

CAULMERT LIMITED

Engineering, Environmental & Planning

Consultancy Services

Medra

Berse Road, New Broughton

PHASE II GEO-ENVIRONMENTAL REPORT

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1 INTRODUCTION

1.1 Details of Commission

- 1.1.1 Caulmert Ltd were commissioned by Atticus Planning on behalf of Medra ("the Client") to undertake a Phase II Geo-environmental appraisal of land located off Berse Road, New Broughton, Wrexham ("the Site").
- 1.1.2 Caulmert Ltd have previously been commissioned to undertake a Phase 1 Desk Study of the site and this appointment follows the recommendations within that report, which recommended intrusive investigations to be undertaken to confirm environmental and geotechnical risks at the site, while providing design parameters for the scheme development.
- 1.1.3 While a summary of the pertinent points of the Phase 1 Desk Study are included within this report it is recommended that the Phase 1 Desk Study is read in its entirety:
- Phase 1 Geoenvironmental Report, Berse Road, New Broughton, June 2021 (Report Ref:5073-XX-XX-RP-V-3000.A0.C1.)
- 1.1.4 This report is intended to support a planning application for the proposed development while also providing due diligence information prior to the purchase of the site, along with providing preliminary design information.
- 1.1.5 This report constitutes a geotechnical assessment of the ground conditions and a geo-environmental appraisal of the site including a contamination risk assessment of the Site. This includes the derivation of a provisional Conceptual Site Model in accordance with the staged procedure outlined in "*Model Procedures for the Management of Land Contamination*" (CLR11).

1.2 Limitations of this Study

- 1.2.1 This report is solely for the use of the Client and should not be relied upon by third parties without prior written consent from Caulmert.
- 1.2.2 Information used within this report has been gathered from data sets compiled by third party organisations and purchased on behalf of the Client. The validity and accuracy of this third-party information is outside the control of Caulmert.
- 1.2.3 Interpretation and recommendations contained within this report should not be assumed valid for adjacent areas of land or alternative land uses and are based upon the proposed layout provided to Caulmert at the time of compiling this report.

1.3 Objectives of Report

1.3.1 The objective of this report is to complete an assessment of potential environmental and geotechnical liabilities associated with the proposed redevelopment of the site. while providing preliminary recommendations including geotechnical parameters to allow design of sub-structures.

1.4 Scope of Report

1.4.1 The scope of works consists of the following:

- An assessment of ground conditions given the Site's planned development, its construction phase and the foundation requirements.
- Identification of any significant environmental or geotechnical constraints to the development of the site.
- Confirmation of the ground conditions recorded in the desk study report.
- Investigate potential contamination sources identified in the desk study report.
- Updating the preliminary conceptual site model (CSM) identifying potential sources, pathways and receptors of contaminants from the previous Phase I Desk Study and current ground investigation data; and
- Recommendations for further investigations (as necessary).

1.5 Previous Investigations

1.5.1 Caulmert has not undertaken any previous investigations on the site and is not aware of any investigations carried out by others.

2 PROPOSED DEVELOPMENT

- 2.1.1 A development layout is yet to be finalised; however, it is anticipated the development will comprise of approximately thirty residential detached and semi-detached two storey houses, with associated access roads, private driveways, gardens and public open space.
- 2.1.2 An indicative development layout is presented as Figure 1; an extract is provided below.
- 2.1.3 No construction details, structural loads or site wide elevations have been developed to date. It is assumed the building will be of traditional load bearing masonry wall construction.



Figure 1 – Proposed Development Area

3 Preliminary Investigation

3.1 Site Location and Description

3.1.1 The Site is located to the southeast of New Broughton, Wrexham and to the south of Berse Road, LL11 6TP (British National Grid Reference 331373, 350975). The site location plan is presented as Figure 1 below.



Figure 1 - Site Location Plan

- 3.1.2 The site is currently an open field with a public footpath bisecting the site running approximately east to west. An additional footpath bisects the northern extent of the field diagonally running northeast to southwest.
- 3.1.3 The site is bound by two dismantled railway lines, one to the west and the other bounds half of the eastern boundary. Berse road bounds the remaining eastern boundary. Residential houses are to the north and the Afon Gwenfro water course is to the south.
- 3.1.4 A summary of the Site's current uses, and that of its surroundings, from available information is presented in the Phase 1 Report, summarised below in Table 2.1.

