0.0018	1
WS210	11/01/2016	0.1	969	20.4	<1	<1	0.0	0	1	1	0.001	1
	25/01/2016	1.4	1001	20.7	<1	<1	0.0	0	1	0.2	0.0028	1
	09/02/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.4	0.0004	1
WS211	11/01/2016	-0.1	969	20.3	<1	<1	0.0	0	1	0.3	0.0003	1
	25/01/2016	-0.2	1001	20	<1	<1	0.0	0	1	0.6	0.0012	1
	09/02/2016	0.1	969	19.8	<1	<1	0.0	0	1	0.7	0.0007	1
WS212	11/01/2016	0.1	969	7.2	<1	<1	0.0	0	1	4	0.004	1
	25/01/2016	1.4	1001	15.1	<1	<1	0.0	0	1	1.4	0.0196	1
	09/02/2016	0.1	969	8.5	<1	<1	0.0	0	1	3.5	0.0035	1
WS214	11/01/2016	0.1	969	20.6	<1	<1	0.0	0	1	0.3	0.0003	1
	25/01/2016	0.1	1001	20.9	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	18.1	<1	<1	0.0	0	1	3	0.003	1
WS217	11/01/2016	0.1	969	18.6	<1	<1	0.0	0	1	3.2	0.0032	1
	25/01/2016	0.1	1001	79.9	<1	<1	0.0	0	1	19.4	0.0194	2
	09/02/2016	0.1	969	18.9	<1	<1	0.0	0	1	3	0.003	1

Capabilities on project:
Environment

Exploratory Hole	Date	Flow rate (l/h)	Barometric Pressure (mb)	Max 02%	C0	H2S	Peak CH4 (% vol)	GSV (l/hr)	Characteristic Situation CH4	Peak CO2 (% vol)	GSV	Characteristic Situation CO2
WS218A	11/01/2016	0.1	969	20.4	<1	<1	0.0	0	1	0.4	0.0004	1
	25/01/2016	-0.5	1001	20.7	<1	<1	0.0	0	1	0.1	0.0005	1
	09/02/2016	0.1	969	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
WS220	11/01/2016	0.1	969	19.4	<1	<1	0.0	0	1	0.6	0.0006	1
	25/01/2016	0.1	1001	20.8	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	17.2	<1	<1	0.0	0	1	2.5	0.0025	1
WS223	11/01/2016	0.1	969	18.9	<1	<1	0.0	0	1	0.1	0.0001	1
	25/01/2016	0.1	1001	18.3	<1	<1	0.0	0	1	0.1	0.0001	1
	09/02/2016	0.1	969	20.2	<1	<1	0.0	0	1	0.1	0.0001	1
Maximum	n/a	6.4	1001.0	79.9	0.0	0.0	0.0	0.0	1	19.4 (WS217 on 25/01/16)	0.0196	2
Minimum	n/a	-2.1	969.0	7.2	0.0	0.0	0.0	0.0	1	0.1	0.0001	1

During the monitoring exploratory holes adjacent to proposed main building (WS204 and WS217) recorded elevated carbon dioxide levels. Elevated carbon dioxide levels were found elsewhere onsite in locations BH101 and WS201. In accordance with CIRIA Report C665 (Ref. 25) the ground gas regime for the site has been categorised as Characteristic Situation 2.

There are a number of potential sources of the ground gas, including Made Ground and organic material within natural strata. However, the available information cannot provide a basis for determining the actual source of the ground gas at this stage.

Refined Conceptual Site Model

6 Refined Conceptual Site Model

6.1 Introduction

A refined conceptual site model (CSM) has been developed on the basis of the AECOM Desk Study Report (Ref 01) and the findings of the Geotechnics' ground investigation factual report (Ref. 07) and contamination assessment (Section 5). The CSM has been developed on the understanding that the site will developed for a commercial end use in line with the development proposal outlined in Section 1.1.

To assess the potential geo-environmental impacts associated with contamination at the site, the conceptual model has been revised using the source pathway receptor approach, promoted by DEFRA and the Environment Agency. For there to be an identifiable risk, not only must there be contaminants present on the site (source) there must also be a receptor and a pathway which allows the source to impact on the receptor.

6.2 Contamination Sources

6.2.1 Sources Based on the contamination assessment

Potential on site contamination sources include:

S1 – Potentially contaminated Made Ground and shallow natural soils; and

S2 – Potentially contaminated groundwater.

6.2.2 Contaminants of Concern

Table 6.1. Contaminants of Concern Encountered within Made Ground.

Determinand	Human Health	Controlled Waters	Property/Ecological Receptors
Metals			
Arsenic		✓	✓
Chromium III		✓	✓
Chromium VI		✓	✓
Chromium Total		✓	✓
Lead		✓	✓
Nickel		✓	✓
Vanadium		✓	✓
Non Metals			
Total Cyanide		✓	✓
Asbestos	✓		
TPH Compounds			
Aliphatic >C21-C36		✓	✓
Aliphatic >C35-C44		✓	✓

Determinand	Human Health	Controlled Waters	Property/Ecological Receptors
Aromatic >EC12-EC17		✓	✓
Aromatic >EC16-EC22		✓	✓
Aromatic >EC21-EC36		✓	✓
Aromatic >EC21-EC36		✓	✓
Phenol			
4-methylphenol	✓		✓
PAHs			
Acenaphthene		✓	✓
Benzo(a)anthracene	✓		✓
Benzo(a)pyrene		✓	✓
Benzo(b)fluoranthene	✓	✓	✓
Benzo(k)fluoranthene		✓	✓
Benzo(bk)fluoranthene		✓	✓
Benzo(g,h,i)perylene		✓	✓
Carbazole	✓		✓
Dibenz(a,h)anthracene		✓	✓
Fluorene			✓
Fluoranthene		✓	✓
Indeno(1,2,3-cd)pyrene		✓	✓
VOCS			
Trichloroethene (TCE)	✓		
4-isopropyltoluene	✓		
Isopropylbenzene	✓		
Dichloromethane (DCM)	✓		

Table 6.2. Contaminants of Concern Encountered within Natural Ground.

Determinand	Human Health	Controlled Waters	Property/Ecological Receptors
Nickel		✓	
TPH Compounds			
Aliphatic >C12-C17		✓	
Aliphatic >C16-C22		✓	
Aliphatic >C35-C44		✓	
VOCS			
Chloroform		✓	

6.3 Receptors

6.3.1 Human Health Receptors
R1 – Construction workers
R2 – Maintenance workers
R3 – Final end users
R4 – Adjacent site users

6.3.2 Controlled Waters
R5 – Primary /Secondary Aquifers underlying the site
R6 – Surface Water in the vicinity of the site (River Mersey)

6.3.3 Ecological Receptors & Property
R7 – Future planting and landscaping
R8 – Future proposed services and structures

6.4 Refined Conceptual Site Model

The refined conceptual site model is summarised in Table 6.3.

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Table 6.3. Refined Conceptual Site Model.

Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
S1: Potentially contaminated Made Ground and shallow natural soils	P1: Direct contact with soil (ingestion and dermal)	R1: Construction workers	Moderate Risk	The majority of the determinants were detected below the AECOM Screening Value. Only PAHs in Made Ground were detected in concentrations exceeding specific generic assessment criteria value. Several VOCs and SVOCs were detected above the LOD used in the absence of a screening value. Asbestos has been identified onsite albeit in concentrations below the LOD of (0.001 % of mass). The majority of the site is covered in Hard standing breaking the pathway from the elevated concentrations in the Made Ground and end users. It is recommended that landscaped areas on Made Ground should be covered in an appropriate geo membrane and at least 600mm of clean topsoil to break any contaminant linkage. Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to contaminants and asbestos through appropriate health and safety risk assessment processes, which are likely to require the adoption of appropriate health and safety measures such as adequate personal protective equipment (PPE), damping down for dust suppression and other normal safe practices for on-site workers. Asbestos has been identified onsite although testing has not been able to quantify the amount in given samples. An asbestos watching brief should be undertaken by site staff and should If asbestos is encountered again onsite it should be handled and disposed of appropriately by a specialist asbestos contractor. The risk to final end users from inhalation of vapours is unlikely to occur due to the end use being that of a bus station which is largely open space with structures being underlain by generally impermeable hardstanding. End users are also expected to be largely transient not spending large amounts of time onsite.	Minor	Low Likelihood	Very Low Risk	1
S1: Potentially contaminated Made Ground and shallow natural soils	P1: Direct contact with soil (ingestion and dermal)	R2: Maintenance workers	Moderate Risk		Minor	Low Likelihood	Very Low Risk	2
S1: Potentially contaminated Made Ground and shallow natural soils	P2: Inhalation of dust and / or vapours	R1: Construction workers	Low Risk		Minor	Low Likelihood	Very Low Risk	3
S1: Potentially contaminated Made Ground and shallow natural soils	P2: Inhalation of dust and / or vapours	R2: Maintenance workers	Moderate Risk		Minor	Low Likelihood	Very Low Risk	4
S1: Potentially contaminated Made Ground and shallow natural soils	P2: Inhalation of dust and / or vapours	R3: Final end users	Moderate Risk		Minor	Unlikely	Very Low Risk	5

Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
		R4: Adjacent site users	Moderate	The risk of adjacent site users is only likely to occur during the development phase. Precautions should be taken to minimise the spread of dust from the site, such as damping down and wheel washes. Should asbestos be encountered during the works a specialist asbestos contractor should be consulted and additional control measures should be implemented.	Minor	Unlikely	Very Low Risk	**6**
	P4: Inhalation of ground gas	R1: Construction workers	Moderate / Low Risk	Elevated concentrations of ground gases have been recorded. The recorded levels are above published HSE Workplace Exposure Limits. Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to ground gas through appropriate health and safety risk assessment processes. Anyone undertaking works in a confined space should be appropriately trained and wear suitable RPE and PPE, as per confined space regulations.	Severe	Low Likelihood	Moderate Risk	**7**
		R2: Maintenance workers	High Risk		Severe	Low Likelihood	Moderate Risk	**8**
		R3: Final end users	High Risk	Elevated concentrations of ground gases have been recorded. The gas screening values indicate the site is representative of Characteristic Situation 2 meaning gases are recorded at levels considered significant enough to require gas protection measures appropriate to the proposed development and Characteristic Situation as specified CIRIA Report C665 (2007)'Assessing risks posed by hazardous ground gases to buildings' and BS8485 'Code of practice for the characterisation and remediation from ground gas in affected developments.'	Severe	Low Likelihood	Moderate Risk	**9**
	P6: Surface water run-off and/or direct percolation from surface	R6: Surface water (River Mersey)	High Risk	Elevated levels of contaminants have been identified in leachate samples above the chosen screening criteria. Following construction the site is expected to be generally covered in relatively impermeable hardstanding minimising infiltration and the contact of contaminated soils with surface run-off.	Medium	Likely	Moderate Risk	**10**

Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
	P5: Leaching of contaminants	R5: Principal Aquifer/ Secondary Aquifer	Moderate /Low Risk	The risk to controlled waters from surface run-off and direct percolation is expected to occur primarily during the development phase. Measures should be employed during construction to limit surface water run/off and percolation such as minimising soil exposure and covering of soil stockpiles. Following construction the site is expected to be generally covered in relatively impermeable hardstanding minimising the contact of contaminated soils with surface run-off. The site will be covered with relatively impermeable hard standing which will minimise infiltration and leaching of contaminants from the soils.	Medium	Low Likelihood	Moderate/Low Risk	**11**
	P8: Direct contact with in-ground structures and services.	R8: Proposed services and structures	Moderate /Low Risk	Potentially harmful chemicals and elements have been encountered in both total soils testing and leachate samples taken from the site. Advice should be sought from the local water supply companies to assist in the specification of drinking water supply pipes before emplacement.	Mild	Low Likelihood	Low Risk	**12**
	P9: Plant uptake	R7: Proposed planting	Moderate /Low Risk	Whilst landscaping and planting is not currently expected to be part of the proposed development, potentially phytotoxic chemicals have been encountered onsite. If planting is used onsite a geo-membrane should be used and covered within at least 600mm of clean imported topsoil	Minor	Unlikely	Very Low Risk	**13**
	P8: Migration and accumulation of gases	R8: Proposed services and structures	Low Risk	Elevated concentrations of ground gases have been recorded. The gas screening values indicate the site is representative of Characteristic Situation 2 meaning gases are recorded at levels considered significant enough to require gas protection measures appropriate to the proposed development and Characteristic Situation. Any works undertaken in a confined space should be undertaken in accordance with the current confined space regulations and appropriate PPE and RPE worn	Severe	Unlikely	Moderate/Low Risk	**14**

Source	Transport Pathway	Receptor	Preliminary Risk Assessment	Comment	Revised Consequence of risk being realised	Revised Probability of risk being realised	Revised Risk Classification	Contaminant Linkage ID
S2: Potentially contaminated groundwater	P7: Vertical and lateral migration of groundwater	R6: Principal Aquifer/ Secondary Aquifer	Moderate Risk	Elevated levels of contaminants are present within groundwater samples taken from wells with their response zones situated in natural strata. These are not expected to pose a significant risk to controlled waters receptors for the following reasons: - Metal concentrations only marginally exceed screening values and as such are not deemed to pose a significant risk to their receptors and are expected to be generally reflective of natural background levels. -The elevated levels of Aliphatic TPHs and chloroform encountered in BH109 are considered to be isolated and not widespread across the site, furthermore these determinants were not matched by similarly high levels in soils testing. It is therefore considered that the source of impact is from current or historical off site land uses.	Medium	Low Risk	Moderate/Low Risk	**15**
	P7: Vertical and lateral migration of groundwater	R6: Surface waters	Moderate /Low Risk		Medium	Low Risk	Moderate/Low Risk	**16**

Table 6.4. Residual pollutant linkages.

<table>
<tr><th>Source</th><th>Contaminants of Potential Concern</th><th>Transport Pathway</th><th>Receptor</th><th>Contaminant Linkage ID</th><th>Remedial Action</th></tr>
<tr><td rowspan="5">S1: Potentially contaminated Made Ground and shallow natural soils</td><td>PAHs, SVOCs, and VOCs</td><td>P1: Direct contact with soil (ingestion and dermal)</td><td>R3: Final End users</td><td></td><td>It is recommended that landscaped areas on Made Ground should be covered in an appropriate geo membrane and at least 600mm of clean topsoil to break any contaminant linkage.</td></tr>
<tr><td rowspan="3">Ground Gas</td><td rowspan="3">P4: Inhalation of ground gas</td><td>R1: Construction workers</td><td>7</td><td rowspan="2">Elevated concentrations of ground gases have been recorded. The recorded levels are above published HSE Workplace Exposure Limits.
Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to ground gas through appropriate health and safety risk assessment processes. Anyone undertaking works in a confined space should be appropriately trained and wear suitable RPE and PPE, as per current confined space regulations.</td></tr>
<tr><td>R2: Maintenance workers</td><td>8</td></tr>
<tr><td>R3: Final end users</td><td>9</td><td>The gas screening values indicate the site is representative of Characteristic Situation 2 meaning gases are recorded at levels considered significant enough to require gas protection measures appropriate to the proposed development and Characteristic Situation.</td></tr>
<tr><td>- Arsenic
- Chromium III
- Chromium VI
- Chromium Lead
- Nickel
- Vanadium
- Cyanide
- TPHs
- PAHs
- SVOCs</td><td>P6: Surface water run-off and/or direct percolation from surface</td><td>R5: Surface water (River Mersey)</td><td>**10**</td><td>The risk to controlled waters from surface run-off and direct percolation is expected to occur primarily during the development phase.
Measures should be employed during construction to limit surface water run/off and percolation such as minimising soil exposure and covering of soil stockpiles.</td></tr>
</table>

Engineering Assessment of Ground Conditions

7 Engineering Assessment of Ground Conditions

7.1 Proposed Development

Stockport bus station is proposed to be re-developed by TfGM. The proposed scheme includes the demolition of the existing bus station, building of a new Interchange, realignment of the current road layout, expansion of Mersey Square and the construction of a bridge across the River Mersey.

7.2 Seasonal Shrinkage

The potential for shrinkage and swelling of the potentially ‘shrinkable’ soils underlying the site has been considered based on NHBC Standards Chapter 4 (2007) [Ref. 27].

Due to the nature of the underlying soils only one Plasticity Index was determined. The modified Plasticity Index for the Glacial Clay deposits was <20%, these indicate that this material is likely to have a low potential for volume change.

7.3 Groundwater

Groundwater monitoring instruments have been installed within the various geological units encountered beneath the site. It should be noted that possible fluctuations in groundwater levels seasonally or due to climatic effects have not been determined within the limited monitoring period.

Groundwater levels are included in Geotechnics’ factual report [Ref. 07] and are presented on the geological sections, Drawing 60340298-ACM-00-GEO-DR-0002. A number of the installations only recorded a small quantity of water at the base of the installation or were not accessible at the time of the monitoring visit. The anticipated low permeability of the Glacial Clay deposits is such that a longer monitoring period is likely to be required to assess equilibrium groundwater levels within the clays.

Groundwater within the more permeable strata, i.e. Made Ground Granular, Glacial Sands and Gravels and Sherwood Sandstone, would expect a quicker response and equalisation of water pressures would be anticipated.

7.4 Drainage – Soakaway Drainage

The ground conditions on the site appear to be suitable for soakaway drainage, i.e. Glacial sands and gravels overlying Sherwood Sandstone. Once the site levels and location of any soakaways have been determined this should be confirmed in accordance with BRE Digest 365, Soakaway Design 2007. The sensitivity of the underlying Principal Aquifer and final end use of the site should be taken into consideration when designing the soakaway to ensure ground and surface waters are not impacted. Approval from the Environment Agency (EA) is likely to be required for the use of soakaways, and, where necessary, the EA will issue permits or notices in order to control the risk to groundwater from contaminated discharges.

7.5 Shallow Foundations

7.5.1 General

The Interchange is proposed to be a lightly loaded structure, i.e. station canopy with isolated single storey walls for offices/retail outlets, and may be supported by a raft foundation, subject to detailed design. Preliminary details of structural loading have been provided with maximum loading around 60 to 66kPa anticipated below the canopy external support columns. The majority of the concourse area will have contact stresses of 15kPa or lower. The foundation geometries and structural tolerance to differential settlement will be confirmed at detailed design.

It is anticipated that the underlying medium dense Glacial Sands and Gravels will provide adequate bearing stratum for lightly loaded spread foundations, subject to detailed design.

Foundations should be located within natural ground below any fill and below the depth of effect of variations due to vegetation, seasonal and climatic change.

Due to the localised nature of the Glacial Clay deposits encountered during the ground investigation, it is recommended that if this fine grained material is encountered it should be removed and replaced with suitably compacted granular fill. For the Glacial Sand and Gravel deposits using minimum shear strength in terms of effective stress, c'0, ø' 34°, presumed bearing values (net) of the order 300kPa may be adopted in preliminary design . The bearing capacity calculations are undertaken presuming a 2m by 2m foundation at 1.0m depth, with groundwater at 1.0m bgl. Additional consideration of bearing capacity and settlement will be required at detailed design stage when details of structural tolerance to movement, foundation layout and geometry are available.

7.6 Piled Foundations

7.6.1 Types of Pile

Piled foundations may be considered for heavy structures and/or to minimise size and number of discrete spread foundations given the limited working area as the bus station may still be working during the construction period. Piles may derive capacity from a combination of skin friction and end bearing in the superficial soils and in rock. Pile diameters and lengths will be dictated by design loads. Non displacement, bored cast in situ concrete piles or small displacement driven steel systems are likely to provide optimum performance.

7.6.2 Preliminary Pile Design

The SPT N values for the superficial soils and underlying bedrock are presented on Figure 1. The variation in the Glacial deposits level across the site is shown on the geological cross sections presented on Drawing 60340298-ACM-00-GEO-DR-0002.

A detailed pile design is outside the scope of this report. The design procedure for piles varies considerably, depending on the proposed type of pile. However, for illustrative purposes only, the safe geotechnical axial capacity of a single 600mm diameter bored cast-in-situ concrete pile, 5m long pile and toed into the weathered Sherwood Sandstone. The ground model used was BH108 located on the south side of the proposed River Mersey crossing. The model assumed a 1.0m pile cap, Made Ground Granular to 5.0m bgl, with weathered Sherwood Sandstone to 6.8m bgl with Sherwood Sandstone below. Groundwater is assumed at 5.5m bgl. Based on calculations using Eurocode partial factors the modelled pile is estimated to have a load carrying capacity of 480kN. This value will be reviewed during the detailed design stage depending upon the location of any proposed structures. If an increase in load carrying capacity is required, the piles should be extended and toed into the Sherwood Sandstone. Consideration of pile capacity will be required at detailed design stage when details of structural tolerance to movement, foundation layout and geometry are available.

It should be noted that no reduction in load capacity due to pile group effects has been taken into account in the above value.

7.7 Subgrade Conditions for Road Pavements

The pavement subgrade will predominantly be Made Ground Granular deposits, with localised areas of Made Ground Cohesive material. Natural subgrade soils, if present, will generally be granular sand deposits with localised areas of low plasticity cohesive materials. Pavement design requires prediction of long term stiffness of the subgrade soils under road loading and under equilibrium groundwater condition. In order to avoid subgrade damage design will need to be based on the lower of the undrained in situ condition and longer term equilibrium values.

If the localised cohesive materials are removed and replaced with compacted granular fill, the Made Ground Granular and Glacial Sands and Gravels, expected to be present across the majority of the site, would allow for a preliminary design CBR value of 5%. This value assumes that during construction the formation level will be carefully compacted and any soft spots, i.e. localised cohesive material only, dug out and replaced by suitable compacted granular material. Made Ground present at formation level should be excavated, graded and recompacted to form a suitable foundation material.

7.8 Excavations & Earthworks

All temporary excavations should be battered back to a safe angle as determined on site, or provided with close/continuous support.

Considering the limited and variable groundwater information obtained from installations within the exploratory holes and the presence of groundwater within the Made Ground deposits; it is recommended that provision is made for pumping from sumps to control ingress of groundwater into excavations in the event that water bearing granular bodies are encountered.

The current design does not have any significant earthworks. Significant arisings from drainage excavations may occur during construction; these are likely to require off-site disposal. Re-use of material on site will require a Materials Management Plan if the material to be re-used exceeds 1000 tonnes. Excavation should be possible using conventional site plant.

7.9 Slope stability

Permanent slopes of significant height have not been identified during preliminary design.

Side slopes of 1v:2h within the Glacial Sands and Gravels are likely to provide an adequate factor of safety where slopes are not saturated. It is recommended that slope stability analyses are undertaken at detailed design stage to establish maximum permissible slope angles.

7.10 Utilities

A strategy to deal with the existing and proposed underground and overhead utilities across the site in relation to the proposed development is being progressed by others.

A United Utilities' sewer is to underlie the proposed Stockport Interchange building footprint. The sewer was encountered in BH107 at 7.5m bgl, with Sherwood Sandstone bedrock encountered at 4.0m bgl. The location and level of this sewer, apart from at BH107, is unknown. A condition survey and position/level survey should also be undertaken to confirm the sewer's condition, depth and location.

In BH107 the sewer was encountered over 3m below the bedrock surface. The Interchange is proposed to be a lightly loaded structure, i.e. station canopy with isolated single storey walls for offices/retail outlets, and may be supported by a raft foundation on the Glacial Sands and Gravels above the sewer, subject to detailed design.

Approval from United Utilities will be required to confirm the proposed building does not affect their asset; United Utilities may have further modelling/ confirmation requirements in order to allow construction over their asset.

7.11 Geotechnical Risk Register

Table 7.1 summarises the key geotechnical hazards and risk.

Table 7.1. Geotechnical Risk Register.

HAZARD RISK	CAUSE	BEFORE CONTROL			CONSEQUENCE	AFFECTED	MITIGATION MEASURES
		P	I	R			
Buried utilities	Disruption	4	3	12	Unexpected utility exposed during excavations. Cutting modification/construction may lead to restricted access to utility provider.	Proposed works.	Confirm status of all utilities – undertake utilities search. Utility diversions / construction amendment. Consultation with United Utilities regarding sewer under proposed building footprint.
Settlement (buildings, bridge)	Soft ground, loose deposits present	4	4	16	Settlement of structures. Possible differential settlement.	Proposed works.	Allowance for risk item in construction and design life /maintenance costs. Adequate design. Piled foundation design.
Foundation failure (buildings, bridge)	Soft ground, loose deposits present	4	4	16	Failure of structure foundation.	Proposed works.	Allowance for risk item in construction and design life /maintenance costs. Conservative parameters used in analyses. Adequate design. Piled foundation design.
Concrete attack	High soluble sulphate	1	5	5	Reduction in concrete strength / structural damage.	Retaining wall / foundation materials.	Ground investigation undertaken and chemical classification undertaken to BRE SD1. Use appropriate concrete class required.

Material reuse	Limited cut and fill proposed	3	3	9	Disposal offsite.	Excavations.	Cut and fill design to minimise excavation. Chemical analysis for materials to be disposed of.
Groundwater contamination	Migration of contaminated water	3	3	9	Contamination of groundwater. Prosecution as a result of pollution event.	Proposed works and drainage.	High standard of construction practice on site. Adequate design.
Pavement Failure	Failure of pavement surface	2	4	8	Pavement requires replacement/ regular maintenance. Bus station movements affected.	Proposed works.	Conservative parameters used in analyses. Adequate design.

Conclusions and Recommendations

8 Conclusions and Recommendations

	Conclusions	Recommendations
Infrastructure	Potential contaminants which can impact water supply pipes have been identified in recovered samples.	- Once the location of water supply pipes has been confirmed, it is recommended that the potential risk and any necessary mitigation measures should be determined in accordance with the water supply company's risk assessment guidelines. Agreement with the local water supply company should be sought prior to placement of the pipes.
Ground Gas	- Elevated concentrations of ground gases have been recorded. The recorded levels are above published HSE Workplace Exposure Limits. - Elevated concentrations of ground gases have been recorded. The gas screening values indicate the site is representative of Characteristic Situation 2.	- Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to ground gas through appropriate health and safety risk assessment processes. Furthermore any confined space working should be undertaken in accordance with the confined space regulations. Gas protection measures appropriate to the proposed development and Characteristic Situation should be implemented within the design as specified in CIRIA Report C665 (2007)) 'Assessing risks posed by hazardous ground gases to buildings' and BS8485 'Code of practice for the characterisation and remediation from ground gas in affected developments'.
Human Health	- It is considered that future site users will generally not be exposed to levels of contaminants considered to pose a risk to human health. - Construction and maintenance workers could encounter unidentified isolated areas of potentially impacted ground during the proposed development works.	- It is recommended that landscaped areas on Made Ground should be covered in an appropriate geo membrane and at least 600mm of clean topsoil to break any contaminant linkage. - Precautions should be taken to reduce the risk of exposure of construction and maintenance staff to contaminants through appropriate health and safety risk assessment processes, which are likely to require the adoption of appropriate health and safety measures such as adequate PPE and normal safe practices for on-site workers. - Material encountered that is considered to be potentially contaminated through visual or olfactory evidence, or different to that assessed in the ground investigation will require appropriate assessment to be undertaken to determine if remedial works are required. - It is recommended that during construction appropriate control measures are implemented in order to reduce the risk of off-site migration of

	Conclusions	Recommendations
		contaminants, in particular dust and surface water run off.
Surface Waters	- Elevated concentrations above the chosen Screening Values have been detected in both leachate testing and groundwater samples taken during the ground investigation.	- The risk to controlled waters from surface run-off and direct percolation is expected to occur primarily during the development phase. - Measures should be employed during construction to limit surface water run/off and percolation such as minimising soil exposure and covering of soil stockpiles. - Any water removed during excavation works should be tested and disposed of appropriately.
Suitability for Reuse	- It is understood that ground levels will remain generally unchanged and cut and fill across this site will be minimal. - An initial assessment of soil results to date suggests that material on site is unlikely to be classified as hazardous waste.	Materials encountered during the ground investigation may be reused on site providing that it is excavated and placed in a controlled manner as to not create any contaminant linkages. - Material encountered during construction works that is considered to be potentially contaminated through visual or olfactory evidence, or different to that assessed in the ground investigation will require chemical testing to confirm suitability for reuse.
Unforeseen Contamination	- Due to the historical use of the site and heterogeneous nature of the Made Ground there is the potential for significant hydrocarbon contamination to be present on the site.	A watching brief should be maintained on site and if identified suitable sampling and risk assessment will be required.
Waste Issues, Disposal of Material (Duty of Care, sustainability, waste acceptance criteria)	- Made Ground has been identified at the site. Excavated Made Ground may be considered to be a Controlled Waste by the Environment Agency.	- Any cut and fill works required at the site are likely to be considered to fall under the Environmental Permitting Regulations 2010 by the Environment Agency and may require an Environmental Permit. However, it may be possible to apply for a waste exemption under the Environmental Permitting Regulations. - Alternatively, it may be possible to re-use material on site under the CL:AIRE Code of Practice ‘The Definition of Waste: Development Industry Code of Practice (CL:AIRE 2011)’, if agreed with the Environment Agency. - Material encountered during construction works that is considered to be potentially contaminated through visual or olfactory evidence will require

	Conclusions	Recommendations
		chemical testing to confirm the waste classification. - If excavated, hazardous material should either be treated on site for re-use or should be removed from site and taken to a suitable licensed receiving facility. All waste classifications should be confirmed by the receiving facility.
Foundations & Floor Slabs	- Both shallow and piled foundation solutions may be considered for the proposed structures on site. Foundation selection will depend on design loads, foundation geometry and structural tolerance to total and differential settlement. - Presumed bearing values of the order 300kPa are suggested for shallow foundations bearing with the natural glacial sand and gravels soils below any made ground and below the depth of effect of variations due to vegetation, seasonal and climatic changes. - Piled foundations may be considered for heavy structures and/or to minimise size and number of discrete spread foundations. Piles may derive capacity from a combination of skin friction and end bearing in the superficial soils. Pile diameters and lengths will be dictated by design loads and third party requirements. Non displacement, bored cast in situ concrete piles or small displacement driven steel systems are likely to provide optimum performance. - The results indicate that the Glacial Clay deposits typically have a low potential for volume change.	- If piling is considered, advice should be obtained from a specialist piling contractor. - If any soft, loose or deleterious deposits are encountered at formation level, these should be removed and backfilled with suitable engineered fill or mass concrete. - The use of ground bearing floor slabs will require the removal of existing topsoil, Made Ground, and soft clay deposits and its replacement to proposed formation levels with suitably engineered selected granular fills placed to an end product specification.
Excavations & Earthworks	- Significant earthworks are not proposed.	- All excavations should be battered back to a safe angle as determined on site or be provided with close/continuous support. - If earthworks are proposed it is recommended that slope stability analyses are undertaken at detailed design stage to establish maximum permissible slope angles.

	Conclusions	Recommendations
Infrastructure	- Levels of Sulphate and pH which can aggressively attack concrete have not been identified at the site.	- A Design Sulphate Class of DS-1 and ACEC Classification of AC-1 are recommended for concrete structural elements in contact with the Made Ground and Glacial deposits.
United Utilities Sewer	- A United Utilities' sewer is to underlie the proposed Stockport Interchange building footprint. The sewer was encountered in BH107 at 7.5m bgl, with Sherwood Sandstone bedrock encountered at 4.0m bgl. - Approval from United Utilities will be required to confirm the proposed building does not affect their asset.	- The sewer is located over 3m below the bedrock surface in BH107. A condition survey and position/level survey should also be undertaken of the sewer to confirm its depth and location. - Lightly loaded structures may be supported above the sewer, subject to detailed design. Approval from United Utilities will be required.