Table 2.1: Site Description

Site Location		
OS Map Reference	331373, 350975	
Site Area	3.4ha	
Site Setting / Description	Current Land Use	Agricultural land with 2no. public footpaths.
	Surrounding Area	North: Residential properties
		East: Dismantled railway embankment
		South: Afon Gwenfro
		West: Dismantled railway embankment

3.2 Site History

- 3.2.1 The earliest map dated 1872 shows the site to be made up of 3no. fields with footpath bisecting the site area running approximately west to east. The site is bound by a railway to the west, a road along the northwest and fields to the north and east. The Afon Gwenfro runs along the southern boundary. By 1899 a further railway has been constructed along the sites eastern boundary and connects with the western railway just to the south of the site.
- 3.2.2 There are no further significant changes onsite or in the vicinity of the site until 1939, when housing is shown along Berse Road to the north of the site. By the 1960s the Railway to the east is shown as dismantled and track/footpath is shown crossing the site on an embankment which links the dismantled railway to a footbridge over the western railway. Further housing to the north of the site was developed in the 1970s.
- 3.2.3 By the early 1980s the western railway is shown as disused and for a short while the eastern railway has been reinstated.

Table 3.1 – Potentially Contaminating Land Uses

On site (within red-line site boundary)	Map Date	
	From	To
Potential for made ground to underlie the development area, associated with the construction and dismantling of railway lines and the construction of the embankment.	Pre-1899	Present
Contaminated soils, gas, and groundwater from inert landfills 21m and 56m southeast of site boundary.	1981	Present
Off-site (within 500m of red-line site boundary)	From	To
Made ground from historic railway lines along east and western site boundaries.	Pre 1899	Present
Historic inert landfills 21m and 56m southeast of site boundary.	1981	Present
Colliery spoil from New Broughton Colliery c. 600m northeast and Gatewen Colliery is c.600m north.	Pre-1899	Present

3.3 Geology

- 3.3.1 The British Geological Survey online geological maps (1:50,000) indicate the following ground conditions at the site:
- The natural superficial deposits underlying the site have been identified as Glaciofluvial Sheet Deposits, Devensian age, comprising of SAND and GRAVELS.

- The bedrock geology underlying the site has been identified as the Pennine Lower Coal Measures formation and Pennine Middle Coal Measures formation comprising of MUDSTONE, SILTSTONE and SANDSTONE.
- No coal seams have been identified that outcrop within the site boundary or within close proximity to the site.

3.4 Mining

- 3.4.1 The site has been identified as being in an area which may be affected by coal mining activity. A coal mining report was obtained from the coal authority which has been summarised below. A copy of the coal report is presented in the Desk Study.
- 3.4.2 As outlined previously the BGS Geological Map for the area does not identify any coal seams outcropping onsite or within the close vicinity of the site.
- 3.4.3 The professional opinion of the coal authority (at the time of the reporting) is that it is unlikely that coal mining features associated with the site will impact on the stability within the enquiry boundary.

3.5 Hydrogeology & Hydrology

- 3.5.1 The nearest water course is the Afon Gwenfro that runs along the southern site boundary and flows to the east-southeast joining the Afon Clywedog approximately 3.6km downstream.
- 3.5.2 The superficial and bedrock deposits beneath the Site have been classed as Secondary A aquifer displaying high groundwater vulnerability. Secondary A aquifers are assigned as '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. These are generally aquifers formerly classified as minor aquifers.'
- 3.5.3 The Site is not located within a source protection zone.
- 3.5.4 The Envirocheck shows the southern extent of the site adjacent to the Afon Gwenfro, has potential for 'extreme flooding' from rivers without defences.
- 3.5.5 There is the potential for groundwater flooding to occur below ground level across the northern and central portions of the Site whereby the water table has the potential to rise and potentially rise up beneath floors or underground rooms. Groundwater flooding at the surface has also been identified in the far south of the site.

3.5.6 Flood consequence Assessment by Waterco indicates that the central area of the site maybe at risk from flooding during an upstream blockage of Afon Gwenfro scenario.