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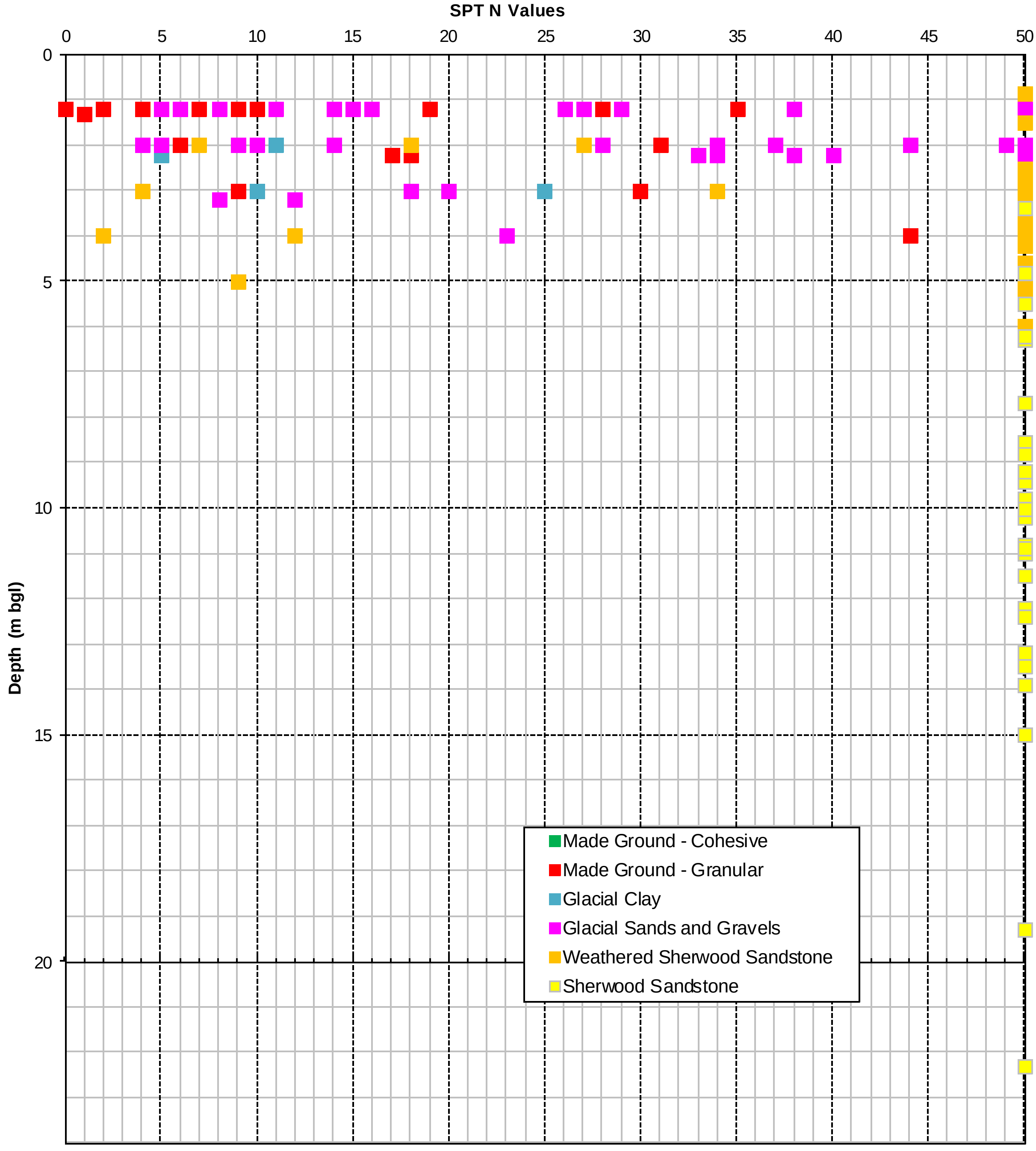
Figures



PROJECT TITLE:- **Stockport Bus Station**	ORIGINATOR:- AECOM
SKETCH / FIG TITLE:- SPT N Values versus depth Made Ground, Glacial Clay, Glacial Sand and Gravels and Sherwood Sandstone	SKETCH / FIG No.:- Figure 1 DATE:- Mar-16

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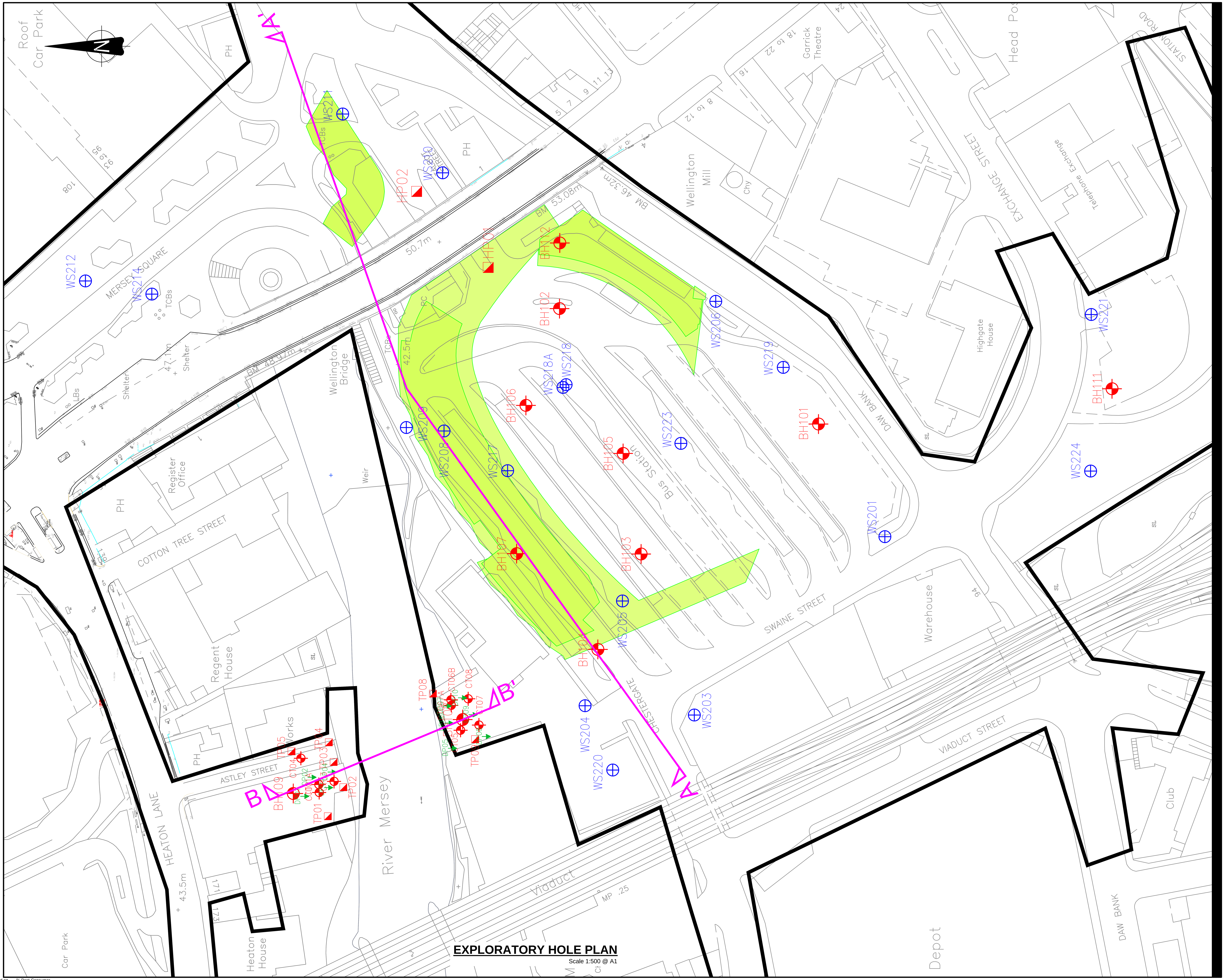
Drawings



EXPLORATORY HOLE PLAN

Scale 1:500 @ A1

Project Management Initials: Designer: RPA Checked: DCG Approved: MdK ISO A1 594mm x 841mm

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AECOM
1 NEW YORK STREET
MANCHESTER, M1 4HDA
+44 (0) 161 601 1700 tel
+44 (0) 161 601 1799 fax
www.aecom.com

ARCHITECTS

AHR
AHR Architects Ltd
7 Brewery Place
Brewery Wharf
Leeds LS10 1NE
T +44(0)113 385 8787
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6. EXPLORATORY HOLE LOCATIONS TAKEN FROM DRAFT FACTUAL REPORT PREPARED BY GEOTECHNICS LTD ON STOCKPORT BUS STATION, REF PN153428, DATED FEBRUARY 2016.

KEY

BH104	BOREHOLE
WS220	WINDOW SAMPLE
TP09	TRIAL PIT
HP02	HAND DUG PIT
DP08	DYNAMIC PROBE
	EXTENTS OF PROPOSED BUILDING
	EXTENTS OF PROPOSED ROOF
A A'	GEOLOGICAL SECTIONLINE

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	MAR 2016	FIRST ISSUE

PROJECT NUMBER

60340298

SHEET TITLE

EXPLORATORY HOLE LOCATION PLAN

SHEET NUMBER

60340298-ACM-00-GEO-DR-0001 P01

ISO A1 594mm x 841mm

Approved: MdK

Checked: DCG

Designer: RPA

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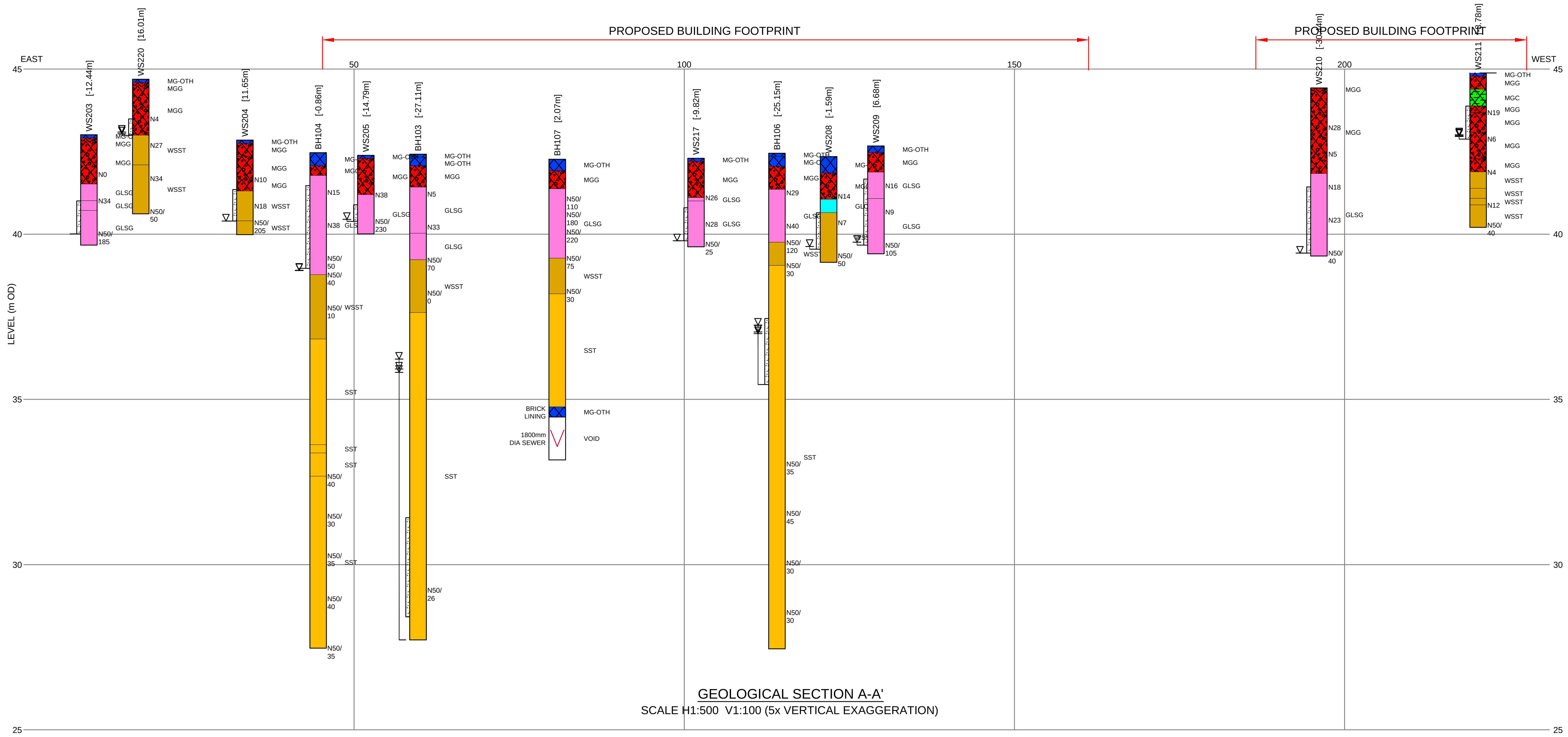
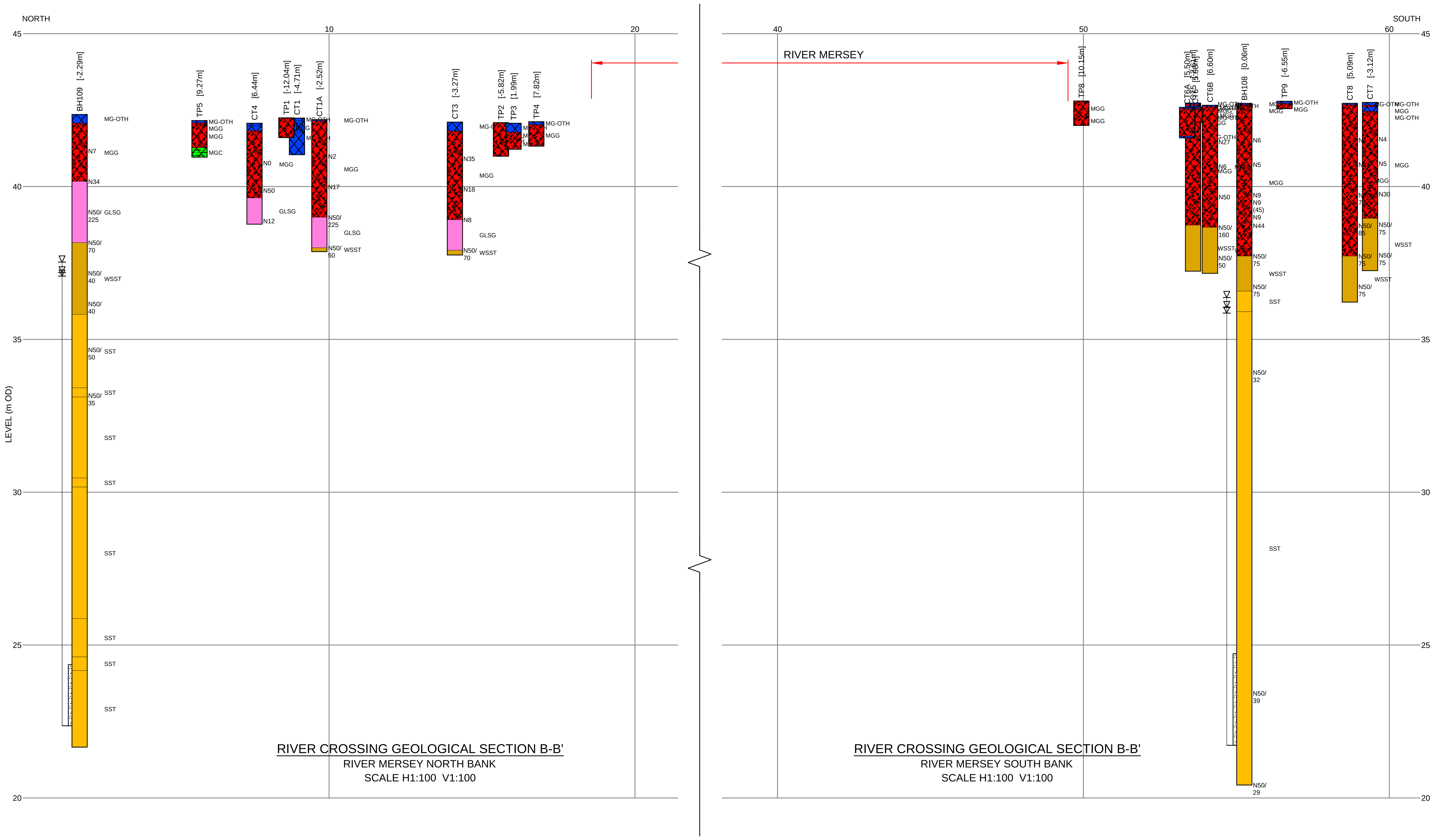


GEOLOGICAL SECTION A-A'
SCALE H1:500 V1:100 (5x VERTICAL EXAGGERATION)



RIVER CROSSING GEOLOGICAL SECTION B-B'
RIVER MERSEY NORTH BANK
SCALE H1:100 V1:100

RIVER CROSSING GEOLOGICAL SECTION B-B'
RIVER MERSEY SOUTH BANK
SCALE H1:100 V1:100

GEOLOGICAL STRATA KEY

MGG	MADE GROUND - GRANULAR
MGC	MADE GROUND - COHESIVE
MG-OTH	MADE GROUND - OTHER (TARMAC, CONCRETE ETC)
ALC	ALLUVIAL CLAY
GLC	GLACIAL TILL
GLSG	GLACIAL SAND & GRAVEL
SST	SHERWOOD SANDSTONE
WSST	WEATHERED SHERWOOD SANDSTONE
BH106 [11.3M]	HOLE ID AND PERPENDICULAR DISTANCE FROM SECTION LINE
N9	SPT N VALUE
(34)	U(100) BLOWS
	RESPONSE ZONE, PIEZO TIP AND MAXIMUM WATER LEVEL MONITORED
	WATER STRIKE & RISE LEVEL

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CONSULTANT

AECOM
1 NEW YORK STREET
MANCHESTER, M1 4HDA
+44 (0) 161 601 1700 tel
+44 (0) 161 601 1799 fax
www.aecom.com

ARCHITECTS

AHR

AHR Architects Ltd
7 Brewery Place
Brewery Wharf
Leeds LS10 1NE

T +44(0)113 385 8787
www.ahr-global.com

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	MAR 2016	FIRST ISSUE

PROJECT NUMBER

60340298

SHEET TITLE

GROUND INVESTIGATION REPORT
GEOLOGICAL SECTIONS A - A' AND B - B'

SHEET NUMBER

60340298-ACM-00-GEO-DR-0002 P01

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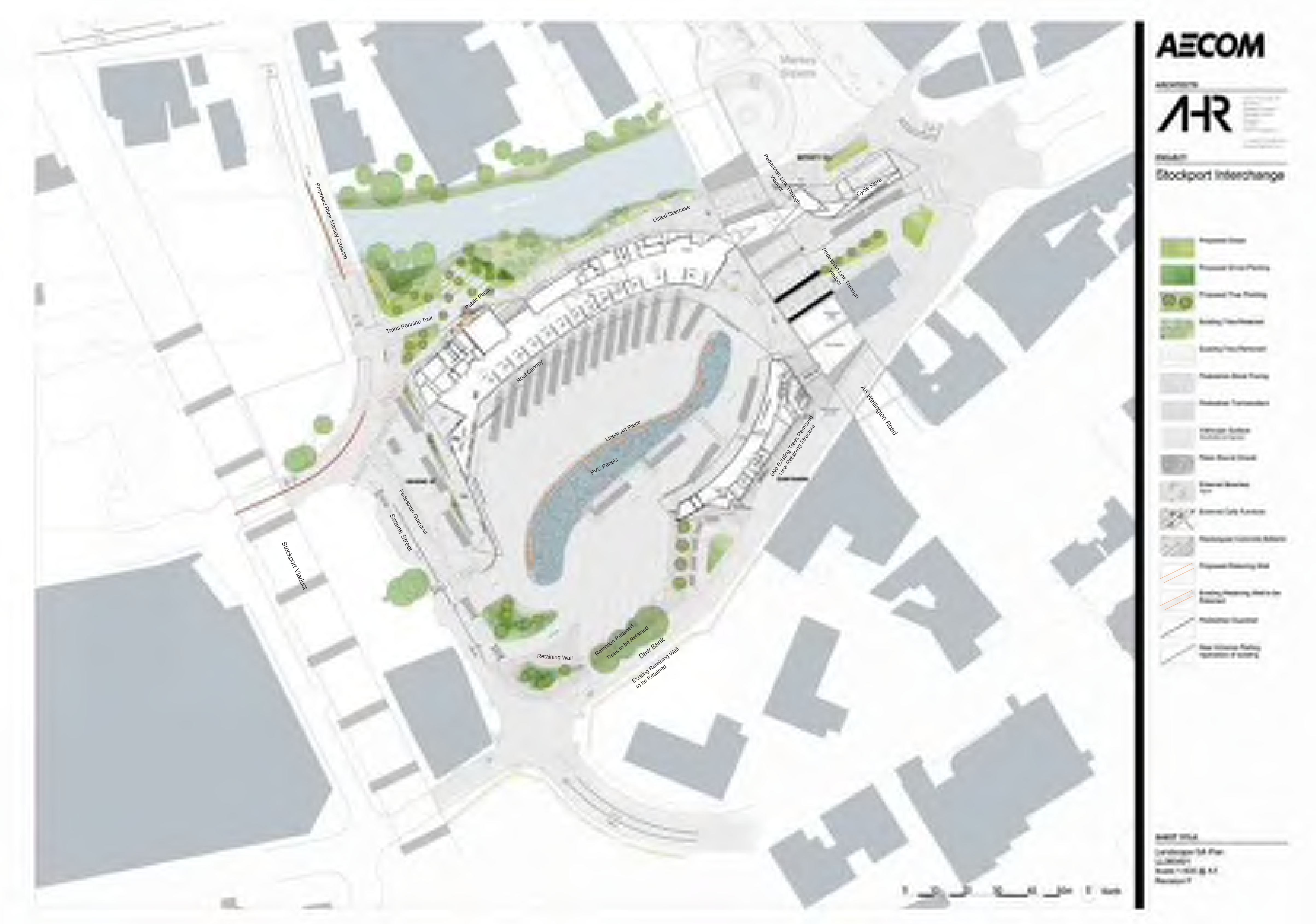
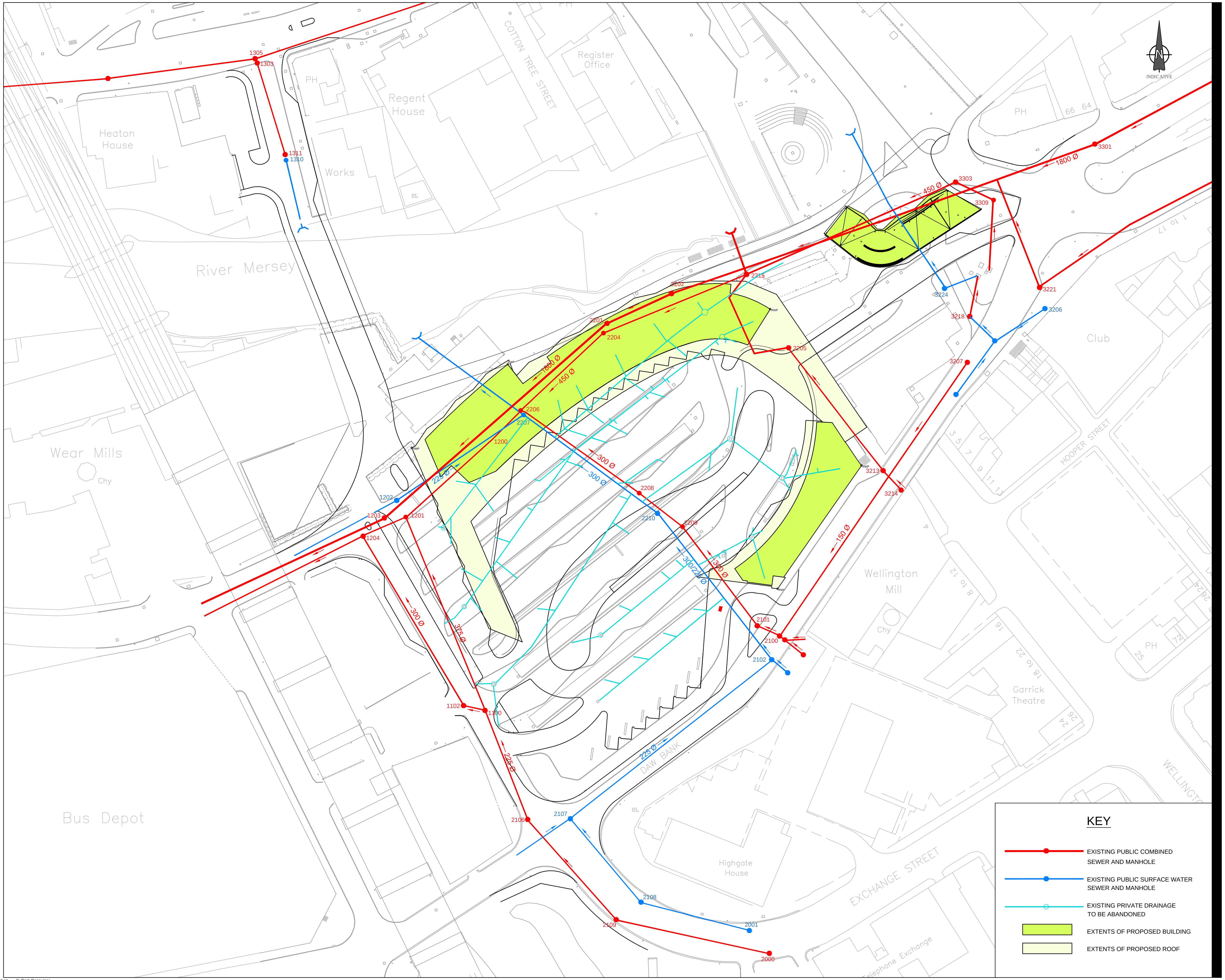
Appendix A- Proposed Site Layout

Landscape DWGs



LL (90)001 Site Plan



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AECOM
1 NEW YORK STREET
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+44 (0) 161 601 1700 tel
+44 (0) 161 601 1799 fax
www.aecom.com

ARCHITECTS

AHR Architects Ltd
7 Brewery Place
Brewery Wharf
Leeds LS10 1NE

T +44(0)113 385 8787
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Appendix B – Legislative Framework for Land Contamination Risk Assessment

Guidance on AECOM's Approach to Contaminated Land Risk Assessment

Legislative Framework

The Contaminated Land Regime in Part IIA of the Environment Protection Act 1990 was introduced to specifically address the historical legacy of land contamination. Part IIA of the Environmental Protection Act 1990 (Amended April 2012) has introduced the following statutory definition for 'Contaminated Land':

'any land which appears to the local authority in whose area it is situated to be in such a condition by reason of substances in, on, or under the land, that:

(a) significant harm is being caused or there is significant possibility of such harm being caused; or

(b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.

The Process of Risk Assessment

The assessment of contaminated land can be seen as a two phase risk based process, comprising:

(1) A qualitative assessment of the likelihood of plausible contaminant linkages, i.e. there must not only be a source of contamination, but a pathway and a receptor; and

(2) A quantitative element which will seek to determine the degree of harm and the significance of such harm on a receptor.

A 'contaminant' is a substance which is in, on or under the land and which has the potential to cause significant harm to a receptor or to cause significant pollution of controlled waters.

A 'pathway' is a route by which a receptor is or might be affected by a contaminant.

A 'receptor' is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property or controlled waters.

The term 'contaminant linkage' indicates that all three elements (i.e. a contaminant, a pathway and a receptor) have been identified. The term 'significant contaminant linkage' means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as Contaminated Land. The term 'significant contaminant' means the contaminant which forms part of a significant contaminant linkage.

Significant Harm to Human Health

The following health effects constitute significant harm: death, life threatening diseases (cancers), other diseases likely to have a serious impact on health, serious injury, birth defects and impairment of reproductive functions.

Significant Possibility of Significant Harm to Human Health

In deciding whether or not land is Contaminated Land on the grounds of significant possibility of significant harm to human health, the local authority use the following categorisations:

Category 1: Human Health

Land should be deemed to be a Category 1: Human Health case where:

(a) the authority is aware that similar land or situations are known, or are strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom or elsewhere; or

(b) the authority is aware that similar degrees of exposure (via any medium) to the contaminant(s) in question are known, or strongly suspected on the basis of robust evidence, to have caused such harm before in the United Kingdom, or elsewhere;

(c) the authority considers that significant harm may already have been caused by contaminants in, on or under land, and that there is an unacceptable risk that it may continue or occur again if no action is taken.

Category 2: Human Health

Land should be placed into Category 2 if the authority concludes, on the basis that there is a strong case for considering that the risks from the land are of sufficient concern, that the land poses a significant possibility of significant harm. Category 2 may include land where there is little or no direct evidence that similar land, situations or levels of exposure have caused harm before, but nonetheless the authority considers on the basis of the available evidence, including expert opinion, that there is a strong case for taking action under Part 2A on a precautionary basis.

Category 3: Human Health

Land should be place into Category 3 if the authority concludes that the strong case of Category 2 does not exist. Category 3 may include land where risks are not low, but nonetheless the authority considers that regulatory intervention under Part 2A is not warranted. This recognises that placing land in Category 3 would not stop others, such as the owner or occupier of the land, from taking action to reduce risks outside of the Part 2A regime if they choose.

Category 4: Human Health

The local authority should consider that the following types of land should be placed into Category 4: Human Health:

(a) Land where no relevant contaminant linkage has been established.

(b) Land where there are only normal levels of contaminants in the soil.

(c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed generic assessment criteria.

(d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

“Normal” Presence of Contaminants

“Normal” levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is particular reason to consider otherwise. “Normal” levels of contaminants in soils may result from:

(a) The natural presence of contaminants (e.g. caused by underlying geology) at levels that might reasonably be considered typical in an area and have not been shown to pose an unacceptable risk.

(b) The presence of contaminants caused by low level diffuse pollution, and common human activity. For example, this would include diffuse pollution from historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts and the spreading of domestic ash in gardens that might reasonably be considered typical.

Significant Pollution of Controlled Waters

Pollution of controlled water means the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter. The term ‘controlled water’ is as defined in Part 3 of the Water Resources Act 1991, except that ground waters does not include waters contained in underground strata but above the saturation zone (i.e. perched water).

The following criteria are used to establish whether significant pollution of controlled waters has occurred:

(a) Pollution equivalent to “environmental damage” to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009.

(b) Inputs resulting in the deterioration of the quality of water abstracted, or intended to be used in the future.

(c) A breach of a statutory surface water Environmental Quality Standard, either directly or via a groundwater pathway.

(d) Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants.

The following categories are adopted in relation to determining the significant possibility of significant pollution of controlled waters.

Category 1: Water

This covers land where the authority considers that there is a strong and compelling case for considering that a significant possibility of significant pollution of controlled waters exists. In particular, this would include cases where there is robust science-based evidence for considering that it is likely that high impact pollution would occur if nothing were done to stop it.

Category 2: Water

This covers land where:

(a) The authority considers the strength of evidence to put the land into Category 1 does not exist; but

(b) Nonetheless, on the basis of the available scientific evidence and expert option, the authority considers that the risks posed by the land are of sufficient concern that the land should be considered to pose a significant possibility of significant pollution of controlled waters on a precautionary basis, with all that this might involve (e.g. likely remediation requirements, and the benefits, costs and other impacts of regulatory intervention). Among other things, this category might include land where there is a relatively low likelihood that the most serious types of significant pollution might occur.

Category 3: Water

This covers land where the authority concludes that the risks are such that (whilst the authority and others might prefer they did not exist) the tests set out in Categories 1 and 2 are not met, and therefore regulatory intervention under Part 2A is not warranted. This category should include land where the authority considers that it is very unlikely that serious pollution would occur; or where there is a low likelihood that less serious types of significant pollution might occur.

Category 4: Water

This covers land where the authority concludes that there is no risk, or that the level of risk posed is low. In particular, the authority should consider that this is the case where:

(a) No contaminant linkage has been established in which controlled waters are the receptor in the linkage; or

(b) the possibility only relates to type of pollution that should not be considered to be significant pollution; or

(c) The possibility of water pollution similar to that which might be caused by “background” contamination.

Terminology

The term ‘Contaminated Land’ is used to mean land which meets the Part IIA definition. Other terms, such as ‘land affected by contamination’ or ‘land contamination’ are used to describe much broader categories of land where contaminants are present but usually not at sufficient level of risk to be Contaminated Land.

Planning Policy and Land Contamination

The National Planning Policy Framework has replaced Planning Policy Statement PPS23: Planning and Pollution Control.

The key parts of the policy specifically relating to soils, geology and contamination are summarised below.

Taken from the section **11 Conserving and enhancing the natural environment**

109. The planning system should contribute to and enhance the natural and local environment by:

- *protecting and enhancing valued landscapes, geological conservation interests and soils;*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

111. Planning policies and decisions should encourage the effective use of land by re-using land that has been previously developed (brownfield land), provided that it is not of high environmental value. Local planning authorities may continue to consider the case for setting a locally appropriate target for the use of brownfield land.

120. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

121. Planning policies and decisions should also ensure that:

- *the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
- *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- *adequate site investigation information*, prepared by a competent person, is presented.*

*Site investigation information: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with established procedures (such as BS10175 (2011) Code of Practice for the Investigation of Potentially Contaminated Sites). The minimum information that should be provided by an applicant is the report of a desk study and site reconnaissance.

AECOM's Approach to Screening for Land Affected by Contamination

For a typical ground contamination assessment, principally for planning, AECOM has adopted the following approach to evaluate the results obtained in the investigation.

Where no current UK guideline values are available, professional expertise within AECOM has been used to assess the extent of contamination.

Human Health Risk Assessment

The potential chronic risks to human health have been assessed by comparing the recorded concentrations of contaminants against AECOM Generic Assessment Criteria (AGAC), as an initial screen.

AGAC Generic Screening Values – Modelling Assumptions

1. Calculated Risk Levels

AGACs are calculated for a minimal level of risk in line with SGVs with the current exception of arsenic, which follows alternative SGV guidance. Therefore concentrations found below AGACs are not normally considered any further. However when process based remediation is being considered it would be advantageous to reduce concentrations of index chemicals to a practical minimum. SGVs may sometimes be calculated at an acceptable level of risk which is higher than a minimal risk level. One example of this is the SGV for Arsenic: in order to keep the SGV on a par with standards for water, the oral human health criterion has been based on the UK Drinking Water Standard, which results in a higher SGV for arsenic than would otherwise be indicated.

2. Soil Guideline Values and soil type

SGVs have been reproduced using CLEA1.04 software using the assumptions in the corresponding TOX and SGV reports. However, SGVs have been calculated using a SOM of 6% which is not generally representative of contamination samples taken from development sites. AGACs for chemicals with SGVs have been recalculated with a SOM of 1%. The AGAC's are also calculated for a "sandy loam" rather than "sandy soil" as in the case of the withdrawn SGVs. AGACs are calculated for a sandy soil in order to ensure they are conservative as an initial screen. If AGAC's are exceeded it may be appropriate to recalculate a more site specific GAC based on different soil properties. As new SGVs are issued it is likely that AGACs will need to be revised in light of the revised TOX and SGV reports. AGAC's will also be reviewed as other authoritative peer-reviewed toxicological or chemical data becomes available.

3. Verification and Robustness

In order to have confidence in the screening values produced initially the CLEA 1.04 model was used to reproduce the newly published but limited number of SGVs. Further cross checking has been undertaken on the values generated by the CLEA 1.04 model by comparing the results against values produced by our in-house software program FM-CLaRAT. AECOM is a contributor to the LQM CIEH and EIC working groups who are seeking to publish authoritative peer reviewed screening values for contaminants which currently do not have SGV's. Consequently the invaluable knowledge about the limitations of the model and how it works gained as part of this process has been utilised fully in producing the AGAC. Details of sensitivity analyses undertaken in connection with land use scenarios are described below. It is noted that CLEA 1.05 was released in 2009 with primarily cosmetic changes and the addition of dioxins and dioxin-like PCBs, the release of which resulted in the existing published SGVs being withdrawn. CLEA 1.05 was almost immediately superseded by CLEA 1.06, the only change being the password. Consequently the AGACs produced using CLEA 1.04 (which do not include values for dioxins and dioxin-like PCBs) are still considered valid as an initial screen.

4. Receptor characteristics

AGAC's are calculated for standard CLEA land use receptors as follows:

Land Use	*Standard Receptor*
Residential with homegrown produce	Female 0-6yrs
Residential without homegrown produce	Female 0-6yrs
Industrial/Commercial	Female 16-65yrs

5. Assumptions for buildings

Contamination is assumed to be at a depth of 65cm below ground level underneath buildings and at surface level external to buildings in line with assumptions for SGVs.

Default gas ingress rates and effective air permeability are also assumed for each building type.

Residential

A sensitivity study of CLEA1.04 residential building types has been carried out to determine the most appropriate setting for calculation of screening values. It transpires that the most sensitive residential building type by a significant margin is a bungalow. The building type used for SGVs is a small terraced house which is not too unusual for high density low cost housing on brownfield sites. The building type used for AGACs is small terraced house in order to avoid too high a degree of conservatism for most developments. It is considered that for this site the selected building type is appropriate.

Commercial and industrial

SGVs and AGAC's are appropriate for screening chemical concentrations for the purpose of obtaining Planning Consent, but are not appropriate for Part IIa determination. A sensitivity study of standard CLEA1.04 commercial and industrial buildings indicates that pre-1970s buildings are more sensitive to contamination than modern buildings. For Planning purposes however it is more appropriate to model risk in modern buildings and so AGACs are based on a post- 1970 office, which is generally slightly more sensitive than a post- 1970 warehouse.

6. Indoor vapour pathway correction factor

Calculation of petroleum hydrocarbon ingress to buildings utilises a "sub-surface soil to indoor air correction factor" of 10 in line with DEFRA guidance on BTEX SGVs. This correction arises from a discrepancy found between observed and predicted hydrocarbon concentrations using the Johnson-Ettinger model in the UK. It is found that indoor concentrations of hydrocarbons are typically at least an order of magnitude lower in practice compared with theory. As it is uncertain whether this discrepancy is due to a difference in the typical foundation design employed in the UK and USA, or results from chemical specific attenuation of contaminants through breakdown, this factor is not included for other species, e.g. elemental mercury and chlorinated hydrocarbons.

7. Soil vapour limit

Risk to human health from soil vapour calculated by CLEA1.04 rises linearly with increasing soil concentration despite the physical limits to concentration in air set by the maximum vapour pressure. A manual procedure has been used to calculate the allowable intake for non-vapour pathways at the limiting soil concentration. The AGAC is calculated to be the soil concentration resulting in the allowable intake for non-vapour pathways. Calculations have been cross-checked with FM-CLaRAT which corrects for soil vapour limit automatically.

8. Saturation limit

Plant uptake may be limited by the concentration of the chemical in the soil pore water. Calculation of GACs using the saturation limit would be a laborious task especially where vapour pressure also limits uptake. Given that plant uptake is only present in one of the current

AECOM scenarios and the reservations expressed by the EA as to whether saturation is always limiting, the current AGACs do not apply an upper limit to plant uptake based on saturation limit. This will be a further option to consider for a more detailed analysis if the initial screen is failed. FMCLaRAT checks have been performed without using the saturation limit in order to maintain consistency with CLEA1.04.

9. Free-phase hydrocarbon limit

SGVs for BTEX compounds have been limited by DEFRA to the limiting upper soil concentration for solubility or maximum vapour pressure, whichever is the lower. Although the reason given for capping SGVs is for protection of human health, no mechanism is elucidated for the increased risk from free-phase hydrocarbons. Heavy hydrocarbons are relatively insoluble and so general adoption of this rule would result in very low GAC values, despite the free-phase being immobile, e.g. solid or bound within the soil particles. Therefore AGAC values have with the exception of BTEX been calculated without this free-phase constraint. If the soil contains a free-phase, consideration should be given as to whether this is acceptable based on human health, ecological, hydrological and aesthetic criteria.

10. Nickel screening values

DEFRA guidance for nickel suggests that risk via inhalation and oral pathways is not additive. AGAC for nickel uses the lower of the inhalation and oral assessment criteria in accordance with the nickel SGV methodology.

11. Asbestos, VOCs, SVOCs and PCBs

The analytical detection limit for PCBs, VOCs and sVOCs has been adopted as an initial screen. The presence of asbestos fibres identified within any of the samples has been adopted as a screen for assessing asbestos.

12. Cyanide

The current CLEA methodology only assesses the chronic risks to human health. Cyanide may also post an acute risk to human health. Where cyanide is present above the detection limit then the risk will be considered on a site specific basis.

Statistical Analysis of Data

Statistical assessment of soil data has been undertaken (where appropriate) in accordance with guidance provided by CL:AIRE/CIEH, Guidance on Comparing Soil Contamination Data with a Critical Concentration, May 2008. This assessment was undertaken using a propriety software package developed by ESI.

Guidelines for the Assessment of Contamination in Groundwater

The assessment of contamination in groundwater is based on a site-specific approach to assessment and remediation, as outlined in the Environment Agency's (2006) guidance 'Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination'. The EA guidance is based on a risk assessment approach incorporating a contaminant-pathway-receptor analysis. The methodology adopts a tiered approach to determine risk-based remedial targets, involving structured decision-making, cost-benefit considerations and progressive data collection and analysis.

At each level a remedial target is derived, but this is likely to be less onerous at the next level as additional processes (such as dilution and attenuation, degradation) which affect contaminant concentrations along its pathway to the receptor are taken in to account. With successive levels, the data requirements and the sophistication of the analysis increase, and the confidence in the predicted impact also increases. Consequently, the contaminant-pathway-receptor relationship is better defined and remedial requirements are likely to be less onerous, if the risk assessment results are favourable. The tiered approach allows low risk sites to be screened out and attention is focussed on those sites where the risks to water are greatest.

Ground Gas Risk Assessment

The assessment of risk from the presence of ground gas takes account of the nature of the identified gas/vapour, its concentration in air, and its borehole flow rate in litres per hour. The data is used to produce a gas screening value which is then used to assess the need or otherwise for gas protection measures. In addition the raw data may be used to assess the short term risk of harm to human health or explosive risk to buildings or other built environment.

The assessment of ground gas contamination is based on the following good practice guidance documents and standards:

- British Standards Institution, 2007. BS8485:2007 Code of practice for characterisation and remediation from ground gas in affected developments. London: BSI.

- Building Regulations, 2010.). Approved Document C - Site preparation, resistance to contaminates and moisture, 2004 edition, incorporating 2010 amendments.

- Environment Agency, 2004. Guidance on the management of landfill gas, Landfill Technical Guidance Note (LFTGN) 03. Bristol: Environment Agency.;

- Building Research Establishment (1991). Construction of new buildings on gas-contaminated land, Report 212. Watford: BRE.;

- CIRIA (2007). Assessing risks posed by hazardous ground gases to buildings, Publication C665. London: CIRIA;

- CIRIA (2009). VOCs handbook: investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination, Publication C682. London: CIRIA.

- CIRIA (1995). Protecting development from methane: Methane and associated hazards to construction, Report R 149. London: CIRIA.

- Wilson, S., Card, G., and Haines, S., (2009). Ground gas handbook. London: Whittles Publishing.

Guidance for the selection of typical gas protection measures are provided in some of the above and the following documents:

- Ove Arup & Partners, 1996. Vols I&II, Passive Venting of Soil Gases beneath Buildings Research Report, Design Guide, Partners in Technology;

- Building Research Establishment (1991). Construction of new buildings on gas-contaminated land, Report 212. Watford: BRE.;

After CIRIA document 552: 'Contaminated Land Risk Assessment; A Guide to good practice'.

Table 1: Classification of Consequence

Classification	Definition
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined in the Environmental Protection Act, Part IIA. Short-term risk of pollution of sensitive water resource (note: Water Resources Act contains no scope for considering significance of pollution). Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000)
Medium	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act 1991 contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem. (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000)
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the Draft Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/services or the environment
Minor	Harm, although not necessarily significant, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.). Easily repairable effects of damage to buildings, structures and services.

Table 2: Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 3: Comparison of Consequence against Probability

Probability	Consequence			
	Severe	**Medium**	**Mild**	**Minor**
High Likelihood	Very High Risk	High risk	Moderate risk	Moderate Risk/low risk
Likely	High Risk	Moderate risk	Moderate/ low risk	Low risk
Low Likelihood	Moderate risk	Moderate risk/low risk	Low risk	Very low risk
Unlikely	Moderate/Low risk	Low risk	Very low risk	Very low risk

Table 4: Description of Classified Risks and Likely Actions Required

Risk Descriptor	Definition
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to the designated receptor is currently happening. The risk, if realised, is likely to result in substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required
High risk	Harm is likely to arise to a designated receptor from an identified hazard. The risk, if realised, is likely to result in substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely in the long term.
Moderate Risk	It is possible that harm could arise to a designated receptor for an identified hazard. However, if it is either unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk, and to determine the potential liability. Some remedial works may be required in the long term.
Low Risk	It is possible that harm could arise to a designated receptor for an identified hazard, but it is likely that this harm, if realised, would at worst be mild
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Appendix C – Ground Investigation Factual Report

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STOCKPORT BUS STATION

Factual Report

for
Transport for Greater Manchester

Engineer : AECOM

Project Number PN153428

March 2016

Issuing Office
North West Office
The Geotechnical Centre
Unit 1, Borders Industrial Park
River Lane, Saltney
Chester
CH4 8RJ
Tel: 01244 671117
mail@chester.geotechnics.co.uk

Head Office
The Geotechnical Centre
203 Torrington Avenue
Tile Hill
Coventry
CV4 9UT
Tel: 02476 694664
mail@geotechnics.co.uk

South West Office
The Geotechnical Centre
7 Pinbrook Units
Venny Bridge
Exeter
EX4 8JQ
Tel: 01392 463110
mail@exeter.geotechnics.co.uk

North East Office
The Geotechnical Centre
Unit 1, Bypass Park Estate
Sherburn-in-Elmet
Leeds
LS25 6EP
Tel: 01977 525030
mail@yorkshire.geotechnics.co.uk

Geotechnics Limited, Registered in England No. 1757790 at 203 Torrington Avenue, Tile Hill, Coventry CV4 9UT

Factual Report

STOCKPORT BUS STATION
for
Transport for Greater Manchester

Engineer :
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Project No:
PN153428
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APPENDICES

STOCKPORT BUS STATION

1.0 INTRODUCTION

A geotechnical and geo-environmental investigation was undertaken by Geotechnics Limited at the site of proposed redevelopment works at Stockport Bus Station. The investigation was carried out to the instructions of the Engineer, AECOM on behalf of the Client, Transport for Greater Manchester. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The investigation comprised cable percussive boreholes, rotary follow-on boreholes, dynamic sample boreholes, trial pits, dynamic probes and concrete core holes, in situ and laboratory testing and reporting. A Factual Report only was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 13 of this report. Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 14 to aid an understanding of the procedures followed and the context in which the report should be read.

In addition, data in electronic format in accordance with "The Electronic Transfer of Geotechnical Data from Ground Investigations" (Fourth Edition) published by the AGS (the AGS Format) are presented separately on disk together with a copy of the report in electronic PDF format.

4.0 THE SITE

4.1 Location

The site is located in Stockport town centre, extending from Stockport Railway Station northwards to Heaton Lane and from the railway viaduct eastwards to Mersey Square. The approximate Ordnance Survey National Grid Reference for the centre of the site is SJ 892 902 and an extract from the relevant 1:50,000 Scale O.S. Map is included as Appendix 1.

4.2 Description

The site is irregular in shape with maximum dimensions of approximately 350m (north-west to south-east) and 250m (north-east to south-west). The River Mersey flows through the northernmost part of the site from east to west. Ground levels across the site generally fall towards the river, such that levels fall from around 68m AOD at the southern boundary (railway station/Station Road) to around 42m AOD on the banks of the River Mersey before rising again to around 45m AOD at the northern boundary (Heaton Road).

The majority of the site comprises Stockport Bus Station which remained operational at the time of the investigation fieldwork. Some warehouse and office buildings are present adjacent to the bus station. The A6 Wellington Road crosses the easternmost part of the site on a viaduct which trends roughly north-west to south-east. Beyond this viaduct lies the primarily hard landscaped public open space of Mersey Square. The River Mersey flows in culvert below Mersey Square.

To the south of the bus station the site includes the western section of Exchange Street and an area of landscaped ground and car park beyond. The River Mersey bounds the bus station to the north. Between the river and the northern site boundary

(Heaton Lane) the site includes an area of car park to the west of Astley Street.

It is understood that tunnels are present below part of the site. These are presumed to be former mill water race excavations through the rock extending from the site of existing and former mills to the River Mersey.

4.3 Site Geology

The 1:50,000 scale map of Stockport published by the British Geological Survey, Sheet 98 Drift edition dated 1962, shows the southernmost part of the site to be underlain by Glacial Till (shown on the map as Boulder Clay). Towards the River Mersey River Terrace Deposits are indicated (shown on the map as First Terrace) whilst beyond the river Fluvioglacial Sheet Deposits are indicated (shown on the map as Fluvioglacial Gravel).

The 1:50,000 Solid edition map (dated 1977) indicates that the site is underlain by rocks of the Chester Pebble Beds Formation, part of the Sherwood Sandstone Group of Triassic age. The conjectured trace of a north-north-west to south-south-east trending fault is shown approximately 100m to the west of the railway viaduct. The strata to the east of this fault are shown to be downthrown. The conjectured trace of a second fault is shown approximately 200m to the east of the site. This fault trends roughly parallel to the other fault and the strata to the east are again downthrown.

The British Geological Survey maps do not shown the presence of Made Ground below the site. However, Made Ground may be present for which the British Geological Survey have no records or which are too shallow for incorporation into the maps. Given historical land uses of this urban site, a thickness of Made Ground would be anticipated across the site.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Engineer for ground investigation of the site in accordance with the Client's requirements.

5.2 General

The procedures followed in this site investigation are based on *BS 5930:1999 + A2:2010 – Code of Practice for Site Investigations* and *BS 10175:2011 Investigation of Potentially Contaminated Sites*. The soils and rocks encountered have been described in accordance with BS5930:1999+A2:2010 and BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. The Cable Percussive/Rotary Borehole, Dynamic Sample Borehole, Trial Pit, Dynamic Probe and Concrete Core Records are included in Appendices 2 to 8 and their approximate positions are shown on the Exploratory Hole Location Plan in Appendix 13.

The Exploratory Hole locations were specified by the Engineer. The co-ordinates and levels shown on the Exploratory Hole Records were measured using a Leica GPS survey device. The depths quoted on the exploratory hole records are in metres below ground level.

At each exploratory hole location with the exception of the concrete cores an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT).

5.3 Boreholes

Twenty-one (21 No.), 150mm diameter boreholes (numbered BH101 to BH109, BH111, BH112, CT1, CT1A, CT3 to CT8, CT6A and CT6B) were sunk by Cable Percussion Tool techniques to depths varying between 0.50m (CT6) and 6.50m below ground level. The work was carried out between 30th November and 17th December 2015.

Representative disturbed (D and B) samples of the soils encountered were obtained at regular intervals. A driven open-tube thick-walled (U) sample was attempted but failed in borehole BH108. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata. In addition, environmental soil samples (ES) were recovered at the depths indicated on the Borehole Records, presented in Appendix 2.

Boreholes BH101 to BH109 and BH112 were continued by rotary coring techniques to depths varying between 7.80m (BH107) and 22.30m (BH108) below ground level. The rotary coring commenced through the base of the Cable Percussion Boreholes which had been left open and cased to facilitate coring, as instructed by the Engineer. This element of the work was carried out during the period between 1st and 17th December 2015.

The drilling equipment on this particular contract utilised water or polymer foam as the flushing medium. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Rock cores were extruded horizontally in transparent liners and placed into suitable core boxes. Photographs of the individual core boxes are included in Appendix 3.

Groundwater observations are included on the Borehole Records where appropriate. It should be noted that the addition of water to the borehole as part of the drilling process may have masked the presence of groundwater in the borehole. Where water was added it has been noted on the Borehole Records.

On completion, standpipes were installed in Boreholes BH101 to BH106, BH108, BH109 and BH112 (see Section 5.8). Borehole BH107 was terminated after encountering a brick sewer. The borehole casing was left in this borehole at the instruction of the asset holder and reinstated at the surface with a heavy duty flush cover. The other boreholes were backfilled with bentonite and the surface reinstated.

5.4 Trial Pits

Thirteen (13 No.) Trial Pits (numbered HP01, HP02, TP1 to TP5, TP6A, TP6B, TP7A, TP7B, TP8 and TP9) were excavated to depths varying between 0.24m (TP9) and 1.30m (TP7A) below ground level using hand tools. The work was carried out between 9th and 15th December 2015 and was supervised on site by a geotechnical engineer.

The profiles of strata or other features were recorded as excavation proceeded and measurements taken from ground level. Representative samples were taken, where appropriate, for laboratory examination and analysis and in addition, environmental soil samples (ES) were recovered at the depths indicated on the Trial Pit Records. Groundwater observations and trench stability notes are included on the Trial Pit Records, presented in Appendix 4. Photographs of the pits are presented in Appendix 5.

5.5 Dynamic Probes

Ten (10 No.) Dynamic Probe Holes (numbered DP1 to DP10) were undertaken at the site to depths varying between 3.45m (DP1) and 4.98m (DP10) below ground level using the super-heavy Dynamic Probe. The work was carried out on 16th and 17th December 2015.

The Probes were taken to the depths at which refusal was achieved for the equipment used. The equipment used conforms to the super heavy (DPSH-B) dynamic probing apparatus as defined in BS EN ISO 22476-2:2005+A1:2011 and effectively drives a 90° cone into the ground using a 63.5 kg automatic trip hammer falling over 750mm. The number of blows required to achieve increments of 100mm penetration is recorded and plotted graphically on the records, presented in Appendix 6.

5.6 Dynamic Sample Boreholes

Nineteen (19 No.) Dynamic Sample Boreholes (numbered WS201, WS203 to WS206, WS208 to WS212, WS214, WS217 to WS221, WS223, WS224 and WS218A) were undertaken at the site to depths varying between 0.30m (WS221) and 5.45m (WS214) below ground level. The work was carried out between 30th November and 16th December 2015.

The Dynamic Samples were taken using the super-heavy Dynamic Probe apparatus which drives lined steel tubes into the ground in 1m lengths. Samples are retrieved in the plastic liners. The hole is not cased and progress depends on the nature of the strata penetrated.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the Borehole Records where appropriate.

On completion, standpipes were installed in each of the boreholes except WS218, WS219, WS221 and WS224 (see Section 5.8). The other boreholes were backfilled with arisings/bentonite.

5.7 Concrete Cores

Ten (10 No.) concrete cores (numbered CC1 to CC6, CC8 to CC10 and CC5A) were carried out using a hand held coring apparatus to depths varying between 0.14m (CC1) and 0.71m (CC10) behind the face of wall. The cores were drilled horizontally. The cores were extracted from the core-barrel, photographed and logged.

The Concrete Core Records are presented in Appendix 8. Photographs of the concrete cores are presented in Appendix 9.

5.8 Instrumentation and Monitoring

Long-term monitoring of the gas and groundwater levels was made possible by the installation of standpipes as follows:

Exploratory Hole	Standpipe Slotted Pipe & Filter Zone (m)
BH101	5.00 to 7.00
BH102	8.00 to 10.00
BH103	11.00 to 14.00
BH104	1.00 to 3.50
BH105	9.50 to 12.00
BH106	5.00 to 7.00
BH108	18.00 to 21.00
BH109	18.00 to 20.00
BH112	12.80 to 14.80
WS201	3.50 to 4.00
WS203	2.00 to 3.00
WS204	1.50 to 2.45
WS205	1.50 to 2.00
WS206	1.00 to 2.00
WS208	1.70 to 2.80
WS209	1.00 to 3.00
WS210	3.00 to 5.00
WS211	1.00 to 2.00
WS212	2.50 to 3.50
WS214	0.50 to 1.00
WS217	1.50 to 2.50
WS218A	1.00 to 2.50
WS220	1.20 to 1.70
WS223	0.50 to 1.40

Monitoring of the gas and groundwater levels at the site commenced on 11th January 2016 with further visits on 25th January, 9th February, 22nd February and 8th March 2016. A sixth (final) monitoring visit is proposed for late March. The results of that monitoring will be issued as an Addendum.

On each of the water monitoring visits a record of the groundwater level in all the standpipes was obtained. On the 25th January visit where water was recorded, samples were obtained following purging of water in the standpipes.

In addition to the groundwater levels, the following parameters were measured and recorded in each standpipe using a Gas Data LMSxi Gas Analyser:-

- Concentrations (% Vol) of CH_4, O_2, CO_2, along with (% LEL) CH_4 and (ppm) H_2S, CO
- Flow Rate
- Barometric Pressure

The results of the monitoring are presented in Appendix 10.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was specified by the Engineer. Unless otherwise stated, the tests were carried out in Geotechnics Limited's UKAS accredited Laboratory (Testing No. 1365) and were undertaken in accordance with the appropriate Standards as indicated below and on the Laboratory Summary Sheets in Appendix 11. Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

BS EN ISO 17892-1:2014

	12 No.	Water Content Determination

BS 1377:1990

Test No.		**Test Description**
Part 2		
4.3 & 5.3	11 No.	Liquid and Plastic Limit Determination
9.2 & 9.3	11 No.	Mechanical Analysis – Wet Sieving
9.4	1 No.	Mechanical Analysis - Sedimentation
Part 4		
3.3	1 No.	Dry Density/Moisture Content relationship determination. Compaction Test - British Standard (2.5 kg Hammer)

ISRM Testing Methods

24 No. Point Load Determination

The following testing was carried out at the laboratories of Jones Environmental Laboratory Limited (UKAS Accredited Laboratory, No. 4225).

36 No. Organic Content Determination

BRE Special Digest 1 Suite

35 No. Suites comprising:-
Soluble Sulphate
Acid Soluble Sulphate
pH

The following testing was carried out at the laboratories of Celtest Limited (UKAS Accredited Laboratory, No. 0494).

ISRM Testing Methods

2 No. Point Load Determination

9 No. Unconfined Compressive Strength Determination

The results of these tests are also presented in Appendix 11.

6.2 Contamination

Selected samples of soil and groundwater were tested at the laboratories of Jones Environmental Laboratory Limited (UKAS Accredited Laboratory, No. 4225) for a number of determinands in order to check on potential site contamination. The determinands were specified by the Engineer. The specified determinands are detailed on the results sheets in Appendix 12 together with the test result as well as the test method, accreditation and detection limit.

Signed for and on behalf of Geotechnics Limited.

Prepared by: ....
Colin Dodd, BSc (Hons), MSc, CEng, MICE
Principal Engineer

Reviewed by:
John Knowles, BSc (Hons), PGCE, MSc, CGeol, FGS
Principal Engineer

APPENDIX 1

Site Location Plan

SITE LOCATION PLAN

STOCKPORT BUS STATION
for
Transport for Greater Manchester

APPENDIX 2

Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike

Depth Water Rose To

Instrumentation

Seal

Filter

Seal

Strata — Legend

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

Gravel

Sand

Silt

Clay

Peat

Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

Coal

Strata, Continued

Mudstone

Siltstone

Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

Igneous Rock

Fine Grained

Medium Grained

Coarse Grained

Backfill Materials

Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389243.3 E 390165.1 N
Borehole	BH101	Project No	PN153428
Ground Level	45.22 m OD	Scale	1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
							G.L.	45.22
0.00	C					MADE GROUND: Grey concrete paving slab.	0.10	45.12
0.20- 0.40	D							
0.20- 0.40	ES					MADE GROUND: Grey concrete.	0.40	44.82
0.50- 0.70	D							
0.50- 0.70	ES					MADE GROUND: Reddish brown sandy angular to subangular fine to coarse gravel of limestone. Low angular to subangular cobble content of limestone. (Sub base).	0.70	44.52
1.00- 1.20	D						1.00	44.22
1.00- 1.20	ES					MADE GROUND: Light grey sandy angular to subangular fine to coarse gravel of limestone. Low angular to subangular cobble content of limestone. (Sub base).		
1.20- 1.65	B							
1.20- 1.65	D	(1.00)			S6		1.60	43.62
2.00- 2.20	D					Loose yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL including limestone, granite and quartzite. High rounded to subrounded cobble content. Below 1.20m, grading to very gravelly sand.		
2.00- 2.20	ES							
2.20- 2.65	B							
2.20- 2.65	D	2.20 (1.50)		23	S5	Firm thinly laminated grey sandy CLAY, locally grading to silt. At 2.20m, soft.		
3.00- 3.12	B						3.00	42.22
3.00- 3.12	D	3.00 (DRY)			S50/50	Weak dark red fine to medium grained SANDSTONE (recovered as gravelly sand).		
4.00- 4.06	#	4.00 (3.60)			C50/25		4.06	41.16

Continued by Rotary techniques

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	General	Detail
4.06- 4.80		0 0		0	(AZCL)	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal undulating smooth and clean.	
4.80- 6.30		30 9	0.07 0.01	0			
4.80- 4.84	4.00				C50/25		
					(NI)		
					(33)		
6.30- 7.80		66 44	0.13 0.01	9	(NI)		
6.40- 6.55		C			(44)		Below 6.80m, discontinuities are very closely to closely spaced.
6.30- 6.34	4.00				C50/20		
					(AZCL)		
					(25)		
					(NI)		
7.80- 9.30		84 69	0.26 0.03	48			Below 8.03m, discontinuities are planar to undulating.
7.80- 7.94		C			(AZCL)		
					(15)		
					(NI)		At 8.70m, subvertical discontinuity.
					(15)		
					(NI)		
					(13)		
9.30-10.80		52 45	0.20 0.05	41	(NI)		
					(66)		
					(AZCL)		

Boring

Depth	Dia	Technique	Crew
1.20	0.50	Inspection Pit	JP
4.06	0.15	Cable Percussion	JP
15.30	0.09	Rotary Core	PB

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			30/11/15	08:00
4.05	4.00	3.60	30/11/15	18:00
4.05	4.00		01/12/15	08:00
12.36	4.00	Added	01/12/15	18:00
12.36	4.00	Added	02/12/15	08:00
15.30	4.00	Added	02/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20					No rise.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 7.00m with a geowrapped slotted section from 5.00m to 7.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 7.00m, gravel filter up to 5.00m, bentonite seal up to 0.30m, concrete up to ground level.
Flush: 4.06-15.30m, Water, 70% returns.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by SG

Figure 1 of 2

11/03/2016

geotechnics

BOREHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH101
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389243.3 E 390165.1 N	Ground Level	45.22 m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(NI) (11)		Between 10.08m and 10.80m, some sand infill on discontinuities.			
10.80-12.30 10.80-10.85	4.00	0 0		0	C50/25 (AZCL)					
12.30-13.80 12.30-12.36	4.00	66 40	0.15 0.01	16	C50/35 (NI) (15)					
13.80-15.30		66 54	0.17 0.03	24	(NI) (AZCL) (13) (NI) (20)		Below 14.30m, discontinuities are closely spaced. Between 14.83m and 15.30m, discontinuities are very closely spaced.			
					(23)	End of Borehole		15.30		29.92

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by SG

Figure 2 of 2

11/03/2016

geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389276.7 E 390240.0 N
Borehole	BH102	Project No	PN153428
Ground Level	43.35 m OD	Scale	1:50

Sampling / Properties

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)
0.10- 0.15	B				
0.50	ES				
0.60- 0.80	B				
1.00	ES				
1.20- 1.70	B				
1.20- 1.65	D	(DRY)			S4
1.80	D				
2.00- 2.38	D	2.00 (DRY)			S50/ 225
2.00	ES				
2.80	D				
2.80- 3.03	D	2.80 (DRY)			S50/75
3.00- 3.50	B				
3.00- 3.15	D	3.00 (DRY)			S50/75
3.80	D				
4.00- 4.50	B				
4.00- 4.23	D	4.00 (DRY)			S50/75
5.00- 5.15	D	4.50 (DRY)			S50/75

Strata

Description	Depth	Level m OD
	G.L.	43.35
MADE GROUND: Grey concrete paving slabs.	0.10	43.25
MADE GROUND: Brown gravelly fine to medium sand. Gravel is subrounded to rounded fine to medium of sandstone, limestone and quartzite.	0.15	43.20
MADE GROUND: Grey reinforced concrete.	0.50	42.85
MADE GROUND: Brown sandy angular to subangular fine to coarse gravel of limestone. Low angular cobble content.		
MADE GROUND: Very loose/loose black sandy angular to subangular fine to coarse gravel of brick, concrete, ash and clinker. High angular cobble content.	1.20	42.15
Very dense yellowish brown sandy rounded to subrounded fine to coarse GRAVEL of limestone, sandstone, quartzite and granite. High rounded to subrounded cobble content.	2.00	41.35
Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.00	39.35
	5.15	38.20

Core Run (Continued by Rotary techniques)

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)
5.00- 5.54	5.00	96 / 68	0.22 / 0.01	22	(AZCL) (NI)
5.17- 5.26		C			(22)
5.54- 7.04	5.00	93 / 93	0.43 / 0.03	73	(AZCL) (7) (50) (7)
7.04- 8.54		58 / 29	0.21 / 0.01	13	(44) (AZCL) (NI) (50) (NI)
8.54- 9.54		0 / 0		0	(10) (19) (AZCL)
8.54- 8.60	4.00 (ADDED)				S50/34
9.54-10.20		9 / 9		0	

General: Extremely weak to weak reddish brown fine to medium grained SANDSTONE. Discontinuities are very closely to closely spaced subhorizontal undulating smooth and clean.

Detail: At 5.29m, subvertical undulating smooth clean discontinuity. At 5.47m, dark brown sand infill on discontinuities. Between 5.65m and 6.34m, discontinuities become closely to medium spaced and planar. Between 6.34m and 6.38m, discontinuities become extremely to very closely spaced. Between 6.38m and 6.95m, discontinuities become closely to medium spaced. Below 6.95m, discontinuities are very closely to closely spaced. Between 8.18m and 8.38m, discontinuities are medium spaced.

Boring

Depth	Dia	Technique	Crew
1.20	0.50	Inspection Pit	HR
5.15	0.15	Cable Percussion	HR
14.70	0.09	Rotary Core	SL

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			30/11/15	08:00
3.03	2.80	DRY	30/11/15	18:00
3.03	2.80	DRY	01/12/15	08:00
7.04	5.00	ADD	01/12/15	18:00
7.04	5.00	ADD	02/12/15	08:00
14.70	5.00	ADD	02/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
Water was added to assist boring between 2.00m and 5.50m.
A 50mm standpipe was installed to 10.00m with a geowrapped slotted section from 8.00m to 10.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 10.00m, fine gravel filter up to 8.00m, bentonite seal up to 0.10m, concrete up to ground level.
Chiselling: 1.80-2.00m for 60 minutes and 2.50-3.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.
All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 2
11/03/2016

geotechnics

BOREHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**BH102**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389276.7 E 390240.0 N	Ground Level	43.35 m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(33)					
10.20-11.70		66 47	0.10 0.04	6	(AZCL)					
10.20-10.34	4.00 (ADDED)				S50/46					
					(NI)					
					(40)					
					(NI)					
11.60-11.70		C			(40)					
11.70-12.70		100 62	0.21 0.01	43	(20)					
					(NI)					
					(14)		Between 12.40m and 12.70m, discontinuities become closely to medium spaced.			
					(NI)					
12.70-13.20		12 12	0.10 0.01	6	(50)		Below 13.02m, discontinuities become closely spaced.			
					(NI)					
13.20-14.70		66 66	0.20 0.03	31	(17)					
					(NI)					
					(10)					
					(AZCL)		Between 14.23m and 14.47m, discontinuities are medium spaced.			
					(11)					
					(AZCL)			14.70		28.65
					(13)	End of Borehole				
					(4)					
					(13)					

Drilling | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 2 of 2

11/03/2016

geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH103
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389205.7 E 390216.4 N	Ground Level	42.42 m OD

Scale 1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
							G.L.	42.42
						MADE GROUND: Grey concrete paving slabs.	0.10	42.32
0.35- 0.55	D					MADE GROUND: Grey concrete.	0.35	42.07
0.35- 0.55	ES					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).		
1.00- 1.20	D						1.00	41.42
1.00- 1.20	ES					Loose greyish brown silty slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to medium including sandstone, quartzite and limestone.		
1.20- 1.65	B							
1.20- 1.65	D	1.20 (DRY)			S5			
2.00- 2.20	D							
2.00- 2.20	ES							
2.20- 2.65	B							
2.20- 2.65	D	2.20 (DRY)			S33		2.40	40.02
						Dense yellowish brown sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and sandstone. High rounded to subrounded cobble content.		
3.20- 3.27	B						3.20	39.22
3.20- 3.35	D	3.20 (DRY)			S50/70	Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).		
4.20- 4.24	D	4.20 (DRY)			S50/0			
							4.80	37.62

Rotary

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail
4.80- 5.70	(ADD)	100 89	0.14 0.00	39	(NI) (12)	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal rough and clean.	
5.70- 7.20	(ADD)	90 90	0.15 0.00	40	(NI) (AZCL) (15)		Between 5.90-6.20m, discontinuities are subvertical and rough.
6.70- 6.86		C					
7.20- 8.70	(ADD)	100 90	0.18 0.00	87	(11) (NI) (11) (NI) (15)		
8.70-10.20	(ADD)	87 87	0.20 0.00	40	(NI) (15) (12) (14)		

Boring

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	JP
4.80	0.15	Cable Percussion	JP
14.70	0.09	Rotary Core	SL

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			08/12/15	08:00
3.27	3.20	DRY	08/12/15	18:00
3.27	3.20	DRY	09/12/15	08:00
4.80	4.20	DRY	09/12/15	18:00
4.80	4.20	DRY	10/12/15	08:00
14.70	4.20	ADD	10/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
Water was added to assist boring between 1.20m and 3.20m.
A 50mm standpipe was installed to 14.70m with a geowrapped slotted section from 11.00m to 14.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 14.00m, gravel filter up to 11.00m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.
Chiselling: 4.00-4.20m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by DSA

Figure 1 of 2

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geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH103
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389205.7 E 390216.4 N	Ground Level	42.42 m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR %	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(AZCL)					
10.20-11.70	(ADD)	67 57	0.10 0.00	7	(18)					
					(AZCL)					
11.70-13.20	(ADD)	40 33	0.10 0.00	13	(17)					
					(AZCL)		Between 13.20-14.70m, discontinuities become closely spaced.			
13.20-14.70	(ADD)	87 87	0.35 0.00	67	(13)					
13.20-13.39		C								
13.20-13.25	4.20 (DRY)				S50/26					
					(8)			14.70		27.72
						End of Borehole				

Drilling | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by DSA

Figure 2 of 2

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geotechnics

BOREHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	BH104	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389178.1 E, 390228.9 N
Ground Level	42.47 m OD	Scale	1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
							G.L.	42.47
						MADE GROUND: Grey reinforced concrete.	0.40	42.07
0.40- 0.60	D					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).	0.70	41.77
0.40- 0.60	ES							
1.00- 1.20	D					Medium dense yellowish brown sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and sandstone. High rounded to subrounded cobble content.		
1.00- 1.20	ES							
1.20- 1.65	B							
1.20- 1.65	D	1.20 (DRY)			S15			
2.00- 2.20	D							
2.00- 2.20	ES					At 2.20m, dense.		
2.20- 2.65	B							
2.20- 2.65		2.20 (DRY)			C38			
						At 3.20m, very dense.		
3.20- 3.30	B							
3.20- 3.37		3.20 (DRY)			C50/50		3.70	38.77
3.70- 3.95	B							
3.70- 3.77		3.70 (DRY)			C50/40	Weak dark red fine to medium grained SANDSTONE (recovered as sand).		
4.70- 4.74		4.70 (DRY)			C50/10			

Continued by Rotary techniques

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	General	Detail	Depth	Level m OD
5.00- 6.50		100 / 60	0.20 / 0.00	40	(NI)			5.65	36.82
6.00- 6.10		C			(10)	Weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal and clean.	Between 6.00m and 6.10m, extremely weak. Subvertical discontinuities, rough and clean.		
6.50- 8.00		60 / 43	0.15 / 0.00	23	(AZCL)				
					(NI)				
					(15)				
8.00- 8.85		100 / 100	0.10 / 0.00	40	(12)				
8.50- 8.65		C					Between 8.50m and 8.65m, extremely weak to very weak.	8.85	33.62
8.85- 9.10		71 / 71	0.15 / 0.00	35	(AZCL)	Weak greyish brown fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal rough and clean.		9.10	33.37
9.10- 9.80		43 / 43	0.05 / 0.00	0	(18)			9.80	32.67
9.80-11.00		38 / 38	0.09 / 0.00	0		Extremely weak to weak			

Boring

Depth	Dia	Technique	Crew
1.20	0.50	Inspection Pit	JP
4.74	0.15	Cable Percussion	JP
15.07	0.09	Rotary Core	PB

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			01/12/15	08:00
2.00	2.00	DRY	01/12/15	18:00
2.00			02/12/15	08:00
4.74	4.70	DRY	02/12/15	18:00
4.74	4.70	DRY	03/12/15	08:00
15.07	4.70	ADD	03/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jars.
A 50mm standpipe was installed to 3.50m with a geowrapped slotted section from 1.00m to 3.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 3.50m, gravel filter up to 1.00m, bentonite seal up to 0.30m, concrete up to ground level.
Chiselling: 3.70-3.95m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 2

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geotechnics

BOREHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**BH104**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389178.1 E 390228.9 N	Ground Level	42.47 m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
9.80- 9.94	4.70 (ADDED)				(AZCL) C50/40	reddish brown MUDSTONE. Discontinuities are very closely spaced subhorizontal and clean.				
					(19)	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Occasional subrounded clasts (up to 30mm) of quartzite. Discontinuities are very closely spaced subhorizontal rough and clean.				
11.00-12.20		58 58	0.13 0.00	11						
11.00-11.07	4.70 (ADDED)				(17) C50/30					
12.10-12.20		C								
12.20-13.50		23 23	0.00 0.00	0						
12.20-12.27	4.70 (ADDED)				(AZCL) C50/35					
					(25)					
13.50-15.00		33 33	0.09 0.00	0						
13.50-13.58	4.70 (ADDED)				(AZCL) C50/40					
					(18)			15.00		27.47
15.00-15.07	4.70 (ADDED)				C50/35	End of Borehole				

Drilling | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 2 of 2

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geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project: STOCKPORT BUS STATION
Engineer: AECOM
Borehole: BH105
Project No: PN153428
Client: TRANSPORT FOR GREATER MANCHESTER
National Grid Coordinates: 389234.8 E, 390221.6 N
Ground Level: 42.62 m OD
Scale: 1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
						MADE GROUND: Grey reinforced concrete.	G.L.	42.62
0.50	ES					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).	0.40	42.22
0.70- 0.80	B							
1.00	ES							
1.10	D							
1.20- 1.65	D					Loose yellowish brown very sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and basalt.	1.20	41.42
1.20- 1.65					S8			
1.80	D							
2.00- 2.50	B					At 2.00m, dense.		
2.00- 2.45	D	1.50 (DRY)			S37			
2.00	ES							
2.80	D							
3.00- 3.50	B					Extremely weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	3.00	39.62
3.00- 3.15	D	3.00 (DRY)			S50/75			
3.80	D							
4.00- 4.15	D	4.00 (DRY)			S50/75			
							4.50	38.12

Continued by Rotary techniques

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	General	Detail
4.50- 5.50		30 20	0.08 0.00	0	(AZCL) (16)	Extremely weak to weak reddish fine to coarse grained SANDSTONE. Discontinuities are very closely spaced subhorizontal rough and clean.	
5.50- 7.00		67 60	0.10 0.00	13	(AZCL)		
5.50- 5.57	4.00 (ADDED)				C50/30 (15)		
7.00- 8.30		77 70	0.20 0.00	23	(AZCL) (12) (NI) (12)		Between 7.80-7.90m occasional subrounded clasts (up to 20mm) of basalt and feldspar.
7.10- 7.29		C					
8.30- 8.50		100 100	0.08 0.00	0	(20)		
8.50-10.00		68 23	0.13 0.00	9	(AZCL) (30) (NI)		

Boring

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	HR
4.50	0.15	Cable Percussion	HR
15.20	0.09	Rotary Core	PB

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			08/12/15	08:00
1.20		DRY	08/12/15	18:00
1.20		DRY	09/12/15	08:00
4.50	4.00	DRY	09/12/15	18:00
4.50	4.00	ADDED	14/12/15	08:00
15.20	4.00	ADDED	14/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
Water was added to assist boring between 3.00m and 4.50m.
A 50mm standpipe was installed to 12.00m with a geowrapped slotted section from 9.50m to 12.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 12.00m, gravel filter up to 9.50m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.
Chiselling: 1.50-2.00m for 30 minutes and 2.00-2.50m for 30 minutes.
Flush: 4.50-8.50m, Water, 75% returns and 8.50-10.00m, Water, 0% returns and 10.00-15.20m,

Symbols and abbreviations are explained on the accompanying key sheet.
All dimensions are in metres.
Logged in accordance with BS5930:1999 + A2:2010

Logged by: DS
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geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH105
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389234.8 E 390221.6 N	Ground Level	42.62 m OD

Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR %	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
10.00-11.50		23 23	0.10 0.00	6	(15)					
10.00-10.07	4.00 (ADDED)				(AZCL) C50/35					
					(20)					
11.50-13.00		67 53	0.20 0.00	27						
11.50-11.56	4.00 (ADDED)				(AZCL) C50/35					
					(NI)					
					(12)					
13.00-14.35		74 74	0.36 0.00	56	(AZCL)					
13.00-13.34		C								
					(25)					
14.35-14.50		100 100	0.15 0.00	100	(10)					
14.50-15.20		100 86	0.20 0.00	71	(NI)					
					(20)	End of Borehole		15.20		27.42

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks: Water, 60% returns.

Logged by: DS

Figure: 2 of 2

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Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389248.7 E 390249.7 N
Borehole	BH106	Project No	PN153428
Ground Level	42.45 m OD	Scale	1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
							G.L.	42.45
						MADE GROUND: Grey concrete paving slabs.	0.10	42.35
						MADE GROUND: Grey concrete.	0.40	42.05
0.40- 0.60	D					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).		
0.40- 0.60	ES							
1.10- 1.20	D						1.10	41.35
1.10- 1.20	ES					Medium dense to dense yellowish brown sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and sandstone. High rounded to subrounded cobble content.		
1.20- 1.70	B			5.0				
1.20- 1.65	B							
1.20- 1.65	D	1.20 (DRY)			S29			
2.00- 2.20	ES							
2.00- 2.20	ES							
2.20- 2.65	B							
2.20- 2.65	D	2.20 (DRY)			S40			
2.70- 2.82	B						2.70	39.75
2.70- 2.97	D	2.70 (DRY)			S50/ 120	Extremely weak dark red fine to medium grained SANDSTONE (recovered as silty sand).		
3.40- 3.51	#	3.40 (DRY)			C50/30		3.40	39.05

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail
3.40- 4.90		77 77	0.17 0.01	19	(AZCL) (17) (10)	Extremely weak to weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are closely spaced, subhorizontal, rough and clean.	
3.70- 3.80		C					
4.90- 6.40		77 77	0.10 0.01	13	(AZCL) (16) (15)		
6.40- 6.90		90 90	0.10 0.01	20	(AZCL) (12)		
6.90- 7.90		90 85	0.15 0.01	27	(AZCL) (12)		
7.90- 9.40		47 40	0.12 0.01	8	(AZCL) (15)		
9.40-10.90		47 47	0.13 0.01	25	(AZCL)		
9.40- 9.48	3.40 (ADDED)				C50/35		

Boring

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	JP
3.51	0.15	Cable Percussion	JP
15.00	0.09	Rotary Core	PB

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			14/12/15	08:00
3.51	3.40	DRY	14/12/15	18:00
3.51	3.40	DRY	15/12/15	08:00
15.00	3.40	ADD	15/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
Water was added to assist boring from 2.70m.
A 50mm standpipe was installed to 7.00m with a geowrapped slotted section from 5.00m to 7.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 7.00m, gravel filter up to 5.00m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.
Chiselling: 2.70-3.40m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.
All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 2

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geotechnics

BOREHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH106
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389248.7 E 390249.7 N	Ground Level	42.45 m OD

Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(12)					
10.80-10.90		C			(20)					
10.90-12.40		17 17	0.80 0.01	0						
10.90-10.98	3.40 (ADDED)				C50/45					
					(AZCL)					
12.40-13.90		47 40	0.30 0.01	20			Between 12.40 and 13.90m, discontinuities are medium spaced.			
12.40-12.48	3.40 (ADDED)				C50/30					
					(10)		Between 13.10 and 13.30m, with subangular to subrounded clasts (up to 50mm) of quartzite.			
					(NI)					
					(5)					
13.90-15.00		73 55	0.15 0.01	36	(AZCL)					
13.90-13.97	3.40 (ADDED)				C50/30					
					(10)			15.00		27.45
						End of Borehole				

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS Flush: 3.40-15.00m, Water, 75% returns.

Logged by GT

Figure 2 of 2
11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	BH107	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389205.8 E / 390252.4 N
Ground Level	42.27 m OD	Scale	1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
						MADE GROUND: Grey reinforced concrete.	G.L.	42.27
0.35- 0.55	D						0.35	41.92
0.35- 0.55	ES					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content. (Sub base).		
0.90- 1.10	D						0.90	41.37
0.90- 1.10	ES					Very dense yellowish brown silty very sandy subrounded to rounded fine to coarse GRAVEL of limestone, granite, quartzite and sandstone. High rounded to subrounded cobble content.		
1.20- 1.31	B							
1.20- 1.46	D	(DRY)			S50/ 110			
1.31- 1.47	B							
1.31- 1.64	D	1.30 (DRY)			S50/ 180			
2.00- 2.20	D							
2.00- 2.20	ES							
2.20- 2.42	B							
2.20- 2.57	D	2.20 (DRY)			S48/ 220			
3.00- 3.07	B						3.00	39.27
3.00- 3.10	D	3.00 (DRY)			S50/75	Extremely weak to very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).		
4.00- 4.08	#	4.00 (DRY)			S50/30		4.08	38.19

Continued by Rotary techniques

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	General	Detail	Depth	Level m OD
4.00- 5.00	4.00	50 10	0.05 0.01	0	(NR) (NI)	Extremely weak reddish brown fine to medium grained SANDSTONE (recovered as gravel).			
5.00- 6.50	4.00	26 6	0.05 0.01	0	(NR) (NI)				
6.50- 8.00	6.50	0 0	- -	0	(NR)			7.50	34.77
						MADE GROUND: Strong orangish red brick with well bonded mortar (10mm thick).		7.80	34.47
						VOID (Sewer).		9.10	33.17
						End of Borehole			

Boring

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	JP
4.08	0.15	Cable Percussion	JP
7.80	0.09	Rotary Core	PB

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			07/12/15	08:00
2.42	2.20	DRY	07/12/15	18:00
2.42	2.20	DRY	08/12/15	08:00
7.80	6.50	ADD	08/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
Water was added to assist boring from 1.20m.
During rotary drilling the flush returns were lost at 4.40m with the core barrel flushing in between 5.00m and 6.00m with no rotation. The casing was subsequently advanced to 6.50m.
At 7.50m a brick sewer was encountered and proved using CCTV. Following confirmation the asset holder requested that the casing be left in to provide an access point and re-instated at surface with a heavy duty flush cover.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 2

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geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH107
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389205.8 E 390252.4 N	Ground Level	42.27 m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD

Drilling | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS Chiselling: 3.00-4.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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geotechnics

BOREHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389157.8 E 390268.0 N
Borehole	BH108	Project No	PN153428
Ground Level	42.72 m OD	Scale	1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)
0.10- 0.20	B				
0.20	ES				
0.30- 0.40	B				
0.50	ES				
0.80	D				
1.00	ES				
1.20- 1.65	D	1.20 (DRY)			S6
1.80	D				
2.00- 2.50	B			22	
2.00- 2.45	D	1.50 (DRY)			S5
2.00	ES				
2.70	D				
3.00- 3.50	B				
3.00- 3.45	D	3.00 (DRY)		16	S9
3.00- 3.45	D				
3.00	ES				
3.00- 3.45	UF45	3.00 (DRY)			
3.80	D				
4.00- 4.50	B				
4.00- 4.45	D	4.00 (DRY)			S44
4.00	ES				
5.00- 5.50	B				
5.00	D				
5.00- 5.15	D	5.00 (DRY)			S50/75
5.00	ES				
5.80	D				
6.00- 6.15	D	5.00 (DRY)			S50/75

Description	Depth	Level m OD
	G.L.	42.72
MADE GROUND: Black tarmacadam.	0.05	42.67
MADE GROUND: Yellowish brown sandy angular fine to coarse gravel of limestone. Medium angular cobble content of limestone. (Sub base).	0.20	42.52
MADE GROUND: Loose reddish grey mottled black sandy angular to subangular fine to coarse gravel of brick and concrete. Medium angular cobble content of brick and some pockets of clay. At 4.00m, dense.	5.00	37.72
Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	6.15	36.57

Continued by Rotary techniques

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)
6.50- 7.30 (80mm)	6.00 (ADD)	0.85 0.30	0.10 -	0.10	(>25) (NI) (>25)
7.30- 8.80 (80mm)	6.00 (ADD)	0.45 0.21	0.90 -	-	(14) (16) (AZCL) (NI) (>25)
8.80-10.30 (80mm)	6.00 (ADD)	1.10 0.72	0.11 -	0.21	(NI) (>25) (1)
8.80- 8.93	6.70 (ADDED)				S50/32 (AZCL) (18)

General	Detail	Depth	Level m OD
Very weak thinly laminated brown micaceous MUDSTONE. Discontinuities are very closely spaced planar smooth with some clay infill.		6.82	35.90
Very weak to medium strong reddish brown medium grained micaceous SANDSTONE with rare rounded clasts (up to 60mm) of quartzite. Discontinuities are very closely to medium spaced horizontal to subvertical planar and undulating smooth.	Between 8.80m and 10.30m, discontinuities are occasionally stepped.		

Boring

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	JP
6.15	0.15	Cable Percussion	JP
22.30	0.09	Rotary Core	SL

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			02/12/15	08:00
1.20		DRY	02/12/15	18:00
1.20		DRY	03/12/15	08:00
6.15	4.50	DRY	03/12/15	18:00
6.15	6.00	DRY	08/12/15	08:00
7.30	6.70	ADD	04/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
Water was added to assist boring from 5.00m.
During rotary coring there was no flush returns between 6.50m and 7.30m The casing was subsequently advanced to 6.70m.
A 50mm standpipe was installed to 21.00m with a geowrapped slotted section from 18.00m to 21.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 21.00m, gravel filter up to 18.00m, bentonite seal up to 0.50m, sub base up to

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by JL

Figure 1 of 3
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BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH108
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389157.8 E 390268.0 N	Ground Level	42.72 m OD

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(NI)					
10.30-11.80 (80mm)	6.00 (ADD)	1.35 1.12	0.57 -	0.83	(12) (AZCL) (-) (13) (3)		Between 10.30m and 11.80m, discontinuities occasionally have black staining (1mm penetration).			
11.80-13.30 (80mm) 11.80-14.80	6.00 (ADD)	1.20 0.91 C	0.33 -	0.68	(AZCL) (13) (NI) (17)		Between 11.80m and 13.30m, discontinuities infilled with clay in places.			
13.30-14.80 (80mm)	6.00 (ADD)	1.40 0.92	0.26 -	0.60	(AZCL) (11) (NI) (15)					
14.35-14.61		C								
14.80-16.30 (80mm)	6.00 (ADD)	1.50 1.05	0.27 -	0.87	(6)					
15.30-15.38		C			(10) (NI)					
16.30-17.80 (80mm)	6.00 (ADD)	1.25 1.04	0.33 0.04	0.93	(4) (AZCL) (10) (4)		Between 16.55 and 16.65, sandstone is fine grained. Below 16.90m, becoming occasionally gravelly.			
17.30-17.58		C								
17.80-19.30 (80mm)	6.00 (ADD)	0.45 0.13	0.13 -	0.13	(AZCL) (NI) (8)		Between 17.80m and 20.80m, discontinuities infilled with clay in places.			
19.30-20.80 (80mm) 19.30-19.37	6.00 (ADD) 6.70 (ADDED)	0.80 0.48	0.12 -	0.33	(AZCL) S50/39					

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
7.30	6.70	ADD	09/12/15	08:00
22.30	6.70	ADD	09/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS 0.30m, tarmacadam up to ground level.
Chiselling: 4.50-5.00m for 60 minutes and 5.00-6.00m for 60 minutes.

Logged by JL

Figure 2 of 3
11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	BH108
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389157.8 E 390268.0 N	Ground Level	42.72 m OD

Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(NI) (8)		Between 20.15m and 20.20m, thin band of weak thinly laminated dark brown mudstone.			
20.80-22.30 (80mm)	6.00 (ADD)	0.80 0.45	0.19 -	0.29	(AZCL) (NI) (6) (4)			22.30		20.42
22.30-22.35	6.70 (ADDED)				S50/29	End of Borehole				

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by JL

Figure 3 of 3

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geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project: STOCKPORT BUS STATION
Engineer: AECOM
Borehole: BH109
Project No: PN153428
Client: TRANSPORT FOR GREATER MANCHESTER
National Grid Coordinates: 389136.4 E, 390317.0 N
Ground Level: 42.36 m OD
Scale 1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
						MADE GROUND: Black tarmacadam.	G.L.	42.36
0.30- 0.50	D					MADE GROUND: Loose blackish brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High angular cobble and boulder content of brick.	0.30	42.06
0.30- 0.50	ES							
1.00- 1.20	D							
1.00- 1.20	ES							
1.20- 1.65	B							
1.20- 1.65	D	(DRY)			S7			
2.00- 2.20	D							
2.00- 2.20	ES							
2.20- 2.65	B					Dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of limestone, quartzite, granite and basalt.	2.20	40.16
2.20- 2.65	D	2.20 (DRY)			S34			
3.00- 3.20	D							
3.00- 3.20	ES					At 3.20m, very dense.		
3.20- 3.42	B							
3.20- 3.58	D	3.20 (DRY)			S50/ 225			
4.20- 4.27	B					Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.20	38.16
4.20- 4.36	D	4.20 (DRY)			S50/70			
5.20- 5.32	#	5.20 (DRY)			S50/40			

Continued by Rotary techniques

Core Run / Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	General	Detail	Depth	Level m OD
5.20- 6.20 (92mm)		0 / 0		0					
6.20- 7.70 (92mm)		86 / 0		0					
6.20- 6.30	5.20 (ADDED)				C50/40	Extremely weak reddish brown fine to coarse grained SANDSTONE with closely spaced bands of mudstone. Discontinuities are predominately horizontal with slightly clayey sand infill.		6.55	35.81
					(NI)				
7.70- 9.20 (92mm)		22 / 20	0.10 / 0.01	6					
7.70- 7.81	5.20 (ADDED)				C50/50				
					(>30)	Extremely weak reddish brown fine to coarse grained SANDSTONE.	At 9.10m, slightly gravelly. Gravel is rounded medium to coarse of quartz.	8.95	33.41
9.20-10.70 (92mm)		83 / 76	0.20 / 0.01	62		Extremely weak to very weak reddish brown fine to coarse grained		9.25	33.11
9.20- 9.27	5.20 (ADDED)				C50/35				
9.40- 9.60		C			(7)				

Boring

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	JP
5.20	0.15	Cable Percussion	JP
20.70	0.09	Rotary Core	PB

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			15/12/15	08:00
5.20	5.20	DRY	15/12/15	18:00
5.20	5.20	ADD	16/12/15	08:00
16.70	5.20	ADD	16/12/15	18:00
16.70	5.20	ADD	17/12/15	08:00
20.70	5.20	ADD	17/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A 50mm standpipe was installed to 20.00m with a geowrapped slotted section from 18.00m to 20.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 20.00m, gravel filter up to 18.00m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.
Chiselling: 2.00-2.20m for 60 minutes.
Flush: 5.20-20.70m, Water, 75% returns.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Figure
11/03/2016

geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	BH109	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389136.4 E 390317.0 N
Ground Level	42.36 m OD	Scale	1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
						SANDSTONE. Discontinuities are very closely to closely spaced subhorizontal undulating rough with occasional sand infill (up to 150mm thick).				
10.70-12.20 (92mm)		51 29	0.35 0.01	14	(8)			11.90		30.46
					(NI)	Extremely weak reddish brown SANDSTONE (recovered as gravelly sand).		12.20		30.16
12.20-13.70 (92mm) 12.30-12.62		83 75 C	0.35 0.01	48	(8)	Extremely weak to very weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are very closely to medium spaced horizontal undulating rough with sand infill (up to 10mm thick).				
13.70-15.20 (92mm) 13.90-14.15		70 65 C	0.20 0.01	47	(10)					
15.20-16.70 (92mm)		60 46	0.10 0.01	14	(14)			16.50		25.86
16.70-18.20 (92mm)		60 14	0.07 0.01	0	(NI)	Extremely weak reddish brown slightly gravelly fine to coarse grained SANDSTONE with silty bands (recovered as slightly gravelly fine to coarse sand).		17.75		24.61
					(26)	Extremely weak reddish brown fine to coarse grained SANDSTONE. Discontinuities are extremely to very closely spaced horizontal undulating rough with sand infill (up to 10mm thick).		18.20		24.16
18.20-19.70 (92mm) 19.40-19.60		100 98 C	0.34 0.01	64	(8)	Extremely weak to very weak reddish brown fine to coarse grained SANDSTONE with widely spaced slightly gravelly bands (up to 50mm thick). Gravel is fine to medium of quartzite.				
19.70-20.70 (92mm) 19.70-19.90		98 92 C	0.15 0.01	22						

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Figure 2 of 3

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geotechnics

BORFHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	BH109	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389136.4 E / 390317.0 N
Ground Level	42.36 m OD	Scale	1:50

Drilling		Properties/Sampling				Strata				
Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
					(12)	Discontinuations are closely to medium spaced locally very closely spaced subhorizontal undulating rough with sand infill (up to 10mm thick).		20.70		21.66
						End of Borehole				

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Figure 3 of 3

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geotechnics

BOREHOLE RECORD - *Cable Percussion*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole** Project No	**BH111** PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389253.5 E 390080.2 N	Ground Level	50.92 m OD

Sampling | Properties | Strata | Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		50.92
0.20- 0.40	D					MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of limestone. Medium angular cobble content.			
0.20- 0.40	ES						0.30		50.62
0.50- 0.70	D					MADE GROUND: Firm dark brown slightly sandy slightly gravelly clay. Gravel is angular to subangular fine to coarse of brick and concrete.			
0.50- 0.70	ES								
0.85- 1.00	B						0.85		50.07
0.85- 1.15	D	(DRY)			S50/ 150	Weak dark red fine to medium grained SANDSTONE (recovered as silty sand).			
1.50- 1.56		1.50 (DRY)			C50/30		1.55		49.37
						End of Borehole			

Boring | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.85	0.50	Inspection Pit	JP	G.L.			03/12/15	08:00						None encountered.
1.55	0.15	Cable Percussion	JP	1.55	1.50	DRY	03/12/15	18:00						

Remarks

Inspection pit hand excavated to 0.85m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
Backfill details from base of hole: bentonite seal up to 0.30m, arisings up to ground level.
Chiselling: 1.50-1.55m for 60 minutes.

Logged by GT

Figure 1 of 1

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Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

geotechnics

BOREHOLE RECORD - *Cable Percussion and Rotary*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389295.7 E 390239.9 N
Borehole	BH112	Project No	PN153428
Ground Level	43.70 m OD	Scale	1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Level m OD
							G.L.	43.70
0.20	ES					MADE GROUND: Grey concrete paving slabs.	0.15	43.55
0.40- 0.50	B					MADE GROUND: Light red sandy angular to subangular fine to coarse gravel of limestone. Medium angular to subangular cobble content. (Sub base)		
0.50	ES							
0.80	D							
1.00	ES						1.00	42.70
1.20- 1.70	B					MADE GROUND: Firm greyish brown slightly sandy slightly gravelly clay with a medium angular to subangular cobble content. Gravel is angular to subangular fine to coarse of brick and concrete.		
1.20- 1.65	D	(DRY)			S4			
							1.60	42.10
1.80	D			109		Soft dark brown and black very organic CLAY. Locally sandy silt, with organic remains.		
2.00- 2.45	D	2.00 (DRY)			S49		2.00	41.70
						Dense to very dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of quartzite and sandstone. High rounded cobble content.		
3.00- 3.50	B							
3.00- 3.23		4.00 (DRY)			S50/75			
3.80	D						3.90	39.80
4.00- 4.50	B					Weak dark red fine to medium grained SANDSTONE (recovered as sand).		
4.00- 4.15	D	3.00 (DRY)			S50/75			
5.00- 5.15	D	4.50 (DRY)			S50/75		5.15	38.55

Core Run Core Dia	Depth Cased	TCR/SCR %	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail
					(22)	Extremely weak to weak reddish brown fine to coarse SANDSTONE with occasional subrounded clasts (up to 50mm) of quartzite. Discontinuities are very closely spaced subhorizontal rough and clean.	
5.50- 5.80	5.50 (ADD)	100 100	0.10 0.00	67	(AZCL)		
5.80- 7.30	5.50 (ADD)	93 93	0.28 0.00	33	(16)		
6.50- 6.80		C			(15)		
7.30- 8.80	5.50 (ADD)	100 100	0.20 0.00	70	(9)		
					(10)		
8.80-10.30	5.50 (ADD)	80 80	0.20 0.00	60	(AZCL)		
					(12)		
9.60- 9.80		C			(AZCL)		
					(14)		

Boring

Depth	Dia	Technique	Crew
1.20	0.50	Inspection Pit	HR
5.15	0.15	Cable Percussion	HR
14.80	0.09	Rotary Core	SL

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			01/12/15	08:00
2.50	2.50	DRY	01/12/15	18:00
2.50	2.50	DRY	02/12/15	08:00
5.15	4.50	DRY	02/12/15	18:00
5.15	4.50	DRY	03/12/15	08:00
11.80	5.50	ADD	03/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
Water was added to assist boring between 2.00m and 2.50m, and 3.00m and 5.50m.
A 50mm standpipe was installed to 14.80m with a geowrapped slotted section from 12.80m to 14.80m with flush lockable protective cover. Backfill details from base of hole: gravel filter up to 12.80m, bentonite seal up to 0.30m, concrete up to ground level.
Chiselling: 3.00-3.20m for 90 minutes and 3.20-3.40m for 60 minutes and 4.00-5.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Figure

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geotechnics

BOREHOLE RECORD - Cable Percussion and Rotary

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389295.7 E 390239.9 N
Borehole	BH112	Project No	PN153428
Ground Level	43.70 m OD	Scale	1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR %	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
10.30-11.80	5.50 (ADD)	60 47	0.35 0.00	33	(AZCL) (NI) (11)					
11.80-13.30	5.50 (ADD)	67 53	0.17 0.00	37	(AZCL) (15) (NI) (13)					
13.30-14.80	5.50 (ADD)	67 57	0.15 0.00	40	(AZCL) (11)			14.80		28.90
						End of Borehole				

Drilling

Depth	Hole Dia	Technique	Crew

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
11.80	5.50	ADD	04/12/15	08:00
14.80	5.50	ADD	04/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Flush: 5.50-5.80m, Water, 80% returns and 5.80-7.30m, Water, 0% returns and 7.30-8.80m, Water, 50% returns and 8.82-10.30m, Water, 80% returns and 10.30-11.80m, Water, 80% returns and 11.80-13.30m, Water, 80% returns and 13.30-14.80m, Water, 80% returns.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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geotechnics

BOREHOLE RECORD - Cable Percussion

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389136.7 E 390309.5 N
Borehole	CT1	Project No	PN153428
Ground Level	42.24 m OD	Scale	1:50

Strata

Description	Depth	Level m OD
	G.L.	42.24
MADE GROUND: Black tarmacadam.	0.10	42.14
MADE GROUND: **Brick wall onto obstruction at 1.20m.	1.20	41.04
End of Borehole		

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	JP

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			16/12/15	09:00
1.10			16/12/05	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

The borehole was terminated at the base of the inspection upon encountering a brick obstruction.
** Driller's description.
Backfill details from base of hole: bentonite seal up to 0.30m, sub base up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 1
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geotechnics

BOREHOLE RECORD - *Cable Percussion*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**CT1A**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389139.0 E 390309.6 N	Ground Level	42.19 m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Level m OD
							G.L.	42.19
						MADE GROUND: Black tarmacadam.	0.05	42.14
						MADE GROUND: Very loose dark brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High angular boulder and cobble content of brick.		
1.20- 1.65	D				S2			
						At 2.20m, medium dense.		
2.20- 2.65	D	1.20 (DRY)			S17			
3.20- 3.58	D	3.20 (DRY)			S50/ 225	Very dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL of limestone, quartzite, granite and basalt.	3.20	38.99
4.20- 4.32	D	4.20 (DRY)			S50/50	Weak dark red fine to medium grained SANDSTONE (recovered as sand).	4.20 4.32	37.99 37.87
						End of Borehole		

Boring / Progress / Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	JP	G.L.			17/12/15	08:00						None encountered.
4.32	0.15	Cable Percussion	JP	4.32	4.20	DRY	17/12/15	18:00						

Remarks
Inspection pit hand excavated to 1.20m depth.
Backfill details from base of hole: bentonite seal up to 0.30m, sub base up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by JP

Figure 1 of 1

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geotechnics

BOREHOLE RECORD - *Cable Percussion*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	CT3
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389139.9 E 390305.2 N	Ground Level	42.11 m OD

Scale 1:50

Sampling: Depth	Sample Type	Depth Cased & (to Water)	Properties: Strength kPa	w %	SPT N	Strata: Description	Depth	Legend	Level m OD
						MADE GROUND: Black tarmacadam.	G.L.		42.11
						MADE GROUND: Medium dense dark brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High cobble content and a high boulder content of brick.	0.30		41.81
1.20- 1.65	D	(DRY)			S35				
2.20- 2.65	D	2.20 (DRY)			S18				
3.20- 3.65	D	3.20 (DRY)			S8	Loose brown slightly gravelly silty SAND. Gravel is fine to medium including sandstone, limestone and quartzite.	3.20		38.91
4.20- 4.35	D	4.20 (DRY)			S50/70	Extremely weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.20 4.35		37.91 37.76
						End of Borehole			

Boring / Progress

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time
1.20	0.40	Inspection Pit	JP	G.L.			16/12/15	08:00
4.35	0.15	Cable Percussion	JP	4.35	4.20	DRY	16/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS
Inspection pit hand excavated to 1.20m depth.
Water was added to assist boring between 3.20m and 4.20m.
Backfill details from base of hole: bentonite seal up to 0.60m, sub base up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Cable Percussion

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	CT4
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389146.6 E 390314.8 N	Ground Level	42.07 m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		42.07
						MADE GROUND: Black tarmacadam.	0.10		41.97
						MADE GROUND: Stone setts.	0.25		41.82
						MADE GROUND: Brown slightly clayey sand. Locally grading to very soft slightly gravelly sandy clay. Gravel is angular to subangular medium to coarse of brick fragments.			
1.30- 1.75	D	(DRY)			S1				
2.20- 2.65	D	2.20 (DRY)			S50		2.45		39.62
						Dense yellowish brown very sandy rounded to subrounded fine to coarse GRAVEL including sandstone. At 3.20m, medium dense.			
3.20- 3.65	D	3.20 (DRY)			S12		3.30		38.77
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	JP
3.30	0.15	Cable Percussion	JP

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			10/12/15	08:00
1.30		DRY	10/12/15	18:00
1.30		DRY	11/12/15	08:00
3.30	3.20	DRY	11/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS

Inspection pit hand excavated to 1.20m depth.
The Borehole was terminated at a depth of 3.30m due to the presence of a potential buried service.
Backfill details from base of hole: bentonite seal up to 0.25m, sub base up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

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BOREHOLE RECORD - Cable Percussion

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	CT5	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389154.7 E, 390268.6 N
Ground Level	42.73 m OD	Scale	1:50

Sampling Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Strata Description	Depth	Legend	Level m OD
							G.L.		42.73
						MADE GROUND: Black tarmacadam.	0.05		42.68
						MADE GROUND: Yellowish brown sandy fine to coarse angular gravel of limestone (Sub base).	0.10		42.63
						MADE GROUND: Concrete and brick.	0.45		42.28
1.20- 1.65	D				S4	MADE GROUND: Loose dark brown sandy fine to coarse angular to subangular gravel of brick, concrete and ash. High cobble content and a high boulder content.			
2.00- 2.45	D	2.00 (DRY)			S6				
3.00- 3.45	D	3.00 (DRY)			S10				
4.00- 4.15	D	4.00 (DRY)			S50/75		4.00		38.73
						Extremely weak to very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).			
5.00- 5.15	D	5.00 (DRY)			S50/75				
							5.50		37.23
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	HR
5.50	0.15	Cable Percussion	HR

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			03/12/15	08:00
3.50	3.00	DRY	03/12/15	18:00
3.50	3.00	DRY	04/12/15	08:00
5.50	4.50	DRY	04/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
Water was added to assist boring between 3.50m and 4.00m.
Backfill details from base of hole: bentonite seal up to 0.15m, tarmacadam up to ground level.
Chiselling: 4.00-5.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Cable Percussion*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	CT6	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389161.9 E 390271.3 N
Ground Level	42.60 m OD	Scale	1:50

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	Description	Depth	Legend	Level m OD
						G.L.		42.60
					MADE GROUND: Black tarmacadam.	0.05		42.55
					MADE GROUND: Black/brown sandy angular to subangular fine to coarse gravel of brick, ash, and concrete. At 0.50m, brick obstruction.	0.50		42.10
					End of Borehole			

Boring / Progress / Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.50	0.40	Inspection Pit	HR	G.L.			07/12/15	08:00						None encountered.
				0.50			07/12/15	18:00						

Remarks

The Borehole was terminated at a depth of 0.50m within the inspection pit upon encountering a brick obstruction.The rig was moved to BHCT6A.
Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Figure 1 of 1
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BOREHOLE RECORD - Cable Percussion

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	CT6A
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389162.2 E 390271.7 N	Ground Level	42.59 m OD

Sampling | Properties | Strata | Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %		Description	Depth	Legend	Level m OD
							G.L.		42.59
						MADE GROUND: Black tarmacadam.	0.05		42.54
						MADE GROUND: Black sandy angular to subangular fine to coarse gravel of ash, concrete and brick.	0.95		41.64
						MADE GROUND: Metal plate.	1.00		41.59
						End of Borehole			

Boring | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.00	0.40	Inspection Pit	HR	G.L.			07/12/15	08:00						None encountered.
				1.00			07/12/15	18:00						

Remarks

The Borehole was terminated at a depth of 1.00m within the inspection pit upon encountering a metal plate obstruction.The rig was moved to BHCT6B.
Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Cable Percussion*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	CT6B	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389163.5 E 390271.4 N
Ground Level	42.66 m OD	Scale	1:50

Sampling: Depth	Sample Type	Depth Cased & (to Water)	Properties: Strength kPa	w %	SPT N	Strata: Description	Depth	Legend	Level m OD
						MADE GROUND: Black tarmacadam.	G.L. 0.05		42.66 42.61
						MADE GROUND: Loose to medium dense dark brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High cobble content and a high boulder content.			
1.20- 1.65	D				S27				
2.00- 2.45	D	2.00 (DRY)			S6	At 2.00m, loose.			
3.00- 3.45	D	3.00 (DRY)			S50	At 3.00m, dense.			
4.00- 4.31	D	4.00 (DRY)			S50/ 160	Extremely weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	4.00		38.66
5.00- 5.14	D	4.00 (DRY)			S50/50				
						End of Borehole	5.50		37.16

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	HR
5.50	0.15	Cable Percussion	HR

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			07/12/15	09:00
5.50	4.00	DRY	07/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks: Inspection pit hand excavated to 1.20m depth.
Water was added to assist boring between 4.00m and 5.00m.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Cable Percussion

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389156.2 E 390263.3 N
Borehole	CT7	Project No	PN153428
Ground Level	42.75 m OD	Scale	1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		42.75
						MADE GROUND: Black tarmacadam.	0.10		42.65
						MADE GROUND: Yellowish brown sandy fine to coarse angular gravel of limestone (Sub base).	0.15		42.60
						MADE GROUND: Concrete.	0.30		42.45
						MADE GROUND: Loose dark brown sandy angular to subangular fine to coarse gravel of brick, concrete and ash. High cobble content and a high boulder content.			
1.20- 1.65	D				S4				
2.00- 2.45	D	1.50 (DRY)			S5				
3.00- 3.45	D	3.00 (DRY)			S30	At 3.00m, medium dense/dense.			
						Extremely weak to very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).	3.80		38.95
4.00- 4.15	D	4.00 (DRY)			S50/75				
5.00- 5.15	D	4.50 (DRY)			S50/75				
						End of Borehole	5.50		37.25

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	HR
5.50	0.15	Cable Percussion	HR

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			04/12/15	08:00
5.50	4.50	DRY	04/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
Water was added to assist boring between 4.00m and 5.00m.
Backfill details from base of hole: bentonite seal up to 0.10m, tarmacadam up to ground level.
Chiselling: 4.00-5.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Cable Percussion*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	CT8
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389163.8 E 390266.4 N	Ground Level	42.72 m OD

Sampling | Properties | Strata | Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		42.72
						MADE GROUND: Black tarmacadam.	0.05		42.67
						MADE GROUND: Loose dark brown sandy fine to coarse angular to subangular gravel of brick, concrete and ash. High cobble content and a high boulder content.			
1.20- 1.65	D				S4				
2.00- 2.45	D	1.50 (DRY)			S31	Boulder of dark red fine to medium grained sandstone.			
3.00- 3.15	D	3.00 (DRY)			S50/75	At 3.00m, very dense.			
4.00- 4.17	D	4.00 (DRY)			S50/85				
5.00- 5.15	D	4.50 (DRY)			S50/75		5.00		37.72
						Very weak dark red fine to medium grained SANDSTONE (recovered as silty sand).			
6.00- 6.15	D	4.50 (DRY)			S50/75				
							6.50		36.22
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	HR
6.50	0.15	Cable Percussion	HR

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			07/12/15	08:00
1.20		DRY	07/12/15	18:00
1.20		DRY	08/12/15	08:00
6.50	4.50	DRY	08/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS

Inspection pit hand excavated to 1.20m depth.
Backfill details from base of hole: bentonite seal up to 0.30m, gravel filter up to 0.20m, tarmacadam up to ground level.
Chiselling: 3.00-3.50m for 60 minutes and 5.00-6.00m for 60 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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APPENDIX 3

Rotary Core Photographs

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH101 4.80m - 9.30m

BH101 9.30m - 15.30m

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH102 5.00m - 8.54m

BH102 8.54m - 12.70m

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH102 12.70m - 14.70m

BH103 4.80 - 7.20

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH103 7.20 - 10.20

BH103 10.20 - 14.70

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH104 5.00 - 8.85

BH104 8.85 - 15.00

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH105 4.50-8.30

BH105 8.30 - 14.35

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH105 14.35 - 15.20

BH106 3.40 - 6.90

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH106 6.90 - 12.40

BH106 12.40 - 15.00

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH107 4.00 - 8.00

BH108 6.50m - 8.80m

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PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH108 8.80m - 11.80m

BH108 11.80m - 14.80m

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH108 14.80m - 17.80m

BH108 17.80m - 22.30m

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH109 5.20m - 12.20m

BH109 12.20m - 16.50m

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH109 16.90m - 19.70m

BH109 19.70m - 20.70m

PHOTOGRAPHS

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH112 5.50m - 7.30m

BH112 7.30m - 10.30m

Project Number : PN153428

Project : STOCKPORT BUS STATION

BH112 10.30m - 14.80m

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APPENDIX 4

Trial Pit Records & Sketches

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike ∇

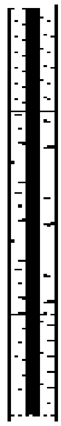
Depth Water Rose To ▼

Instrumentation

Seal

Filter

Seal



Strata — Legend

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

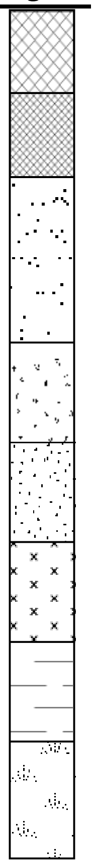
Gravel

Sand

Silt

Clay

Peat



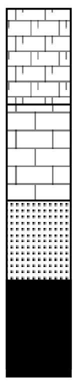
Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

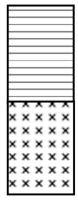
Coal



Strata, Continued

Mudstone

Siltstone

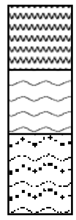


Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

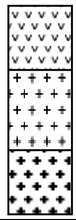


Igneous Rock

Fine Grained

Medium Grained

Coarse Grained



Backfill Materials

Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

TRIAL PIT RECORD *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	HP01
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389288.6 E 390260.6 N	Ground Level	48.58 m OD

Samples and Tests | Strata | Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		48.58
				MADE GROUND: Black tarmacadam.	0.10		48.48
0.20- 0.50	B			MADE GROUND: Dark brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick and concrete.			
0.20	ES						
0.50- 1.00	B						
0.50	ES						
1.00	ES						
					1.20		47.38
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.40
Date	09/12/2015	Length (C)	0.40
Shoring	None.	Date Backfilled	09/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks AGS ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars

Logged by NM

Figure 1 of 1

11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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TRIAL PIT RECORD — *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	HP02
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389310.6 E 390281.3 N	Ground Level	52.84 m OD

Samples and Tests

Depth	Type	Stratum No	Results
0.20	ES		
0.20- 0.30	ES		
0.30- 0.60	B		
0.50	ES		
0.60- 1.00	B		
1.00	ES		

Strata (Scale 1:50)

Description	Depth	Legend	Level m OD
	G.L.		52.84
MADE GROUND: Black tarmacadam.	0.10		52.74
MADE GROUND: Brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	0.30		52.54
MADE GROUND: Light brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of sandstone, concrete and brick.	0.60		52.24
MADE GROUND: Dark brown to grey clayey gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	1.20		51.64
End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.40
Date	09/12/2015	Length (C)	0.40
Shoring	None.	Date Backfilled	09/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks

ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars

Logged by NM

Figure 1 of 1

11/03/2016

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Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

TRIAL PIT RECORD — *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP1
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389129.8 E 390307.0 N	Ground Level	42.25 m OD

Samples and Tests — **Strata** — Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		42.25
0.20	ES			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies, brick, timber, plastic and ceramic.			
0.50	ES				0.65		41.60
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.50
Date	14/12/2015	Length (C)	1.00
Shoring	None.	Date Backfilled	14/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks

ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.
The inspection pit was terminated at 0.65m upon encountering concrete.
Backfill details from base of hole: arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1

11/03/2016

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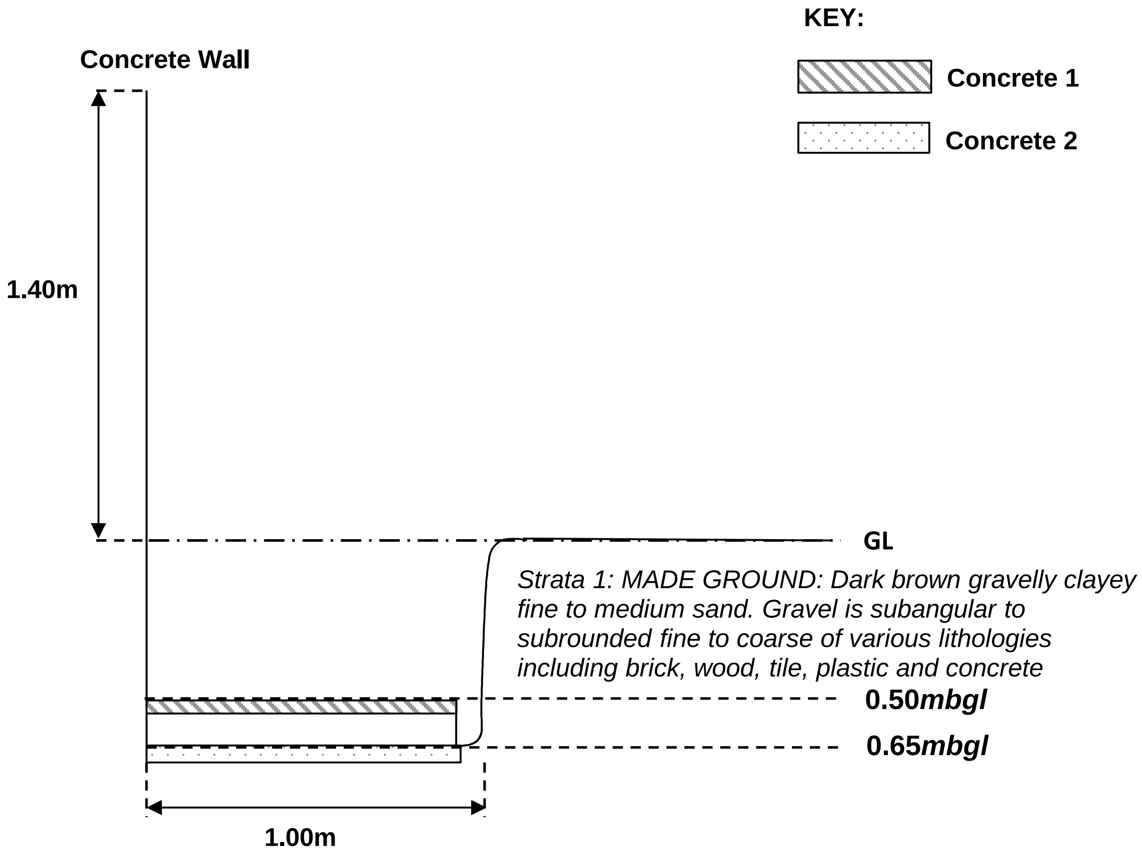


All dimensions in metres, unless othewise stated

TP1

NOT TO SCALE

All Measurements in Metres

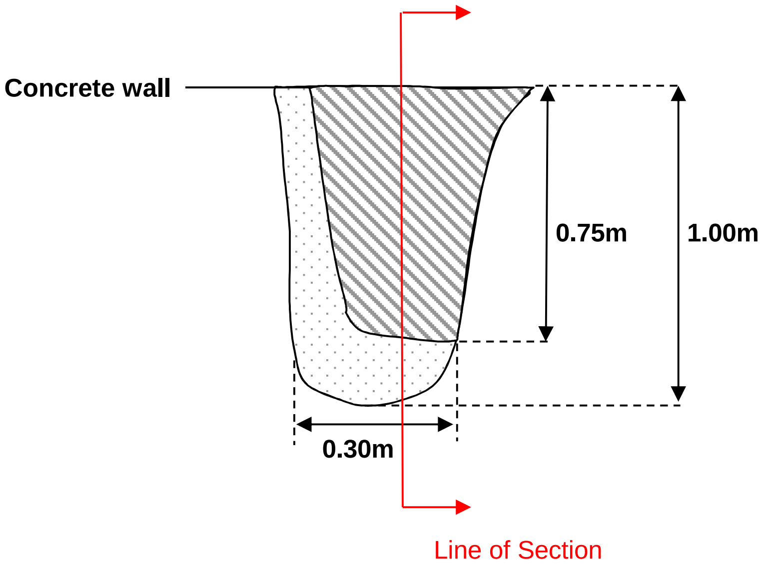
All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Cross-section
Excavated:	14.12.2015
Drawn by:	NM
Date:	14.12.2015
Contact:	NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N^{o}	TP1(2)



KEY:

Concrete 2

Concrete 1

All dimensions in metres, unless othewise stated

TP1

NOT TO SCALE

All Measurements in Metres

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Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Plan
Excavated:	14.12.2015
Drawn by:	NM
Date:	14.12.2015
Contact:	NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N^{o}	TP1(1)

TRIAL PIT RECORD *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP2
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389138.2 E 390302.5 N	Ground Level	42.09 m OD

Samples and Tests | Strata | Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		42.09
0.20	ES			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.			
0.50	ES						
1.00	ES						
					1.10		40.99
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.65
Date	14/12/2015	Length (C)	0.45
Shoring	None.	Date Backfilled	14/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Logged by NM

Figure 1 of 1
11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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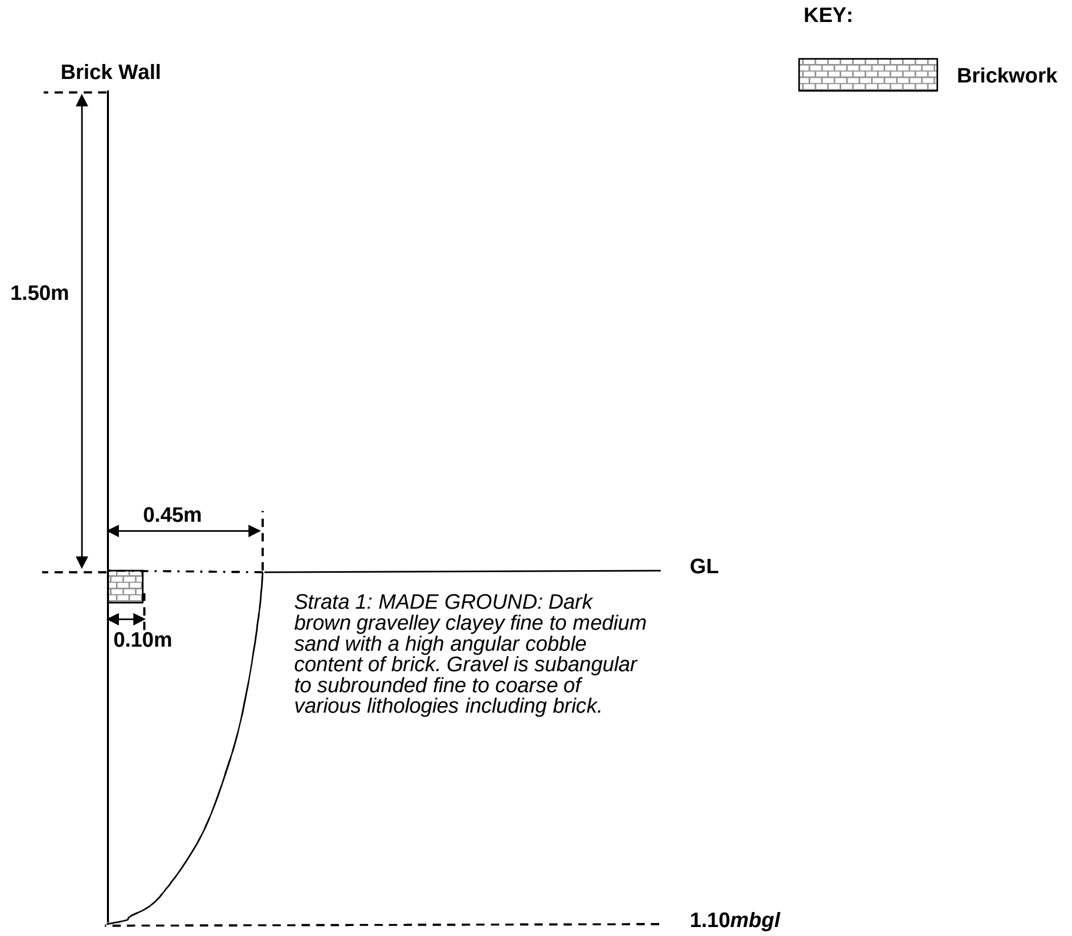


All dimensions in metres, unless othewise stated

NOT TO SCALE

All Measurements in Metres

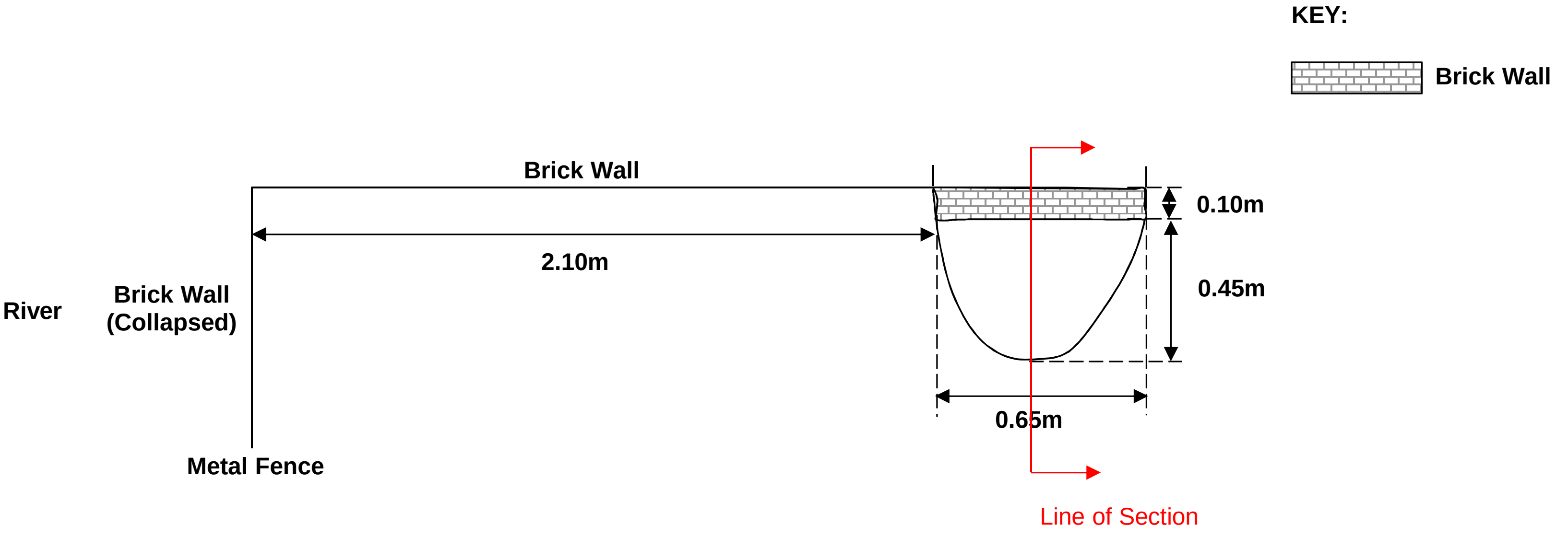
All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Cross-Section
Excavated:	14.12.2015
Drawn by:	NM
Date:	14.12.2015
Contact:	NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N° TP2(2)



All dimensions in metres, unless othewise stated

TP2

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client: TFGM

Project: Stockport Bus Station

Project No: PN153428

Title: Foundation Pit Record

View: Plan

Excavated: 14.12.2015

Drawn by: NM

Date: 14.12.2015

Contact: NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

Nº TP2(1)

TRIAL PIT RECORD — *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Trial Pit**	**TP3**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389145.5 E 390305.3 N	Ground Level	42.07 m OD

Samples and Tests / Strata — Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		42.07
0.20	ES			MADE GROUND: Black tarmacadam.	0.30		41.77
0.50	ES			MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies.	0.50		41.57
0.85	ES			MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of granite, concrete, timber and plastic.	0.85		41.22
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.50
Date	11/12/2015	Length (C)	0.50
Shoring	None.	Date Backfilled	11/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Symbols and abbreviations are explained on the accompanying key sheet.

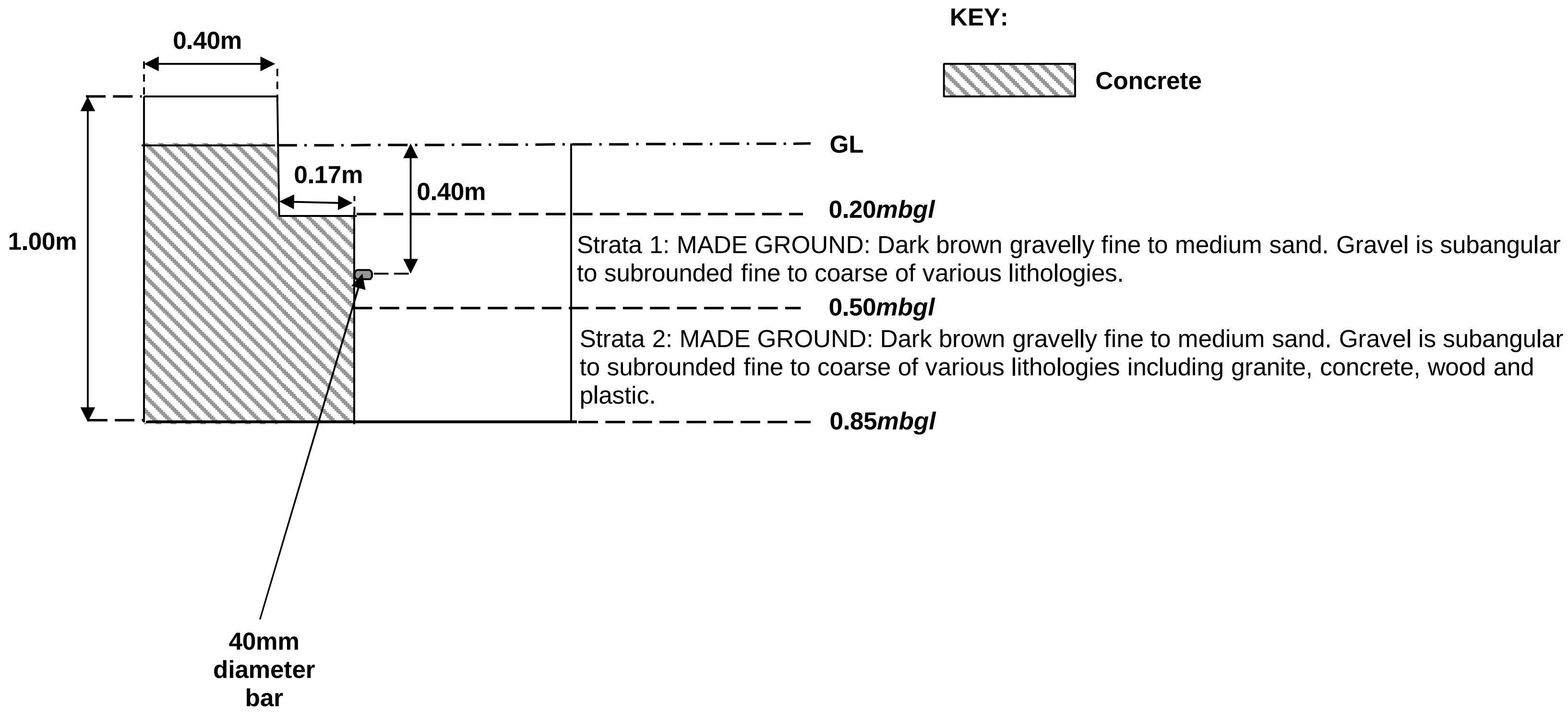
All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1

11/03/2016



All dimensions in metres, unless othewise stated

TP3

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client: TFGM

Project: Stockport Bus Station

Project No: PN153428

Title: Foundation Pit Record

View: Cross-Section

Excavated:	11.12.2015
Drawn by:	NM
Date:	11.12.2015
Contact:	NMisyris@geotechnics.co.uk

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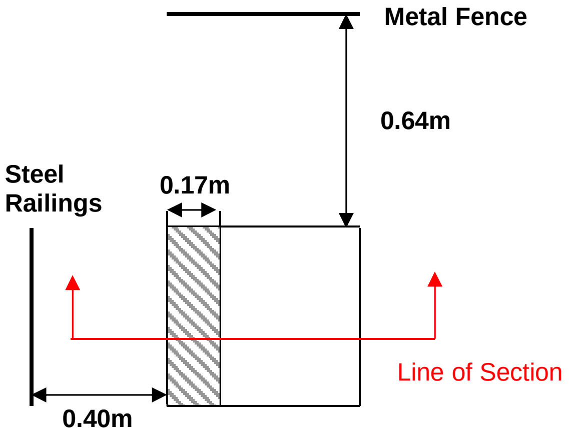
The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

N^o TP3(2)



KEY:

Concrete

All dimensions in metres, unless othewise stated

TP3

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Plan
Excavated:	11.12.2015
Drawn by:	NM
Date:	11.12.2015
Contact:	NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N° TP3(1)

TRIAL PIT RECORD *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP4
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389151.2 E 390306.7 N	Ground Level	42.12 m OD

Samples and Tests | Strata | Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		42.12
				MADE GROUND: Black tarmacadam.	0.10		42.02
0.20	ES			MADE GROUND: Black sandy angular to subangular fine to coarse gravel of brick and concrete. Ash present.			
0.50	ES						
					0.80		41.32
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.46
Date	09/12/2015	Length (C)	0.40
Shoring	None.	Date Backfilled	09/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks

The inspection pit was terminated at 0.80m upon encountering concrete.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 1

11/03/2016

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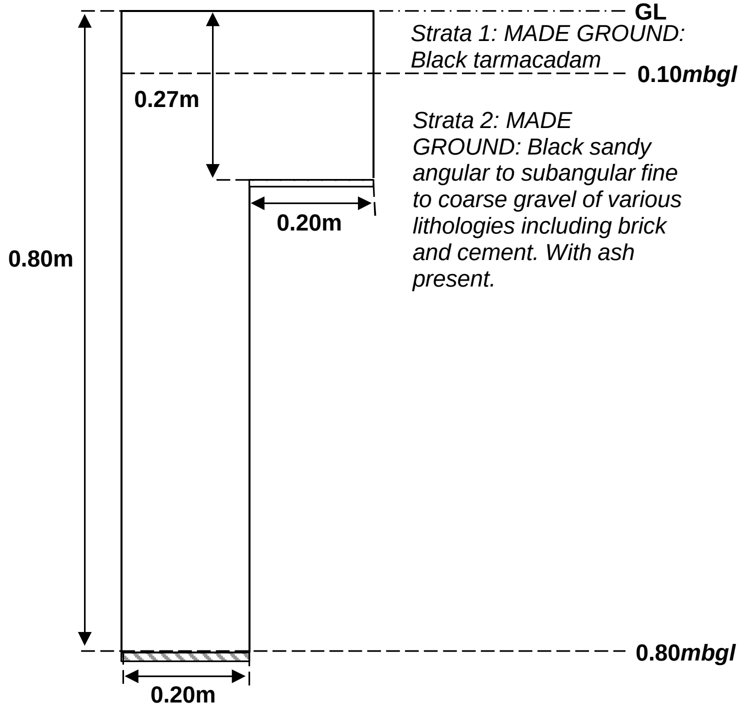


KEY:

Concrete 1

Concrete 2

All dimensions in metres, unless othewise stated

TP4

NOT TO SCALE

All Measurements in Metres

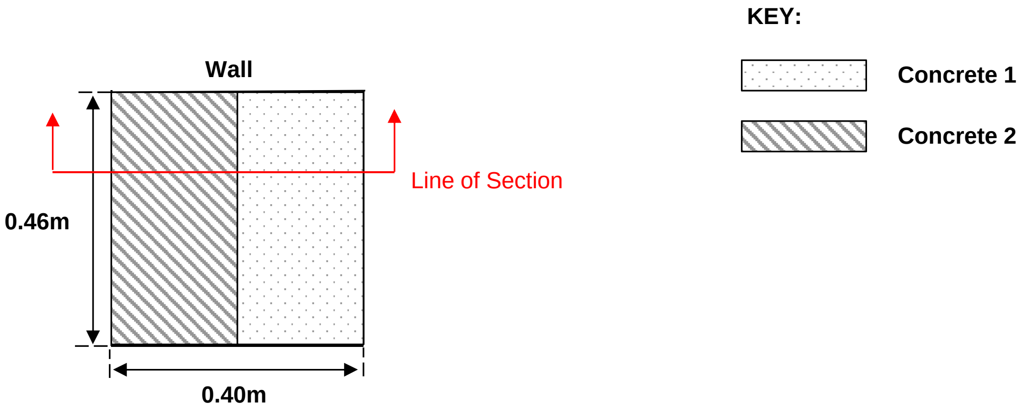
All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Cross-Section
Excavated:	09.12.2015
Drawn by:	GT
Date:	09.12.2015
Contact:	GTeasdale@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N° TP4(2)



All dimensions in metres, unless othewise stated

TP4

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Plan
Excavated:	09.12.2015
Drawn by:	GT
Date:	09.12.2015
Contact:	GTeasdale@geotechnics.co.uk

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The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N^{o}	TP4(1)

TRIAL PIT RECORD
Inspection Pit

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP5
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	Grid Coordinates	389148.6 E 390317.5 N	Ground Level	42.16 m OD

Samples and Tests

Depth	Type	Stratum No	Results
0.20	ES		
0.50	ES		
1.00	ES		

Strata — Scale 1:50

Description	Depth	Legend	Level m OD
	G.L.		42.16
MADE GROUND: Black tarmacadam.	0.08		42.08
MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolerite.	0.14		42.02
MADE GROUND: Black gravelly fine to coarse sand. Gravel is angular and fine to coarse of brick.	0.90		41.26
MADE GROUND: Firm brown slightly sandy slightly gravelly clay. Gravel is angular and fine to coarse of brick fragments.	1.20		40.96
End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.40
Date	09/12/2015	Length (C)	0.35
Shoring	None.	Date Backfilled	09/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Logged by GT

Figure 1 of 1

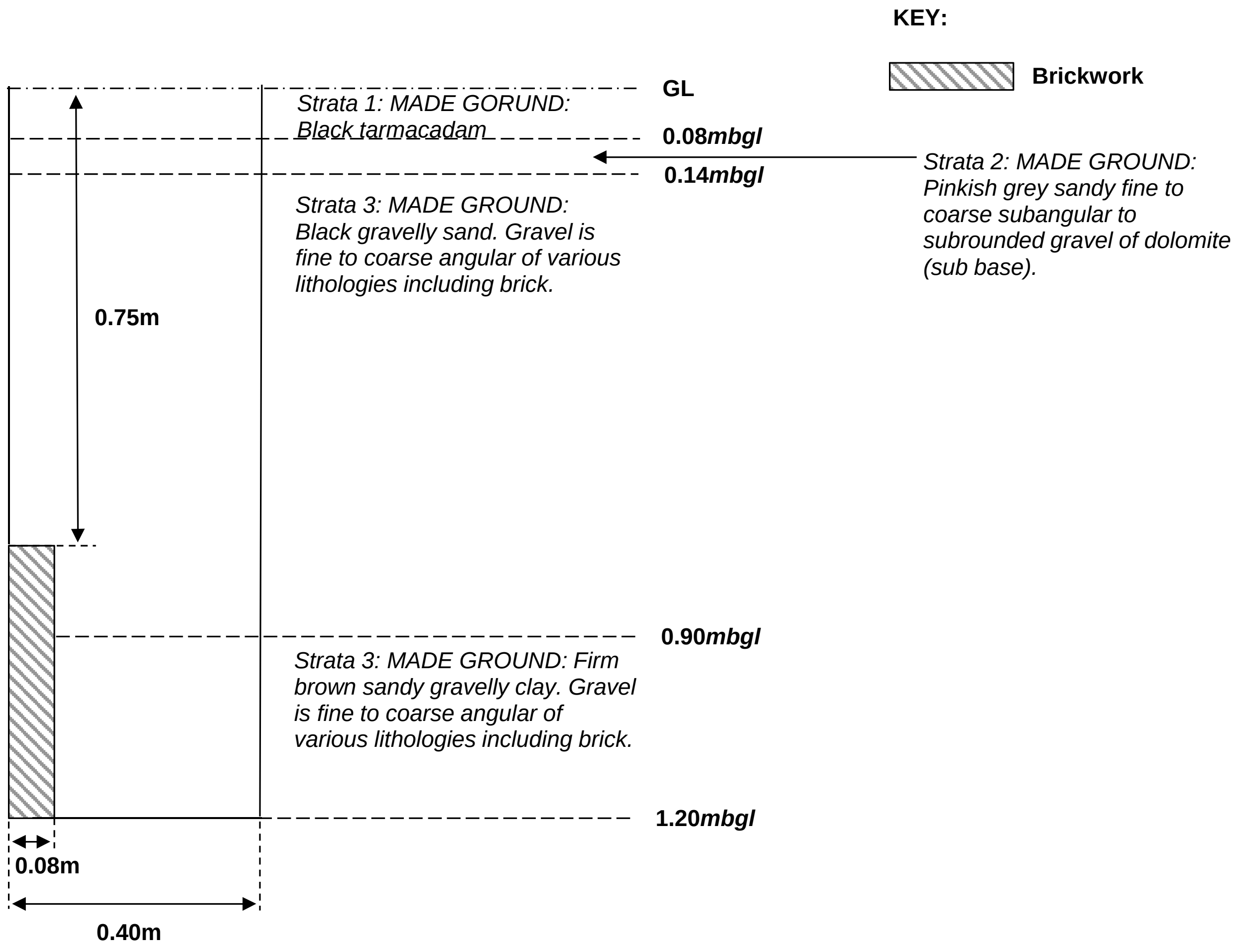
11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

geotechnics



All dimensions in metres, unless othewise stated

TP5

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client: TFGM

Project: Stockport Bus Station

Project No: PN153428

Title: Foundation Pit Record

View: Cross-Sectional

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

Contact: GTeasdale@geotechnics.co.uk

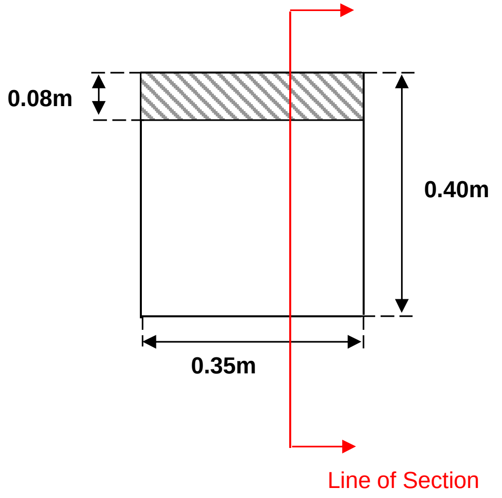
geotechnics

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

N^o TP5(2)



KEY:

Brickwork

All dimensions in metres, unless othewise stated

TP5

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Plan
Excavated:	15.12.2015
Drawn by:	GT
Date:	15.12.2015
Contact:	GTeasdale@geotechnics.co.uk

geotechnics

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N^{o}	TP5(1)

TRIAL PIT RECORD *Inspection Pit*

Project **STOCKPORT BUS STATION** Engineer **AECOM** **Trial Pit** **TP6A**
Project No **PN153428**

Client **TRANSPORT FOR GREATER MANCHESTER**

Samples and Tests				Strata			Scale 1:50
Depth	Type	Stratum No	Results	Description	Depth	Legend	
					G.L.		
				MADE GROUND: Black tarmacadam.	0.20		
				MADE GROUND: Intact brickwork.	0.30		
0.50	ES			MADE GROUND: Light brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	0.60		
1.00	ES			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	1.25		
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.30
Date	15/12/2015	Length (C)	0.35
Shoring	None.	Date Backfilled	15/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks AGS **ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars.**
The excavation was subsequently extended and presented as TP6B.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by **NM**

Figure **1 of 1**

11/03/2016

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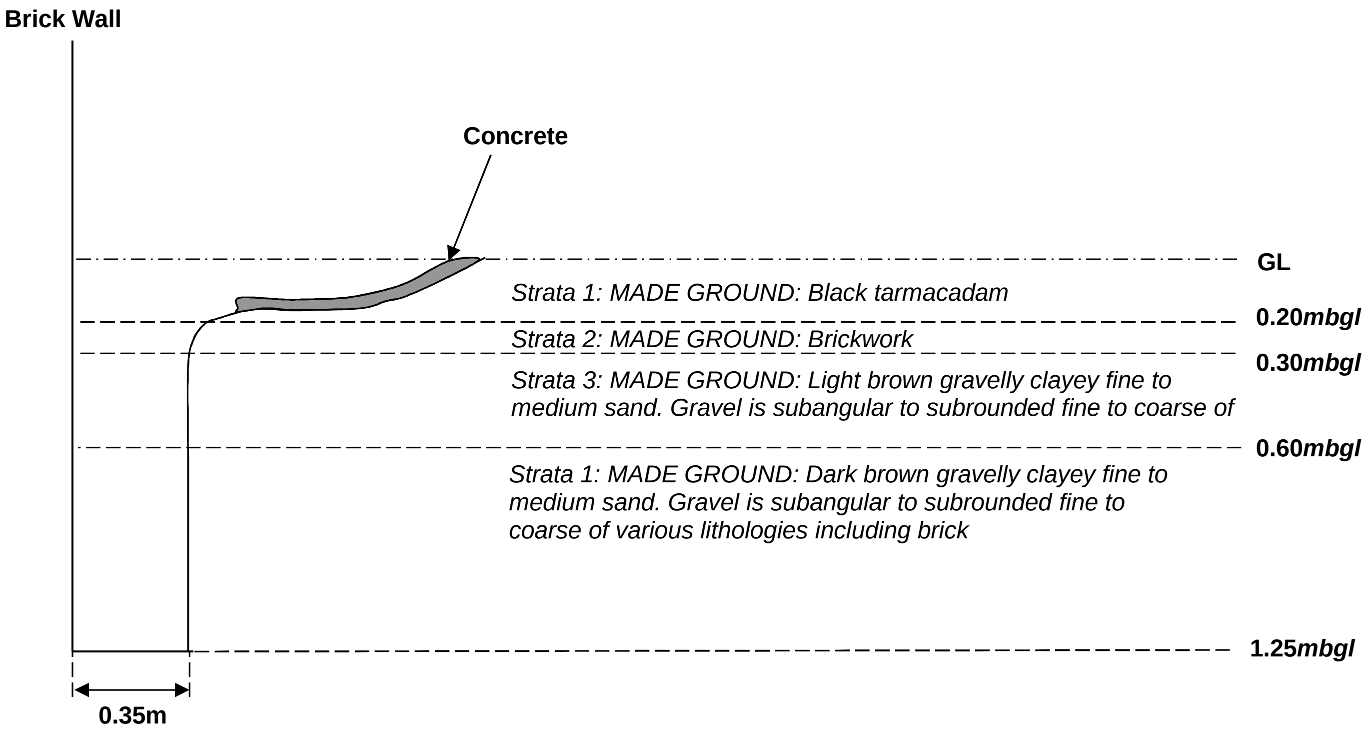


All dimensions in metres, unless othewise stated

TP6a

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

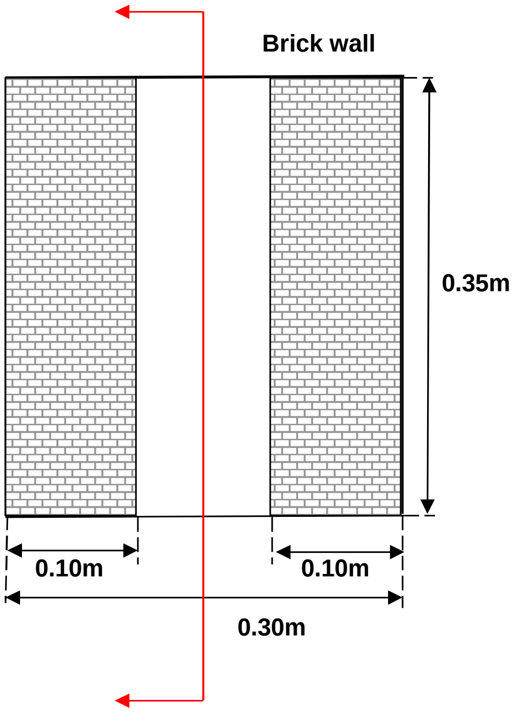
Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Cross-Section
Excavated:	15.12.2015
Drawn by:	NM
Date:	15.12.2015
Contact:	NMisyris@geotechnics.co.uk

geotechnics

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel.	01244 671117
Fax.	01244 671122

N^{o}	TP6a(2)



All dimensions in metres, unless othewise stated

TP6a

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Plan
Excavated:	15.12.2015
Drawn by:	NM
Date:	15.12.2015
Contact:	NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel.	01244 671117
Fax.	01244 671122

N^{o}	TP6a(1)

TRIAL PIT RECORD *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP6B
Client	TRANSPORT FOR GREATER MANCHESTER			Project No	PN153428

Samples and Tests | **Strata** | Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend
					G.L.	
0.10	ES			MADE GROUND: Black tarmacadam.	0.10	
				MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolerite.	0.24	
				MADE GROUND: Black tarmacadam.	0.35	
				MADE GROUND: Grey sandstone paving slab.	0.40	
				End of Excavation		

Excavation

Plant	Hand Tools	Width (B)	0.70
Date	15/12/2015	Length (C)	5.65
Shoring	None.	Date Backfilled	15/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks

ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.
The excavation is an extension to TP6A.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 1
11/03/2016

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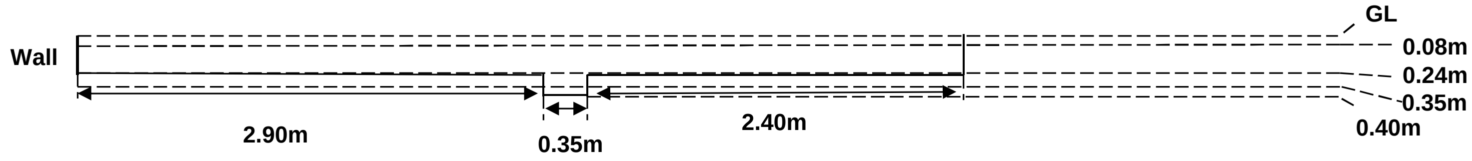


KEY:

GL

Strata 1: MADE GROUND: Black tarmacadam

0.08m

Strata 2: MADE GROUND: Pinkish grey sandy subangular to subrounded fine to coarse gravel of dolomite (sub base).

0.24m

Strata 3: MADE GROUND: Black tarmacadam

0.35m

Strata 4: MADE GROUND: Grey sandstone paving slab.

0.40m

All dimensions in metres, unless othewise stated

TP6b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client: TFGM

Project: Stockport Bus Station

Project No: PN153428

Title: Foundation Pit Record

View: Cross-Section

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

Contact: GTeasdale@geotechnics.co.uk

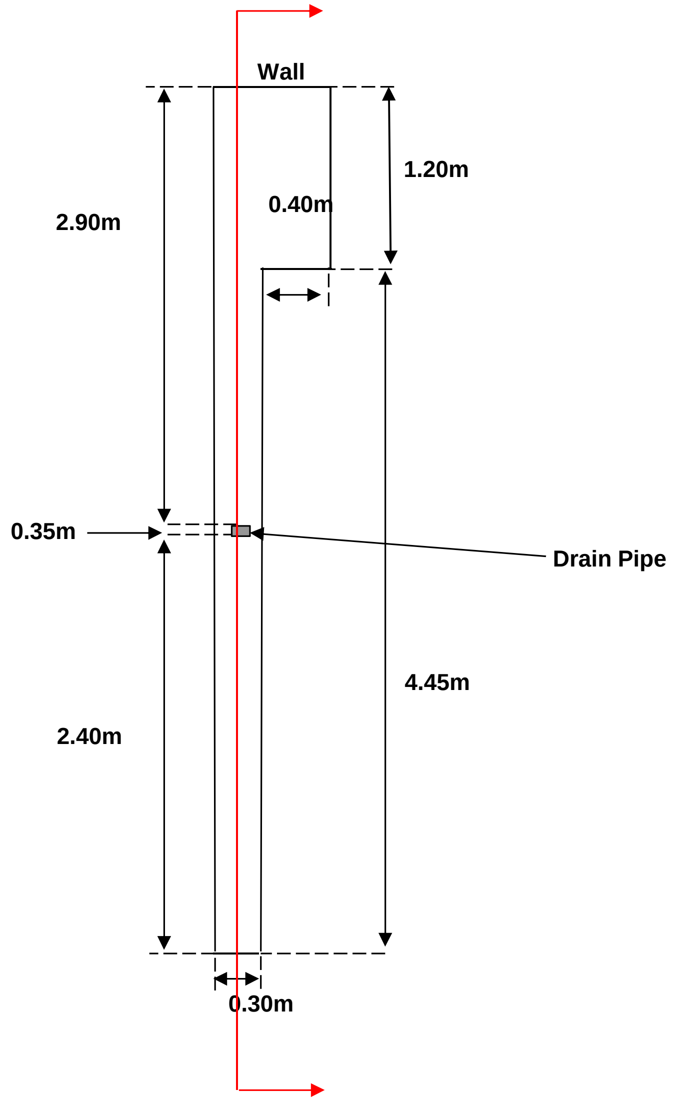
geotechnics

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

N° TP6b(2)



All dimensions in metres, unless othewise stated

TP6b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Cross-Section
Excavated:	15.12.2015
Drawn by:	GT
Date:	15.12.2015
Contact:	GTeasdale@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel.	01244 671117
Fax.	01244 671122

N°	TP6b(1)

TRIAL PIT RECORD *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP7A
Client	TRANSPORT FOR GREATER MANCHESTER			Project No	PN153428

Samples and Tests / **Strata** — Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend
					G.L.	
				MADE GROUND: Black tarmacadam.	0.20	
				MADE GROUND: Grey concrete.	0.35	
0.50	ES			MADE GROUND: Dark brown gravelly clayey fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick and concrete.		
1.00	ES				1.30	
				End of Excavation		

Excavation

Plant	Hand Tools	Width (B)	0.50
Date	15/12/2015	Length (C)	0.30
Shoring	None.	Date Backfilled	15/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details

Remarks

ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.
The excavation was subsequently extended and presented as TP7B.

Symbols and abbreviations are explained on the accompanying key sheet.

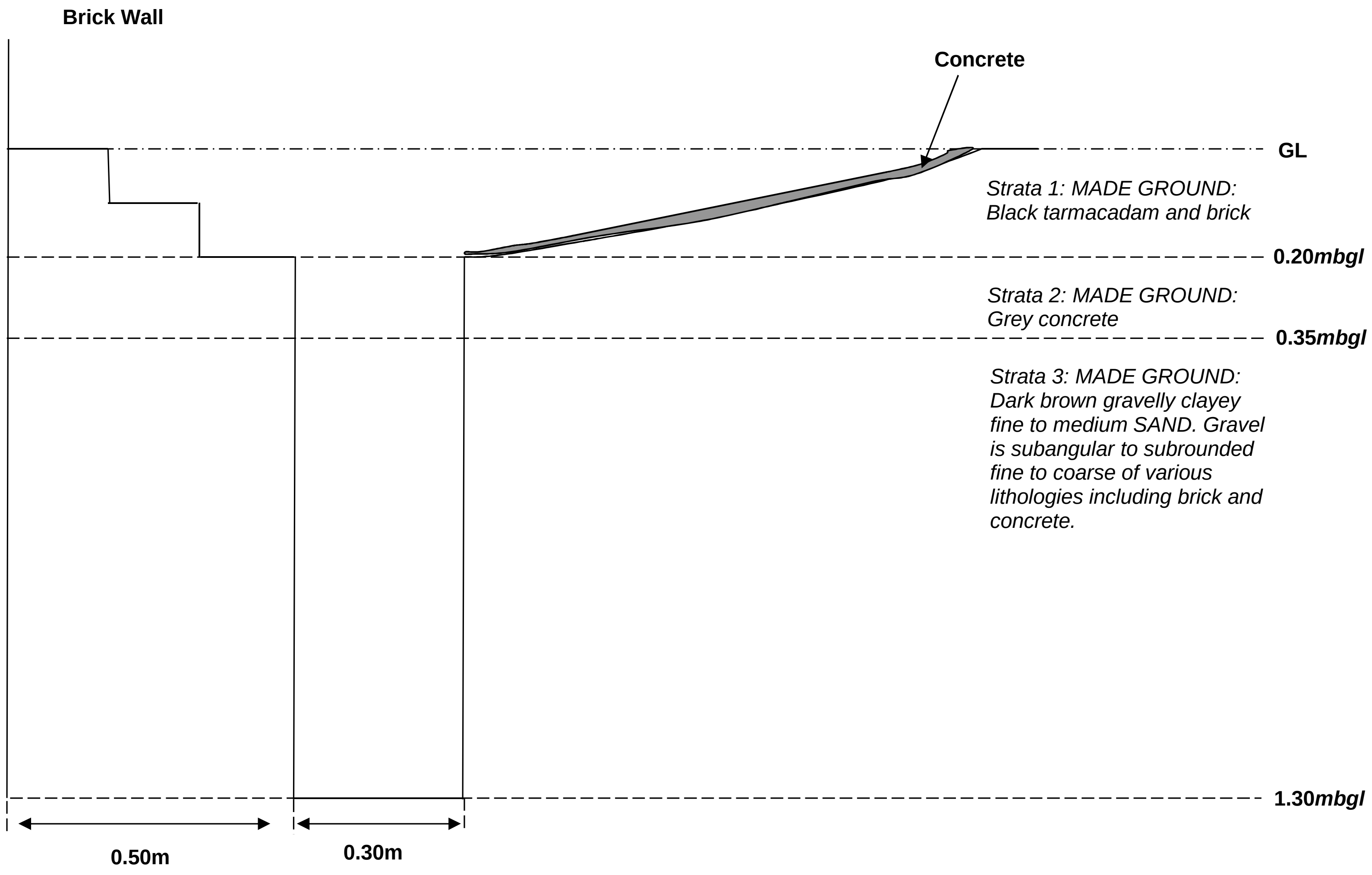
All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1

11/03/2016



All dimensions in metres, unless othewise stated

TP7a

NOT TO SCALE

All Measurements in Metres

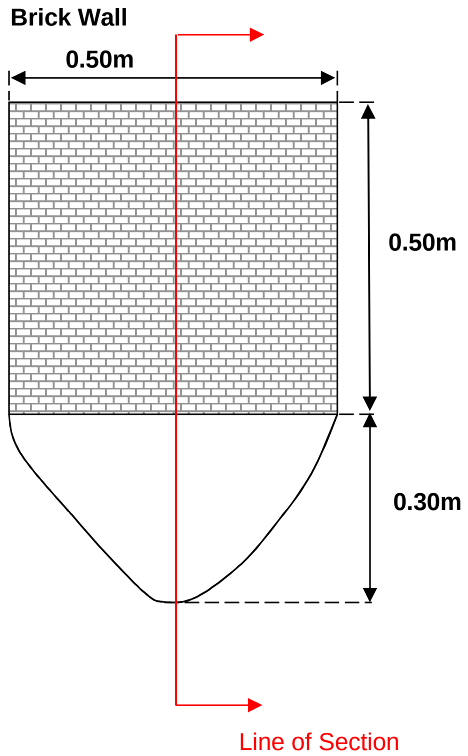
All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Cross-Section
Excavated:	15.12.2015
Drawn by:	NM
Date:	15.12.2015
Contact:	NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N^{o}	TP7a(2)



KEY:

Brickwork

All dimensions in metres, unless othewise stated

TP7a

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client: TFGM

Project: Stockport Bus Station

Project No: PN153428

Title: Foundation Pit Record

View: Plan View

Excavated: 15.12.2015

Drawn by: NM

Date: 15.12.2015

Contact: NMisyris@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

N° TP7a(1)

TRIAL PIT RECORD *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP7B
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER				

Samples and Tests / **Strata** — Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend
					G.L.	
0.10	ES			MADE GROUND: Black tarmacadam.	0.08	
				MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolerite. At 0.24, refusal on black tarmacadam.	0.33	
				End of Excavation		

Excavation

Plant	Hand Tools	Width (B)	0.70
Date	15/12/2015	Length (C)	3.00
Shoring	None.	Date Backfilled	15/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks AGS

ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.
The excavation is an extension to TP7A.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 1

11/03/2016

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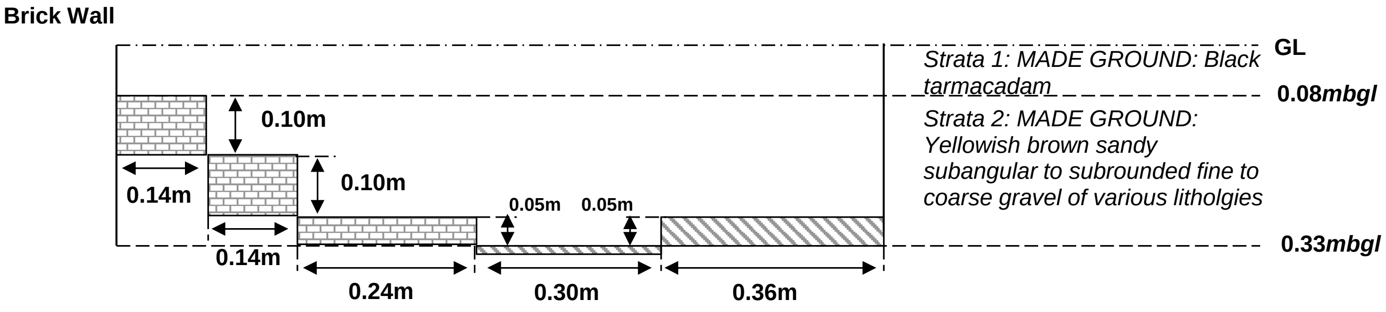

KEY:

Brickwork

Concrete

All dimensions in metres, unless othewise stated

TP7b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Cross-Section
Excavated:	15.12.2015
Drawn by:	GT
Date:	15.12.2015
Contact:	GTeasdale@geotechnics.co.uk

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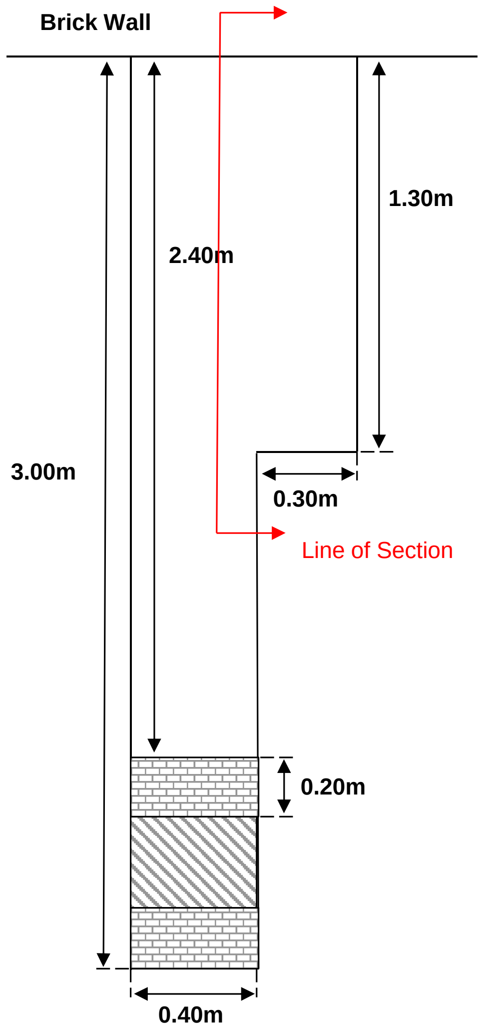
The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

Nº TP7b(2)



KEY:

Brickwork

Concrete base

All dimensions in metres, unless othewise stated

TP7b

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client: TFGM

Project: Stockport Bus Station

Project No: PN153428

Title: Foundation Pit Record

View: Plan

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

Contact: GTeasdale@geotechnics.co.uk

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The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

N° TP7b(1)

TRIAL PIT RECORD

Inspection Pit

Project	STOCKPORT BUS STATION	Engineer	AECOM	Trial Pit	TP8
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389165.3 E 390276.6 N	Ground Level	42.80 m OD

Samples and Tests / **Strata** — Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		42.80
0.20	ES			MADE GROUND: Black organic gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of brick. Ash present.	0.50		42.30
0.50	ES			MADE GROUND: Blackish brown sandy angular to subangular fine to coarse gravel of clinker. Ash present.	0.80		42.00
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.35
Date	15/12/2015	Length (C)	1.25
Shoring	None.	Date Backfilled	15/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks AGS

ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A drawing of the excavation is presented separately.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by GT

Figure 1 of 1

11/03/2016

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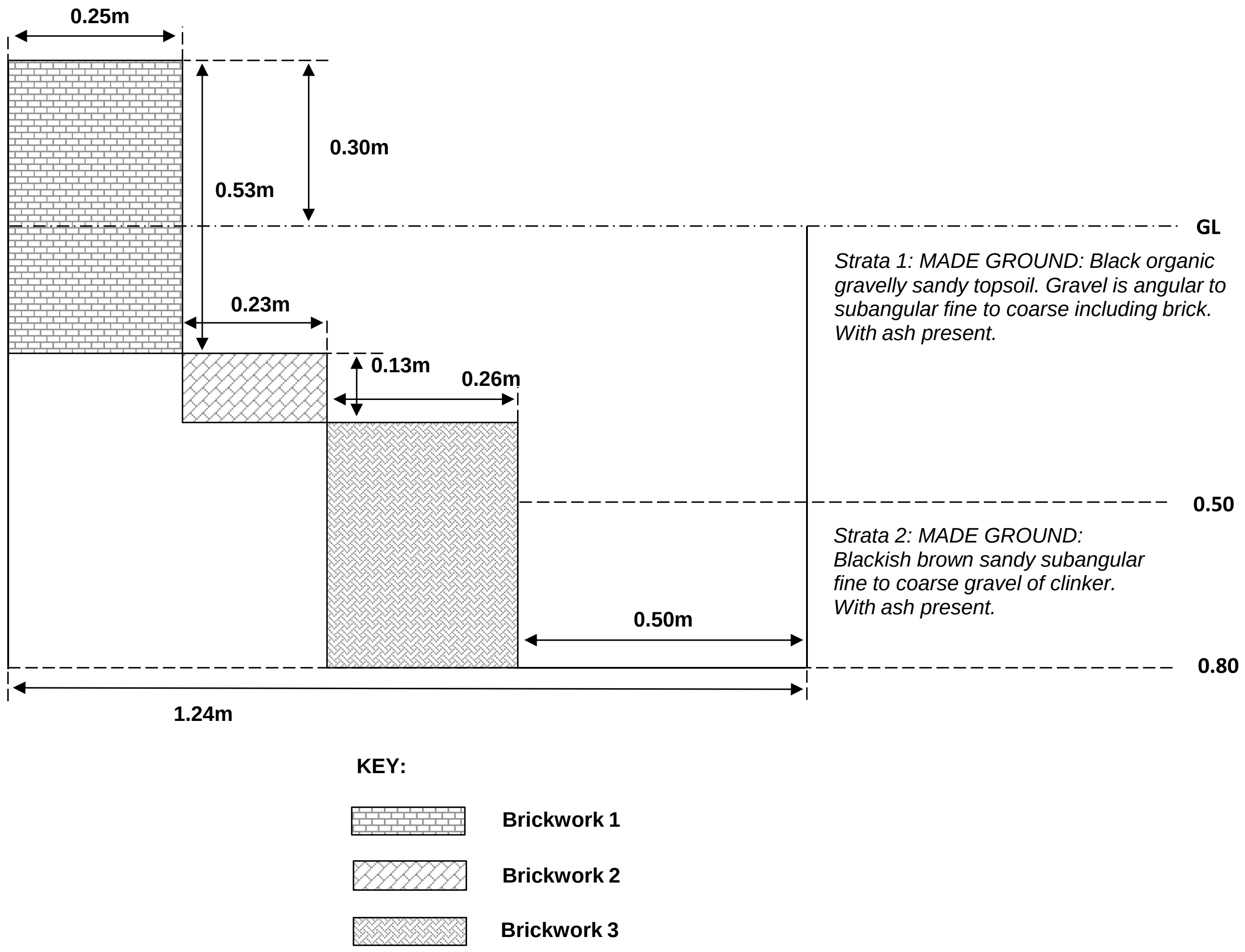


All dimensions in metres, unless othewise stated

TP8

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client: TFGM

Project: Stock port Bus Station

Project No: PN153428

Title: Foundation Pit Record

View: Cross-Section

Excavated: 15.12.2015

Drawn by: GT

Date: 15.12.2015

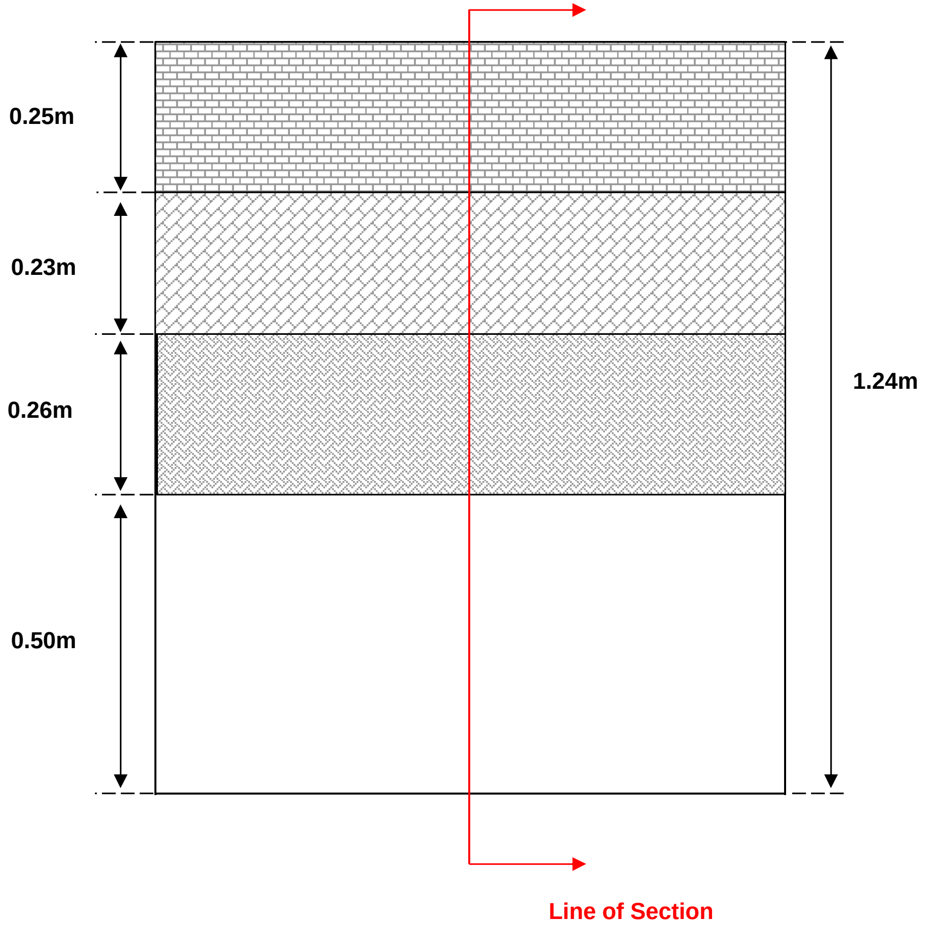
Contact: GTeasdale@geotechnics.co.uk

The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117

Fax. 01244 671122

Nº TP8(2)



KEY:

- Brickwork 1
- Brickwork 2
- Brickwork 3

All dimensions in metres, unless othewise stated

TP8

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:	TFGM
Project:	Stockport Bus Station
Project No:	PN153428
Title:	Foundation Pit Record
View:	Plan
Excavated:	15.12.2015
Drawn by:	GT
Date:	15.12.2015
Contact:	GTeasdale@geotechnics.co.uk

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The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel. 01244 671117
Fax. 01244 671122

N°	TP8(1)

TRIAL PIT RECORD *Inspection Pit*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Trial Pit**	**TP9**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389152.1 E 390264.4 N	Ground Level	42.79 m OD

Samples and Tests / **Strata** — Scale 1:50

Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		42.79
0.20	ES			MADE GROUND: Black tarmacadam.	0.08		42.71
				MADE GROUND: Yellowish brown sandy angular fine to coarse gravel of dolerite (sub base).	0.24		42.55
				End of Excavation			

Excavation

Plant	Hand Tools	Width (B)	0.35
Date	15/12/2015	Length (C)	3.50
Shoring	None.	Date Backfilled	15/12/2015
Stability	Stable during excavation.		

Groundwater

Depth Observed	Depth of Pit	Details
		None encountered.

Remarks AGS ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars

Logged by GT

Figure 1 of 1

11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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APPENDIX 5

Trial Pit Photographs

5

Project Number : PN153428

Project : Stockport Bus Station

TP1 - Photo A

TP1 - Photo B

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PHOTOGRAPHS

Project Number : PN153428

Project : Stockport Bus Station

TP2 - Photo A

TP2 - Photo B

Project Number : PN153428

Project : Stockport Bus Station


TP3 - Photo A


TP3 - Photo B

Project Number : PN153428

Project : Stockport Bus Station


TP4 - Photo A


TP4 - Photo B

Project Number : PN153428

Project : Stockport Bus Station

TP5 - Photo A

TP5 - Photo B

PHOTOGRAPHS

Project Number : PN153428

Project : Stockport Bus Station

TP6 - Photo A

TP6 - Photo B

Project Number : PN153428

Project : Stockport Bus Station

TP6 - Photo C

TP7 - Photo A

Project Number : PN153428

Project : Stockport Bus Station

TP7 - Photo B

TP8 - Photo A

TP8 - Photo B

TP9 - Photo A

Project Number : PN153428

Project : Stockport Bus Station

TP9 - Photo B

APPENDIX 6

Dynamic Probe Test Results

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike ∇

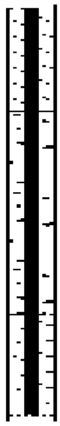
Depth Water Rose To ▼

Instrumentation

Seal

Filter

Seal



Strata — Legend

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

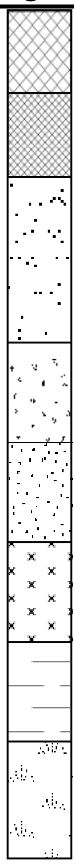
Gravel

Sand

Silt

Clay

Peat



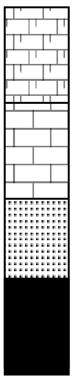
Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

Coal



Strata, Continued

Mudstone

Siltstone

Metamorphic Rock

Fine Grained

Medium Grained

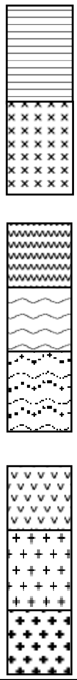
Coarse Grained

Igneous Rock

Fine Grained

Medium Grained

Coarse Grained



Backfill Materials

Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

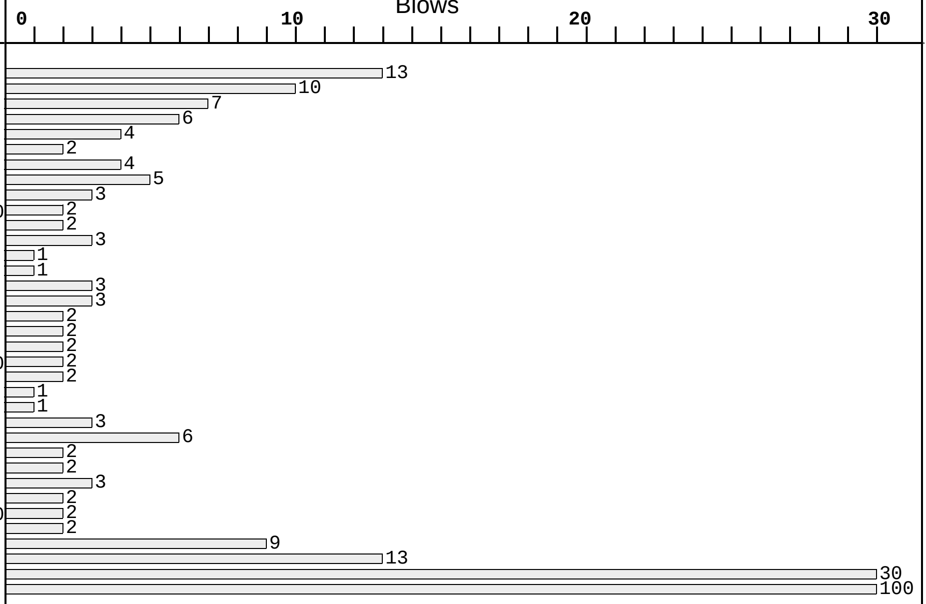
DYNAMIC PROBE RECORD - *Super Heavy*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**DP1**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389135.6 E 390312.5 N	Ground Level	42.30 m OD

Testing

Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
		13 10 7 6 4 2 4 5 3 2	41.3	1.00
		2 3 1 1 3 3 2 2 2 2	40.3	2.00
		2 1 1 3 6 2 2 3 2 2	39.3	3.00
		2 9 13 30 100		
			38.3	4.00
			37.3	5.00
			36.3	6.00
			35.3	7.00
			34.3	8.00
			33.3	9.00
			32.3	10.00



Probing

Depth	Dia	Technique	Crew
3.45	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			17/12/15	08:00
3.45		DRY	17/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Figure 1 of 1

11/03/2016

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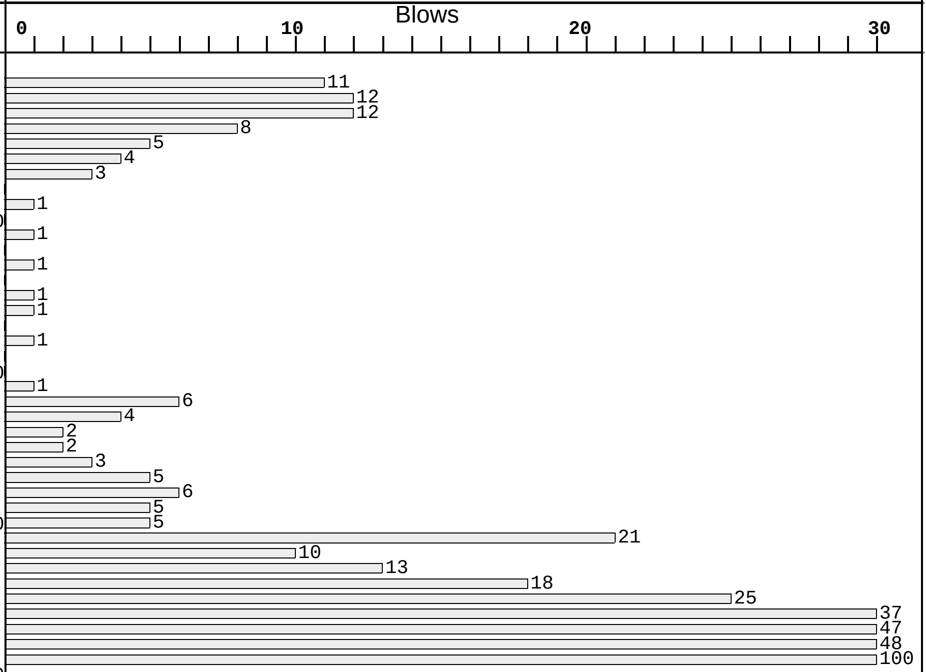
DYNAMIC PROBE RECORD - *Super Heavy*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	DP2
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389141.1 E 390310.4 N	Ground Level	42.13 m OD

Testing

Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
		11 12 12 8 5 4 3 0 1 0	41.1	1.00
		1 0 1 0 1 1 0 1 0 0	40.1	2.00
		1 6 4 2 2 3 5 6 5 5	39.1	3.00
		21 10 13 18 25 37 47 48 100	38.1	4.00
			37.1	5.00
			36.1	6.00
			35.1	7.00
			34.1	8.00
			33.1	9.00
			32.1	10.00



Probing

Depth	Dia	Technique	Crew
3.87	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			17/12/15	08:00
3.87		DRY	17/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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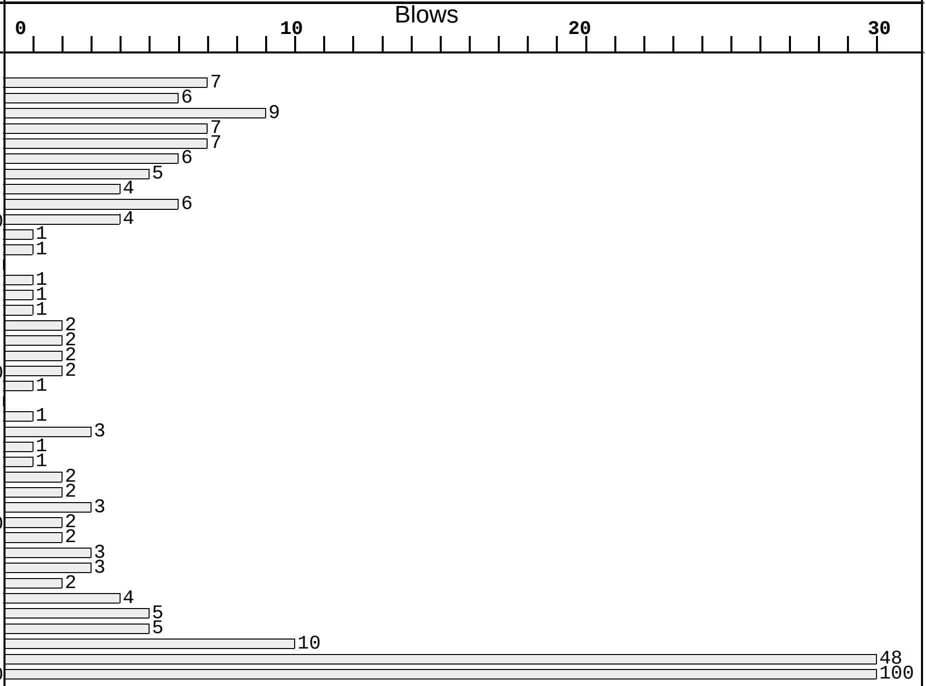
DYNAMIC PROBE RECORD - *Super Heavy*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**DP3**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389138.1 E 390305.6 N	Ground Level	42.13 m OD

Testing — Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
		7 6 9 7 7 6 5 4 6 4	41.1	1.00
		1 1 0 1 1 1 2 2 2 2	40.1	2.00
		1 0 1 3 1 1 2 2 3 2	39.1	3.00
		2 3 3 2 4 5 5 10 48 100	38.1	4.00
			37.1	5.00
			36.1	6.00
			35.1	7.00
			34.1	8.00
			33.1	9.00
			32.1	10.00



Probing

Depth	Dia	Technique	Crew
3.95	0.05	Inspection Pit	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			17/12/15	08:00
3.95		DRY	17/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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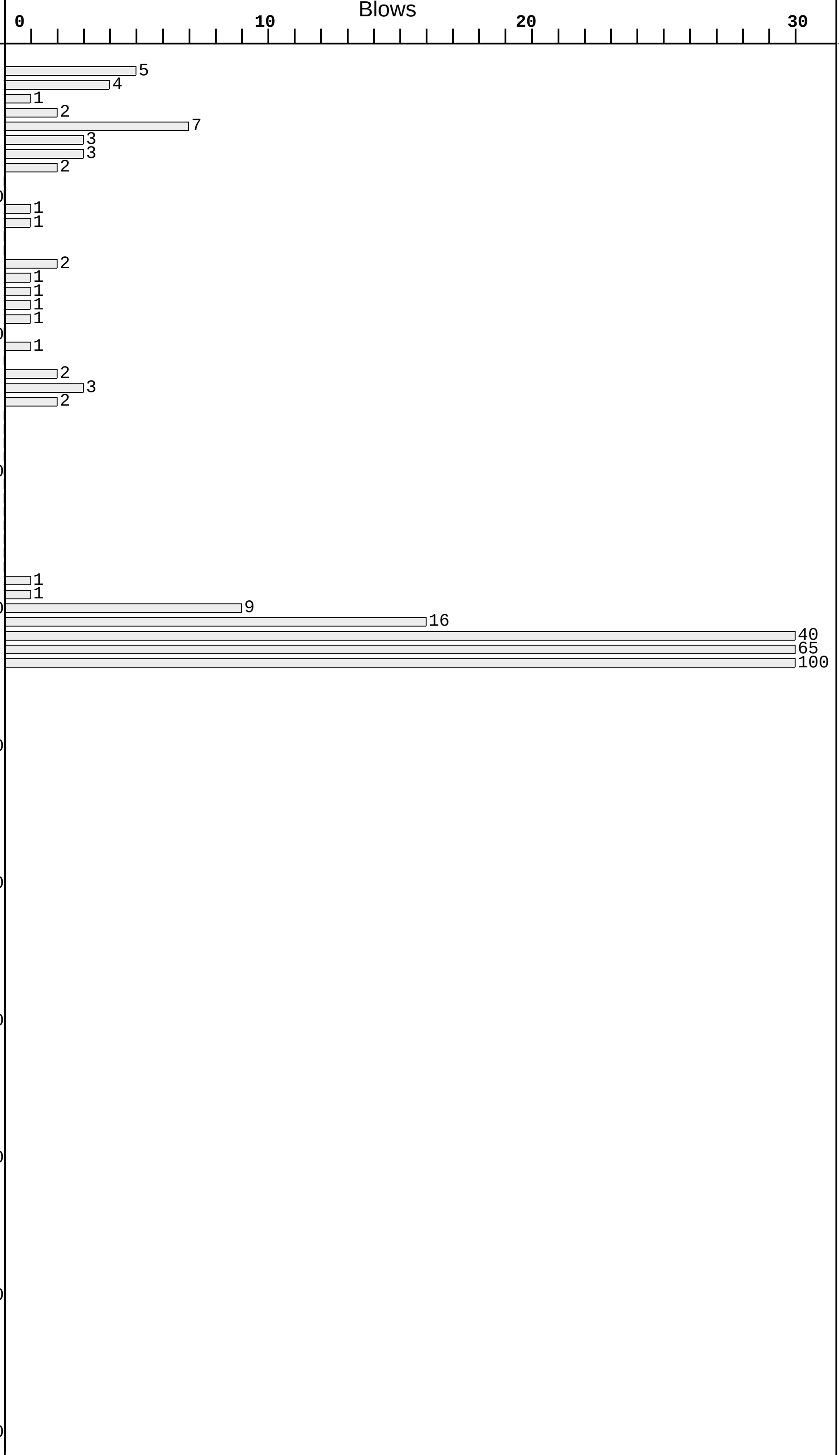
DYNAMIC PROBE RECORD - *Super Heavy*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**DP4**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389142.6 E 390304.6 N	Ground Level	42.07 m OD

Testing — Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
		5 4 1 2 7 3 3 2 0 0	41.0	1.00
		1 1 0 0 2 1 1 1 1 0	40.0	2.00
		1 0 2 3 2 0 0 0 0 0	39.0	3.00
		0 0 0 0 0 0 0 1 1 9	38.0	4.00
		16 40 65 100	37.0	5.00
			36.0	6.00
			35.0	7.00
			34.0	8.00
			33.0	9.00
			32.0	10.00

Blows



Probing

Depth	Dia	Technique	Crew
4.34	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			17/12/15	08:00
4.34		DRY	17/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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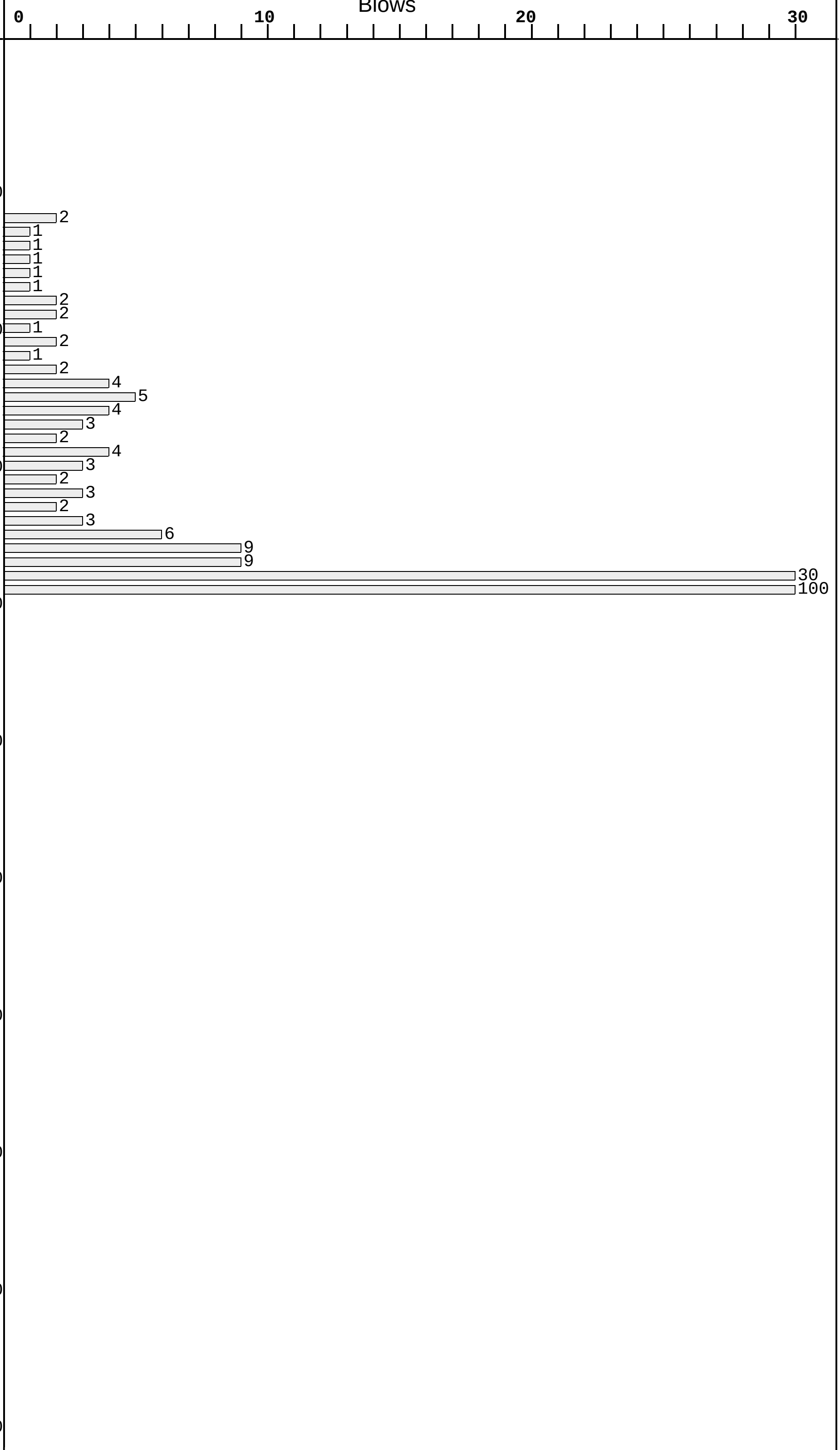
DYNAMIC PROBE RECORD - *Super Heavy*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**DP5**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389149.5 E 390269.8 N	Ground Level	42.73 m OD

Testing — Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
			41.7	1.00
		2 1 1 1 1 1 2 2 1 2 1 2 4 5 4 3 2 4 3 2 3 2 3 6 9 9 30 100	40.7	2.00
			39.7	3.00
			38.7	4.00
			37.7	5.00
			36.7	6.00
			35.7	7.00
			34.7	8.00
			33.7	9.00
			32.7	10.00

Blows



Probing

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	AT
3.95	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			16/12/15	08:00
3.95		DRY	16/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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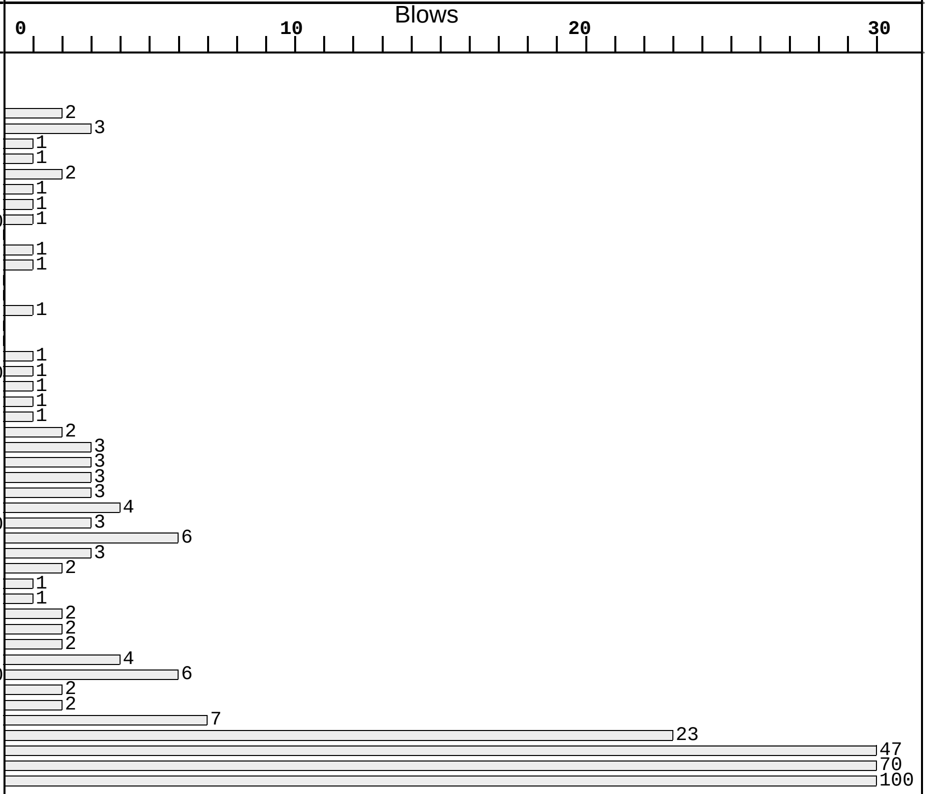
DYNAMIC PROBE RECORD - *Super Heavy*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	DP6	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389156.8 E 390270.8 N
Ground Level	42.62 m OD	Scale	1:50

Testing

Remarks	Torque N/m	Blows	Level	Depth
		2 3 1 1 2 1 1 1	41.6	1.00
		0 1 1 0 0 1 0 0 1 1	40.6	2.00
		1 1 1 2 3 3 3 3 4 3	39.6	3.00
		6 3 2 1 1 2 2 2 4 6	38.6	4.00
		2 2 7 23 47 70 100	37.6	5.00
			36.6	6.00
			35.6	7.00
			34.6	8.00
			33.6	9.00
			32.6	10.00



Probing

Depth	Dia	Technique	Crew
0.30	0.40	Inspection Pit	AT
4.75	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			17/12/15	08:00
4.75		DRY	17/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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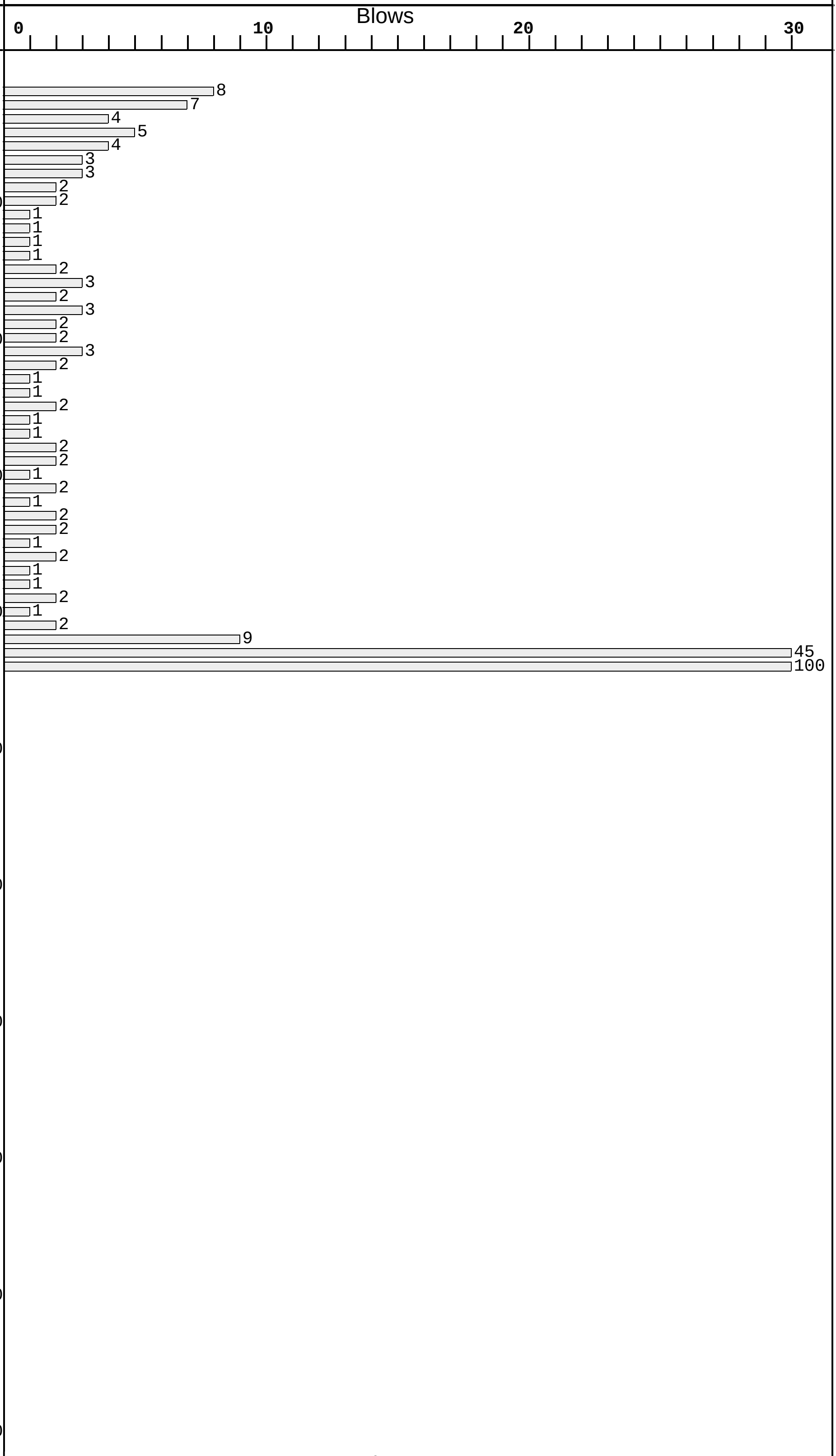
DYNAMIC PROBE RECORD - Super Heavy

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	DP7
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389161.7 E 390271.3 N	Ground Level	42.59 m OD

Testing — Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
		8, 7, 4, 5, 4, 3, 3, 2, 2	41.5	1.00
		1, 1, 1, 1, 2, 3, 2, 3, 2, 2	40.5	2.00
		3, 2, 1, 1, 2, 1, 1, 2, 2, 1	39.5	3.00
		2, 1, 2, 2, 1, 2, 1, 1, 2, 1	38.5	4.00
		2, 9, 45, 100	37.5	5.00
			36.5	6.00
			35.5	7.00
			34.5	8.00
			33.5	9.00
			32.5	10.00



Probing

Depth	Dia	Technique	Crew
0.20	0.40	Inspection Pit	AT
4.46	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			16/12/15	08:00
4.46		DRY	16/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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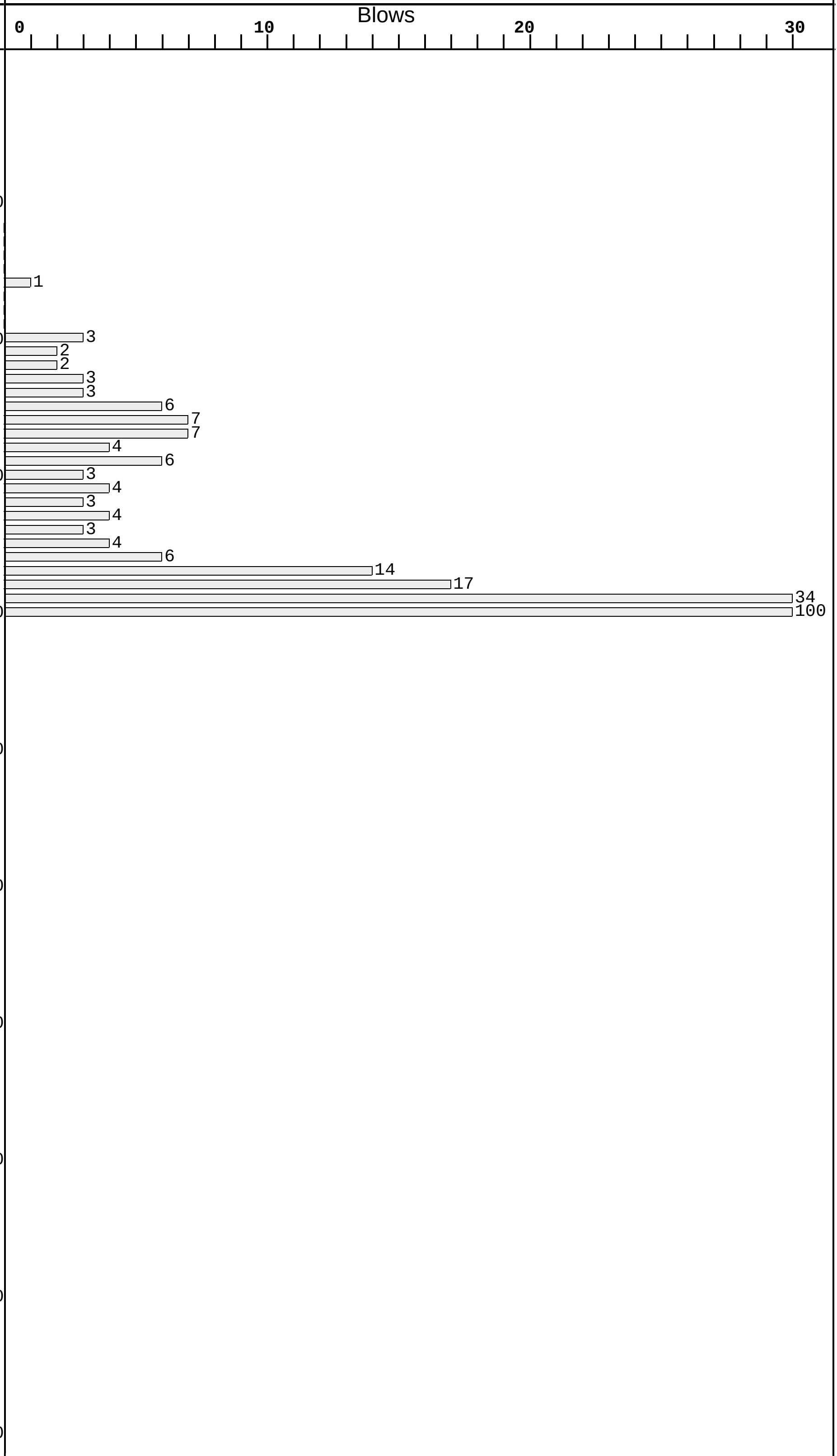
DYNAMIC PROBE RECORD - Super Heavy

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**DP8**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389152.9 E 390260.0 N	Ground Level	42.85 m OD

Testing — Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
			41.8	1.00
		0 0 0 0 1 0 0 0 3 2 2 3 3 6 7 7 4 6 3 4 3 4 3 4 6 14 17 34 100	40.8 39.8 38.8	2.00 3.00 4.00
			37.8	5.00
			36.8	6.00
			35.8	7.00
			34.8	8.00
			33.8	9.00
			32.8	10.00



Probing

Depth	Dia	Technique	Crew
1.20	0.40	Inspection Pit	AT
4.07	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			16/12/15	08:00
4.07		DRY	16/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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DYNAMIC PROBE RECORD - *Super Heavy*

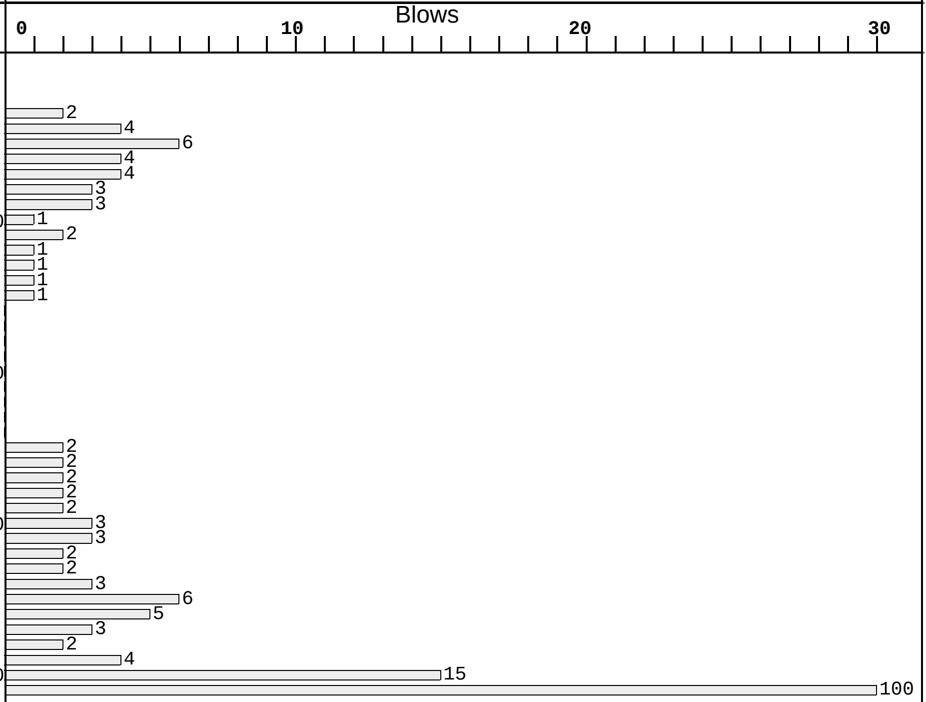
Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**DP9**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389159.2 E 390263.8 N	Ground Level	42.71 m OD

Testing

Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
		2 4 6 4 4 3 3		
		1	41.7	1.00
		2 1 1 1 1 0 0 0 0		
		0	40.7	2.00
		0 0 0 0 2 2 2 2 2		
		3	39.7	3.00
		3 2 2 3 6 5 3 2 4		
		15	38.7	4.00
		100		
			37.7	5.00
			36.7	6.00
			35.7	7.00
			34.7	8.00
			33.7	9.00
			32.7	10.00

Blows



Probing

Depth	Dia	Technique	Crew
0.30	0.40	Inspection Pit	AT
4.08	0.05	Dynamic Probe	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			17/12/15	08:00
7.08		DRY	17/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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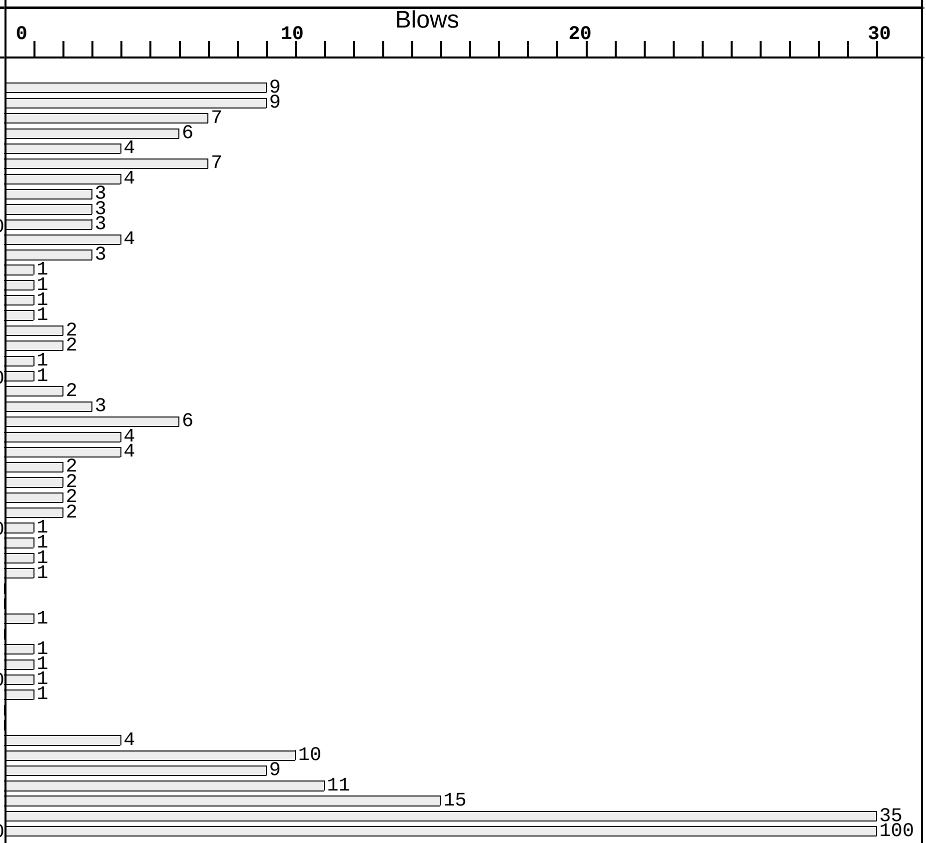
DYNAMIC PROBE RECORD - *Super Heavy*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**DP10**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389164.1 E 390266.9 N	Ground Level	42.65 m OD

Testing — Scale 1:50

Remarks	Torque N/m	Blows	Level	Depth
		9		
		9		
		7		
		6		
		4		
		7		
		4		
		3		
		3		
		3	41.6	1.00
		4		
		3		
		1		
		1		
		1		
		1		
		2		
		2		
		1		
		1	40.6	2.00
		2		
		3		
		6		
		4		
		4		
		2		
		2		
		2		
		2		
		1	39.6	3.00
		1		
		1		
		1		
		0		
		0		
		1		
		0		
		1		
		1		
		1	38.6	4.00
		1		
		0		
		0		
		4		
		10		
		9		
		11		
		15		
		35		
		100	37.6	5.00
			36.6	6.00
			35.6	7.00
			34.6	8.00
			33.6	9.00
			32.6	10.00



Probing				Progress					Groundwater					
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
4.98	0.05	Dynamic Probe	AT	G.L. 5.98		DRY	16/12/15 16/12/15	08:00 18:00						None encountered.

Remarks: Probe equipment checked and test carried out in accordance with BS EN ISO 22476-2:2005.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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APPENDIX 7

Dynamic Sample Borehole Records

DATA SHEET - *Symbols and Abbreviations used on Records*

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike ∇

Depth Water Rose To ▼

Instrumentation

Seal

Filter

Seal

Strata — Legend

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

Gravel

Sand

Silt

Clay

Peat

Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

Coal

Strata, Continued

Mudstone

Siltstone

Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

Igneous Rock

Fine Grained

Medium Grained

Coarse Grained

Backfill Materials

Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam

Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum / Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS201
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389210.7 E 390145.9 N	Ground Level	45.61 m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N
0.20	ES				
0.50	ES				
1.00- 1.20	D				
1.00	ES				
1.20- 2.00	B				
1.20- 1.65	D	(DRY)		18	S28
2.00- 2.45	D	(DRY)			S11
2.00- 2.40	D				
2.40- 3.00	B			23	
3.00- 3.45	D	(DRY)			S10
3.00- 3.20	D				
3.20- 3.50	B				
3.50- 3.60	D				
3.60- 4.00	B				
4.00- 4.27	D	(DRY)			S50/ 115

Description	Depth	Level m OD
	G.L.	45.61
MADE GROUND: Brownish orange gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	0.80	44.81
MADE GROUND: Soft brown sandy gravelly clay, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments. Below 1.20m, stiff.	2.00	43.61
Firm greyish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of various lithologies.	3.00	42.61
Firm brown CLAY.	3.50	42.11
Very dense reddish brown fine to medium SAND.	4.27	41.34
End of Borehole		

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.50	Inspection Pit	AT
4.27	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			30/11/15	08:00
4.27		DRY	30/11/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 4.00m with a slotted section from 3.50m to 4.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 3.50m, bentonite seal up to 1.50m, arisings up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

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BOREHOLE RECORD - Dynamic Sample

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	WS203	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389159.1 E 390201.0 N
Ground Level	43.01 m OD	Scale	1:50

Sampling / Properties

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N
0.20- 0.50	B				
0.20	ES				
0.50- 1.00	B				
0.50	ES				
1.00	ES				
1.20- 2.00	B				
1.20- 1.65	D	(DRY)			S0
2.00- 3.00	B				
2.00- 2.45	D	(DRY)			S34
3.00- 3.34	D	(DRY)			S50/ 185

Strata

Description	Depth	Level m OD
	G.L.	43.01
MADE GROUND: Tarmacadam.	0.10	42.91
MADE GROUND: Dark brown sandy angular to subangular fine to medium gravel of various lithologies, fragments of brick and concrete. Occasional rootlets.	0.20	42.81
MADE GROUND: Very loose dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.	1.50	41.51
Very loose reddish brown gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of sandstone. Low cobble content of sandstone.	2.00	41.01
Dense brown gravelly fine to medium SAND with black organic matter. Gravel is subangular to subrounded fine to coarse of sandstone.	2.30	40.71
Dense orangish brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of sandstone. Low cobble content of sandstone. At 3.00m, very dense.	3.34	39.67
End of Borehole		

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.50	Inspection Pit	AT
3.34	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			04/12/15	08:00
3.34		DRY	04/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 3.00m with a geowrapped slotted section from 2.00m to 3.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 2.00m, bentonite seal up to 0.20m, concrete up to 0.05m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389161.8 E 390232.6 N
Borehole	WS204	Project No	PN153428
Ground Level	42.85 m OD	Scale	1:50

Sampling: Depth	Sample Type	Depth Cased & (to Water)	Properties: Strength kPa	w %	SPT N	Strata: Description	Depth	Legend	Level m OD
							G.L.		42.85
						MADE GROUND: Tarmacadam.	0.10		42.75
0.20- 0.50	B					MADE GROUND: Dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.	0.50		42.35
0.20	ES								
0.50- 1.00	B								
0.50	ES								
1.00	ES					MADE GROUND: Brown gravelly fine to medium sand. Gravel is angular to subangular fine to medium of various lithologies and fragments of brick. Many rootlets.	1.20		41.65
1.20- 2.00	B								
1.20- 1.65	D	(DRY)			S10				
2.00- 2.50	B					MADE GROUND: Loose orangish brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick. Between 1.40m and 1.50m, band of sandy clay. Between 1.50m and 1.55m, cobbles of sandstone.	1.55		41.30
2.00- 2.45	D	(DRY)			S18				
2.50- 2.86	D	(DRY)			S50/ 205	Medium dense orangish grey fine to coarse SAND.	2.45		40.40
						Very dense orange gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of sandstone.	2.86		39.99
						End of Borehole			

Boring / Progress / Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.L.			03/12/15	08:00						None encountered.
2.86	0.10	Dynamic Sampler	AT	2.86		DRY	03/12/15	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 2.45m with a geowrapped slotted section from 1.50m to 2.45m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.45m, fine gravel filter up to 1.50m, bentonite seal up to 0.20m, concrete up to 0.05m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS205
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389192.1 E 390221.8 N	Ground Level	42.39 m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		42.39
						MADE GROUND: Grey granite cobble setts.	0.10		42.29
0.20	ES					MADE GROUND: Light brown gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete.			
0.50	ES								
1.00	ES								
1.20- 2.00	B						1.20		41.19
1.20- 1.65	D	(DRY)			S38	Dense orangish brown gravelly fine to coarse SAND with a medium subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone.			
2.00- 2.38	D	(DRY)			S50/ 230	At 2.00m, very dense.			
							2.38		40.01
						End of Borehole			

Boring / Progress / Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.L.			11/12/15	08:00						None encountered.
2.38	0.10	Dynamic Sampler	AT	2.38		DRY	11/12/15	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars.
A 50mm standpipe was installed to 2.00m with a geowrapped slotted section from 1.50m to 2.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.50m, gravel filter up to 1.00m, bentonite seal up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS206
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389278.8 E 390194.8 N	Ground Level	48.13 m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		48.13
0.20	ES					MADE GROUND: Tarmacadam.	0.20		47.93
0.50- 1.00 0.50	B ES					MADE GROUND: Dark greyish brown gravelly sand of ash. Gravel is subangular to subrounded fine to medium of various lithologies.			
1.00	ES						1.00		47.13
1.20- 1.65 1.20- 1.50 1.50- 2.00	D D B	(DRY)			S50	MADE GROUND: Dense to very dense brown slightly gravelly fine to medium sand of ash. Gravel is angular to subangular fine to medium of various lithologies. Low cobble content of broken brick and concrete.			
2.00- 2.34	D	(DRY)			S50/ 190				
							2.34		45.79
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.50	Inspection Pit	AT
2.34	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			02/12/15	08:00
2.34		DRY	02/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 2.00m with a geowrapped slotted section from 1.00m to 2.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS208
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389241.3 E 390273.4 N	Ground Level	42.35 m OD

Scale 1:50

Sampling / Properties

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N
0.50- 1.00	B				
0.50	ES				
1.00	ES				
1.20- 1.65	D	(DRY)		12	S14
1.20- 1.30	D				
1.30- 1.70	B				
1.70- 1.80	D				
1.80- 2.00	D				
2.00- 2.45	D	(DRY)			S7
2.00- 2.40	D				
2.40- 2.80	B				
2.40- 2.80	B				
2.80- 3.00	D				
3.00- 3.50	B				
3.00- 3.20	D	(DRY)			S50/50

Strata

Description	Depth	Legend	Level m OD
	G.L.		42.35
MADE GROUND: Concrete.	0.50		41.85
MADE GROUND: Dark brownish grey gravelly sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick.	1.30		41.05
Firm brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium of various lithologies.	1.70		40.65
Loose light brown to reddish brown gravelly SAND. Gravel is subrounded fine to medium of sandstone. Between 2.40m and 2.80m, grading to silty sand and gravel. At 3.00m, very dense.	3.20		39.15
End of Borehole			

Boring / Progress / Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.L.			01/12/15	08:00						None encountered.
3.20	0.10	Dynamic Sampler	AT	3.20		DRY	01/12/15	18:00						

Remarks AGS

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 2.80m with a geowrapped slotted section from 1.70m to 2.80m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.80m, fine gravel filter up to 1.70m, bentonite seal up to 0.70m, sub base up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD – *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS209
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389242.3 E 390284.3 N	Ground Level	42.67 m OD

Sampling | Properties | Strata | Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		42.67
0.20	ES					MADE GROUND: Tarmacadam.	0.20		42.47
0.50	ES					MADE GROUND: Dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to medium of various lithologies and fragments of concrete and brick.	0.80		41.87
0.60- 1.00	B								
1.00	ES					Medium dense reddish brown gravelly fine to coarse SAND with a low cobble content of sandstone. Gravel is subangular to subrounded fine to coarse including sandstone and quartzite.	1.60		41.07
1.20- 1.65	D	(DRY)			S16				
1.20- 1.30	D								
1.30- 1.60	B								
1.60- 2.00	B					Loose reddish brown very gravelly clayey SAND with a low cobble content of sandstone. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone.			
2.00- 2.45	D	(DRY)			S9				
2.00- 2.40	D								
2.40- 3.00	B								
3.00- 3.26	D	(DRY)			S50/ 105	At 3.00m, very dense.	3.26		39.41
						End of Borehole			

Boring | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.L.			02/12/15	08:00						None encountered.
3.26	0.10	Dynamic Sampler	AT	3.26		DRY	02/12/15	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 3.00m with a geowrapped slotted section from 1.00m to 3.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to 0.10m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

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BOREHOLE RECORD – Dynamic Sample

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS210
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389316.0 E 390273.8 N	Ground Level	44.43 m OD

Scale 1:50

Sampling Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Strata Description	Depth	Legend	Level m OD
							G.L.		44.43
0.20- 0.50	B					MADE GROUND: Grey and red angular cobbles of brick and concrete.	0.10		44.33
0.20	ES								
0.50- 1.00	B					MADE GROUND: Loose to medium dense dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick.			
0.50	ES								
1.00	ES								
1.20- 2.00	B								
1.20- 1.65	D	(DRY)			S28				
2.00- 3.00	B					At 2.00m, loose, grading to slightly silty very sandy gravel.			
2.00- 3.00	B								
2.00- 2.45	D	(DRY)			S5				
						Medium dense greyish orange very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including sandstone.	2.60		41.83
3.00- 4.00	B								
3.00- 3.45	D	(DRY)			S18				
4.00- 5.00	B					At 4.00m, silty.			
4.00- 4.45	D	(DRY)			S23				
5.00- 5.09	D	(DRY)			S50/40	At 5.00m, very dense.			
						End of Borehole	5.09		39.34

Boring / Progress / Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	AT	G.L.			09/12/15	08:00						None encountered.
5.09	0.15	Cable Percussion	AT	5.09		DRY	09/12/15	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 5.00m with a geowrapped slotted section from 3.00m to 5.00m with flush lockable protective cover. Backfill details from base of hole: gravel filter up to 3.00m, bentonite seal up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Dynamic Sample

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS211
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389333.0 E 390302.7 N	Ground Level	44.88 m OD

Sampling / Properties / Strata — Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		44.88
						MADE GROUND: Grey concrete.	0.10		44.78
0.20- 0.50	B					MADE GROUND: Dark brown gravelly fine to medium sand with ash present. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	0.50		44.38
0.20	ES								
0.50- 1.00	B								
0.50	ES								
1.00- 1.20	B					MADE GROUND: Soft brown slightly gravelly sandy clay. Gravel is subangular to subrounded fine to coarse of various lithologies, brick and concrete.	1.00		43.88
1.00	ES								
1.20- 1.50	B					MADE GROUND: Light brown gravelly clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse to various lithologies and brick fragments.	1.20		43.68
1.20- 1.65	D	(DRY)			S19				
1.50- 1.60	D								
1.60- 1.80	B								
1.80- 2.00	B					MADE GROUND: Medium dense dark brown mottled black clayey gravelly fine to medium sand with a strong hydrocarbon odour and organic remains. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	1.80		43.08
2.00- 2.60	B								
2.00- 2.45	D	(DRY)			S6				
2.60- 2.80	B					MADE GROUND: Loose orangish brown clayey gravelly fine to medium sand. Gravel is angular to subrounded fine to coarse of various lithologies, brick and glass.	2.60		42.28
2.80- 3.00	B								
3.00- 3.50	B					MADE GROUND: Dark grey clayey gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and brick fragments.	3.00		41.88
3.00- 3.45	D	(DRY)			S4				
3.50- 3.80	B					Very loose/loose grey clayey fine to coarse SAND.	3.50		41.38
3.80- 4.00	D			43		Orangish grey fine to coarse SAND.	3.80		41.08
4.00- 4.45	D	(DRY)			S12	Soft dark grey sandy CLAY, locally silt.	4.00		40.88
4.00- 4.50	D					Medium dense greyish orange fine to coarse SAND. At 4.60m, very dense.			
4.60- 4.67		(DRY)			S50/40		4.67		40.21
						End of Borehole			

Boring / Progress / Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.L.			08/12/15	08:00						None encountered.
4.67	0.10	Dynamic Sampler	AT	4.67		DRY	08/12/15	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 2.00m with a geowrapped slotted section from 1.00m to 2.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.00m, fine gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	WS212	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389284.7 E 390377.1 N
Ground Level	45.74 m OD	Scale	1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Level m OD
							G.L.	45.74
						MADE GROUND: Concrete slab.	0.08	45.66
0.50	ES					**MADE GROUND**: Loose dark brown gravelly fine to medium sand of ash. Gravel is angular to subangular fine to coarse of various lithologies and concrete.		
1.00	ES							
1.20- 1.50	B							
1.20- 1.65	D	(DRY)			S9			
1.50- 1.70	D						1.50	44.24
1.70- 2.00	B					**MADE GROUND**: Loose dark brown gravelly fine to medium sand with black organic matter. Gravel is angular to subangular fine to coarse of various lithologies.	1.70	44.04
2.00- 2.40	B					Very loose/loose brown slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse predominantly of sandstone.		
2.00- 2.45	D	(DRY)			S4			
2.40- 2.60	D					Soft brown slightly gravelly sandy CLAY, locally silt. Gravel is subangular to subrounded fine to coarse of various lithologies. At 3.00m, stiff.	2.40	43.34
2.60- 3.00	B							
3.00- 3.45	D	(DRY)		22	S25			
3.00- 3.40	D							
3.00- 3.40	D							
3.40- 3.70	B					Stiff brown slightly sandy CLAY.	3.40	42.34
3.70- 4.00	B					Very dense reddish brown fine to coarse SAND.	3.70	42.04
4.00- 4.43	D	(DRY)			S50/ 275			
						End of Borehole	4.43	41.31

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.50	Inspection Pit	AT
4.43	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			07/12/15	08:00
4.43		DRY	07/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks
Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 3.50m with a geowrapped slotted section from 2.50m to 3.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 3.50m, fine gravel filter up to 2.50m, bentonite seal up to 1.00m, sub base up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**WS214**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389280.9 E 390357.9 N	Ground Level	46.35 m OD

Scale 1:50

Sampling / Properties

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N
0.20- 0.50	B				
0.20	ES				
0.50- 1.00	B				
0.50	ES				
1.00- 1.20	B				
1.00	ES				
1.20- 1.65	D	(DRY)			S14
1.20- 1.40	D				
1.40- 1.50	D				
1.50- 1.80	B				
1.80- 2.00	D				
2.00- 2.45	D	(DRY)			S5
2.00- 2.40	D				
2.40- 3.00	B				
3.00- 3.45	D	(DRY)			S4
3.00- 3.50	D				
3.50- 3.70	B				
3.70- 4.00	B				
4.00- 4.45	D	(DRY)			S2
4.50- 4.70	D				
5.00- 5.45	D	(DRY)			S9

Strata

Description	Depth	Legend	Level m OD
	G.L.		46.35
MADE GROUND: Grey concrete.	0.07		46.28
MADE GROUND: Orange fine to coarse sand.	0.15		46.20
MADE GROUND: Dark brown gravelly fine to coarse sand with ash. Gravel is subangular to subrounded fine to coarse of various lithologies, ceramic, brick fragments and concrete.	1.00		45.35
Medium dense reddish brown fine to coarse SAND with a low cobble content.	1.50		44.85
Medium dense reddish brown gravelly fine to medium SAND with black organic remains. Gravel is subangular to subrounded fine to coarse of various lithologies.	1.80		44.55
Loose reddish brown gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone. At 2.40m, very gravelly.	3.70		42.65
Dark brown mottled black fine to coarse gravelly SAND with black organic remains. Gravel is subangular to subrounded fine to coarse including mudstone.	4.00		42.35
Very loose brown clayey fine to coarse SAND.	4.70		41.65
Loose brown fine to coarse SAND.	5.45		40.90

End of Borehole

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.50	Inspection Pit	AT
5.45	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			08/12/15	08:00
5.45		DRY	08/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
Clay pipe noted in side of inspection pit.
A 50mm standpipe was installed to 1.00m with a geowrapped slotted section from 0.50m to 1.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.00m, fine gravel filter up to 0.50m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Dynamic Sample

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389229.8 E 390255.0 N
Borehole	WS217	Project No	PN153428
Ground Level	42.30 m OD	Scale	1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							G.L.		42.30
0.20	ES					MADE GROUND: Grey subangular granite cobble setts.	0.10		42.20
0.50	ES					MADE GROUND: Light brown gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete (Sub base).			
1.00	ES								
1.20- 1.30	D						1.20		41.10
1.20- 1.65		(DRY)			S26	Dark brown clayey gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse including limestone and sandstone.	1.30		41.00
1.30- 2.00	B								
1.30	ES								
						Medium dense greyish orange gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including limestone, sandstone and quartzite.			
2.00- 2.60	B								
2.00- 2.45	D	(DRY)			S28				
2.60- 2.68	D	(DRY)			S50/25	At 2.60m, very dense.			
							2.68		39.62
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	AT
2.68	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			14/12/15	08:00
2.68		DRY	14/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A 50mm standpipe was installed to 2.50m with a geowrapped slotted section from 1.50m to 2.50m with flush lockable protective cover. Backfill details from base of hole: gravel filter up to 1.50m, bentonite seal up to 0.50m, sub base up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	WS218	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389254.7 E 390238.1 N
Ground Level	42.75 m OD	Scale	1:50

Sampling Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Strata Description	Depth	Level m OD
							G.L.	42.75
						MADE GROUND: Grey concrete.	0.40	42.35
0.50	ES					MADE GROUND: Light grey gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete, granite and sandstone. At 0.60m, with a medium angular cobble content of sandstone, granite and concrete.	0.95	41.80
0.95- 1.00 1.00 1.20- 1.65	D ES D	(0.90)			S27	Medium dense greyish brown clayey sandy angular to subangular fine to coarse GRAVEL including sandstone and limestone. At 0.95m, with clay bands.	1.70	41.05
						End of Borehole		

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	AT
1.65	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			15/12/15	08:00
1.70		0.90	15/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.90		0.80	20		Slow inflow.

Remarks

AGS

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
The borehole was terminated at a depth of 1.70m having met refusal on an obstruction.
Backfill details from base of hole: arisings up to 0.40m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1

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geotechnics

BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS218A
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389253.9 E 390239.0 N	Ground Level	42.71 m OD

Scale 1:50

Sampling: Depth	Sample Type	Depth Cased & (to Water)	Properties: Strength kPa	w %	SPT N	Strata: Description	Depth	Level m OD
						MADE GROUND: Grey concrete.	G.L.	42.71
0.50	ES					MADE GROUND: Light grey gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of concrete, granite and sandstone.	0.40	42.31
1.00	ES							
1.20- 2.00	B							
1.20- 1.65	D	(DAMP)			S11	Loose greenish brown clayey fine to medium SAND.	1.20	41.51
1.20	ES					Medium dense orangish brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including sandstone.	1.50	41.21
2.00- 3.00	B							
2.00- 2.45	D	(DRY)			S14			
						Very dense orange gravelly fine to coarse SAND with a low subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of sandstone.	2.50	40.21
3.00- 3.17	D	(DRY)			S50/50		3.17	39.54
						End of Borehole		

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	AT
3.17	0.15	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			16/12/15	08:00
3.17		DRY	16/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.90					Damp - no rise.

Remarks

AGS

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A 50mm standpipe was installed to 2.50m with a geowrapped slotted section from 1.00m to 2.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.50m, gravel filter up to 1.00m, bentonite seal up to 0.40m, sub base up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	WS219	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389259.7 E 390175.3 N
Ground Level	45.13 m OD	Scale	1:50

Sampling Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Strata Description	Depth	Legend	Level m OD
							G.L.		45.13
						MADE GROUND: Concrete.	0.20		44.93
0.50- 0.90 0.50	B ES					MADE GROUND: Greyish brown gravelly fine to medium sand. Gravel is angular to subangular fine to coarse of various lithologies.	0.50		44.63
1.00	ES					Reddish brown sandy angular to subangular fine to coarse GRAVEL of limestone. Medium angular to subangular cobble content.	1.20		43.93
1.20- 2.00 1.20- 1.65	B D	(DRY)			S26	Medium dense brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of limestone.			
2.00- 2.45	D	(DRY)			S44	At 2.00m, dense.	2.45		42.68
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.50	Inspection Pit	AT
2.45	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			01/12/15	08:00
2.45		DRY	01/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks AGS
Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
Backfill details from base of hole: bentonite seal up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - Dynamic Sample

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS220
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389143.2 E 390224.6 N	Ground Level	44.69 m OD

Scale 1:50

Sampling: Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N
0.20- 0.50	B				
0.20	ES				
0.50- 1.00	B				
0.50	ES				
1.00	ES				
1.20- 1.65	D	(DRY)			S4
1.20- 1.30	D				
1.30- 1.70	B				
1.30- 1.70	D			33	
1.70- 2.00	B				
2.00- 2.45	D	(DRY)			S27
2.00- 2.40	D				
2.40- 2.60	D				
2.60- 3.00	B				
3.00- 4.00	B				
3.00- 3.45	D	(DRY)			S34
4.00- 4.07	D	(DRY)			S50/50

Strata: Description	Depth	Legend	Level m OD
	G.L.		44.69
MADE GROUND: Tarmacadam.	0.10		44.59
MADE GROUND: Light brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of sandstone and fragments of brick.	0.20		44.49
MADE GROUND: Very loose/loose dark brown gravelly fine to medium sand of ash. Gravel is subangular to subrounded fine to coarse of various lithologies, fragments of brick and concrete. Between 1.20m and 1.70m, black organic matter.	1.70		42.99
Medium dense light grey fine to coarse SAND. Between 2.00m and 2.60m, gravelly. Gravel is subangular to subrounded fine to coarse of sandstone.	2.60		42.09
Dense orangish brown gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of sandstone. Below 3.60m, cobbles of sandstone. At 4.00m, very dense.	4.07		40.62
End of Borehole			

Boring: Depth	Hole Dia	Technique	Crew	Progress: Depth of Hole	Depth Cased	Depth to Water	Date	Time	Groundwater: Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.50	Inspection Pit	AT	G.L.			03/12/15	08:00						None encountered.
4.07	0.10	Dynamic Sampler	AT	4.07		DRY	03/12/15	18:00						

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
A 50mm standpipe was installed to 1.70m with a geowrapped slotted section from 1.20m to 1.70m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.70m, gravel filter up to 1.20m, bentonite seal up to 0.20m, concrete up to 0.05m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BORDEHOLE RECORD - Dynamic Sample

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**WS221**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389275.0 E 390086.2 N	Ground Level	51.03 m OD

Scale 1:50

Sampling: Depth	Sample Type	Depth Cased & (to Water)	Properties: Strength kPa	w %		Strata: Description	Depth	Legend	Level m OD
							G.L.		51.03
0.10- 0.30	ES					**MADE GROUND: Topsoil with broken concrete. At 0.30m, sandstone.			
							0.30		50.73
						End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
0.30	0.50	Inspection Pit	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			03/12/15	08:00
0.30			03/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 0.30m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
The Trial Pit was terminated at a depth of 0.30m due to the presence of an obstruction.
** Driller's description.
Backfill details from base of hole: arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	WS223
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389237.7 E 390204.9 N	Ground Level	43.39 m OD

Scale 1:50

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Level m OD
						MADE GROUND: Grey concrete.	G.L.	43.39
0.50- 1.00 0.50 1.00	B ES ES					MADE GROUND: Loose brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of sandstone and fragments of brick.	0.40	42.99
1.20 1.20- 1.65 1.30- 1.90	D D B	(1.00)		20	S5	Firm grey mottled dark brown slightly gravelly slightly sandy CLAY with organic traces. Gravel is subangular to subrounded fine to coarse of various lithologies.	1.40	41.99
2.00- 2.50 2.00- 2.45 2.00	B D ES	(1.30)			S10	Loose/medium dense greyish brown fine to medium clayey SAND.	2.00	41.39
2.50- 3.00 3.00- 3.65 3.00- 3.45	B B D	(2.50)			S20	Medium dense greyish orange silty slightly gravelly fine to coarse SAND.	2.50	40.89
3.65- 3.72		(3.00)			S50/40	Medium dense greyish brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse including quartzite and some igneous lithologies. At 3.65m, very dense.	3.20	40.19
						End of Borehole	3.72	39.67

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.40	Inspection Pit	AT
3.72	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			10/12/15	08:00
3.72		3.00	10/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20					Slow inflow.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 2 x 60ml VOC vials, 1 x 1kg plastic tub and 2 x 258ml amber jars
A 50mm standpipe was installed to 1.40m with a geowrapped slotted section from 0.50m to 1.40m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.40m, gravel filter up to 0.50m, bentonite seal up to 0.30m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Dynamic Sample*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Client	TRANSPORT FOR GREATER MANCHESTER	National Grid Coordinates	389229.7 E 390086.4 N
Borehole	WS224	Project No	PN153428
Ground Level	53.31 m OD	Scale	1:50

Sampling / Properties

Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %
0.20- 0.50	B			
0.20	ES			
0.50- 1.00	B			
0.50	ES			
1.00	ES			
1.20- 1.40	D			
1.40- 1.70	B			

Strata

Description	Depth	Legend	Level m OD
	G.L.		53.31
MADE GROUND: Dark brown gravelly fine to medium sand. Gravel is subangular to subrounded fine to coarse of various lithologies and fragments of brick. Some wood.	1.20		52.11
Dark brown gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse including mudstone and quartzite.	1.40		51.91
Brown gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of various lithologies.	1.70		51.61
End of Borehole			

Boring

Depth	Hole Dia	Technique	Crew
1.20	0.50	Inspection Pit	AT
1.70	0.10	Dynamic Sampler	AT

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time
G.L.			04/12/15	08:00
1.20		DRY	04/12/15	18:00
1.20		DRY	10/12/15	08:00
1.70		DRY	05/12/15	18:00

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
					None encountered.

Remarks

Inspection pit hand excavated to 1.20m depth.
ES Sample = 1 x 60ml VOC vial, 1 x 1kg plastic tub and 1 x 258ml amber jar.
The Dynamic Sample was undertaken using hand held equipment.
Backfill details from base of hole: arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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APPENDIX 8

Concrete Core Records

8

DATA SHEET - Symbols and Abbreviations used on Records

Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecone Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content

(All other strengths from undrained triaxial testing)

S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
( )	Extrapolated value

Groundwater

Water Strike ∇

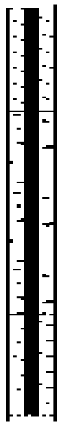
Depth Water Rose To ▼

Instrumentation

Seal

Filter

Seal



Strata — Legend

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

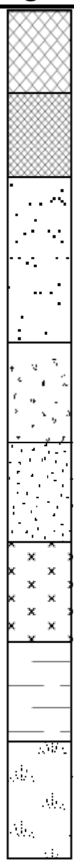
Gravel

Sand

Silt

Clay

Peat



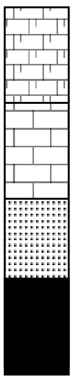
Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

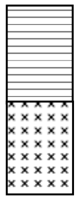
Coal



Strata, Continued

Mudstone

Siltstone

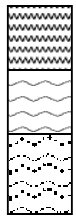


Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

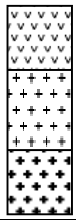


Igneous Rock

Fine Grained

Medium Grained

Coarse Grained



Backfill Materials

Arisings

Bentonite Seal

Concrete

Fine Gravel Filter

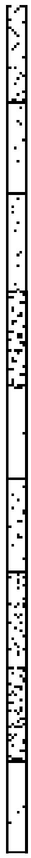
General Fill

Gravel Filter

Grout

Sand Filter

Tarmacadam



Rotary Core

RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	Fractures/metre
FRACTURE SPACING (m)	Maximum / Minimum
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

(where core recovery is unknown it is assumed to be at the base of the run)

BOREHOLE RECORD - *Concrete core*

Project	STOCKPORT BUS STATION	Engineer	AECOM	**Borehole**	**CC1**
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER				

Scale 1:50

Drilling: Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Properties/Sampling: Type TCR/SCR%	Length Max/Min	RQD %		Strata: Description General	Description Detail	Depth	Legend
								G.L.	
0.00- 0.14		C				**MADE GROUND: Strong light grey fine grained micaceous sandstone with well bonded light grey mottled white mortar up to 5mm thick.**		0.14	
						End of Borehole			

Drilling

Depth	Hole Dia	Technique	Crew
0.14		Concrete core	UU

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS **Angle of Inclination: 0 degrees from horizontal.**

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Figure **1 of 1**

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Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Concrete core*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	CC2
				Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER				

Drilling | Properties/Sampling | Strata | Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %		Description General	Description Detail	Depth	Legend
								G.L.	
0.00- 0.24		C				MADE GROUND: Strong light grey fine grained micaceous sandstone with well bonded light grey mottled white mortar up to 5mm thick.		0.24	
						End of Borehole			

Drilling | Progress | Groundwater

Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.24		Concrete core	UU											

Remarks AGS Angle of Inclination: 0 degrees from horizontal.

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Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Concrete core*

Project	STOCKPORT BUS STATION	Engineer	AECOM	Borehole	CC3
Client	TRANSPORT FOR GREATER MANCHESTER			Project No	PN153428

Drilling | Properties/Sampling | Strata — Scale 1:50

Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %		Description General	Description Detail	Depth	Legend
								G.L.	
0.00- 0.37		C				MADE GROUND: Strong light grey fine grained micaceous sandstone with well bonded light grey concrete, 70-80% aggregate of angular to subangular fine to coarse gravel of various lithologies. 5% voids in concrete.		0.37	
						End of Borehole			

Drilling

Depth	Hole Dia	Technique	Crew
0.37		Concrete core	UU

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS Angle of Inclination: 0 degrees from horizontal.

Logged by NM

Figure 1 of 1

11/03/2016

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

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BOREHOLE RECORD - *Concrete core*

Project	STOCKPORT BUS STATION	Engineer	AECOM
Borehole	CC4	Project No	PN153428
Client	TRANSPORT FOR GREATER MANCHESTER		

Scale 1:50

Drilling: Core Run/Depth (Core Dia)	Depth Cased & (to Water)	Properties/Sampling: Type TCR/SCR%	Length Max/Min	RQD %		Strata: Description General	Description Detail	Depth	Legend
								G.L.	
0.00- 0.25		C				MADE GROUND: Strong light grey fine grained micaceous sandstone with occasional orangish brown staining.		0.25	
						End of Borehole			

Drilling

Depth	Hole Dia	Technique	Crew
0.25		Concrete core	UU

Progress

Depth of Hole	Depth Cased	Depth to Water	Date	Time

Groundwater

Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks AGS Angle of Inclination: 0 degrees from horizontal.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:1999 + A2:2010

Logged by NM

Figure 1 of 1

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