3.6 Ground Gas

3.6.1 There are two historical landfill sites within 60m of the site boundary:

- 21m southeast. Inert waste 01.01.1981-31.12.1985 (not on historic maps).
- 56m southeast. Non-Tox, Non-Comb. Builders Rubble dated 01.05.1981 (not on historic maps).

3.6.2 The Envirocheck indicates that the site is in a higher probability radon area (10 to 30% of homes are estimated to be at or above the Action Level). Full radon protective measures are necessary in the construction of new dwellings or extensions.

3.6.3 The risks associated with the ground gases methane (CH₄) and carbon dioxide (CO₂) are assessed using BS 8485:2015 (Ref.2) and guidelines from CIRIA 665 (Ref. 3) and the NHBC (Ref.4).

3.6.4 Current UK best practice guidance suggests that the ground gas assessment and characterisation for a site is dealt with separately for different types of development. In the above guidance:

- 'Situation A' covers all forms of development (residential and industrial/commercial developments), other than low rise residential development; and
- 'Situation B' is defined as the specific development of low-rise (one to three storeys in height) housing with beam and block floors, vented sub-floor void and gardens.

3.6.5 The development proposals require consideration of Situation B.

3.6.6 The sensitivity of the development is high on account of the development comprising residential dwellings.

3.6.7 It is judged from the available evidence that the gas generation potential of the site is very low to low as the ground conditions comprise Glaciofluvial Sheet deposits. However, in close proximity to the sites southeast boundary there is a former landfill, with limited records on the waste deposited. While the landfill is located some distance (approximately 200m) from the proposed development there is the potential for ground gas to migrate onto site. As such the site has been classified to be of 'moderate risk' and ground gas monitoring has been recommended with monitoring wells targeting the southeast boundary of the site.

4 PRELIMINARY RISK ASSESSMENT

4.1 Qualitative Risk Assessment

4.1.1 A qualitative risk assessment has been undertaken for these potential source-pathway-receptor linkages. This is based on consideration of both:

- The likelihood of an event (takes into account both the presence of the hazard and receptor and the integrity of the pathway).
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

4.1.2 The risk assessment has been based on development of the site with a proposed 'Residential with plant up take' end-use (Table 4.1).

Table 4.1 – Summary of Potential Pollutant Linkages (Preliminary Conceptual Site Model)

Potential Source	Potential Contaminant	Potential Pathways	Potential Receptor	Pollutant Linkage Present	Comments
Made Ground associated with railway construction and decommissioning	Metals, semi-metals, non-metals, PAH, petroleum hydrocarbons and asbestos	Inhalation	Human Health – End user and on-site worker	Likely	Depends on made ground content and thickness
		Ingestion			
		Direct contact			
		Infiltration	Groundwater and Surface Water Quality		
		Lateral migration; groundwater			
		Vertical diffusion; groundwater			
Natural soils and bedrock	Sulphate and pH	Direct Contact	Building materials durability	Unlikely	
Potential for ground gas generation from Made Ground/Organic soils associated with historic railway	Carbon dioxide, carbon monoxide and hydrogen sulphide	Inhalation	Human Health – Future residents and site workers	Likely	Depends on made ground content and thickness.
		Migration through potential Superficial Deposits			
Potential gas producing material from historic landfill	Carbon dioxide, methane, carbon monoxide and hydrogen sulphide	Lateral migration through superficial deposits	Human Health – Future residents and site workers	Likely	Historic landfills are within 30m of site boundary.
		Groundwater			
		Inhalation			
Potential contaminated leachate from historic	Metals, semi-metals, non-metals, PAH, petroleum	Lateral migration; groundwater	Human Health – Future residents and site workers	Likely	Historic landfills are within 30m of site boundary.

Potential Source	Potential Contaminant	Potential Pathways	Potential Receptor	Pollutant Linkage Present	Comments
landfill	hydrocarbons and asbestos	Vertical migration; groundwater	Groundwater and Surface Water Quality		
Potential gas producing material from organic soils associated with the Afon Gwenfro.	Carbon dioxide, methane, carbon monoxide and hydrogen sulphide	Lateral migration through superficial deposits	Human Health – Future residents and site workers	Unlikely	Significant amounts of organic material not anticipated due to the Afon Gwenfro being a minor watercourse.
		Inhalation			
Potential gas producing material from organic soils associated with coal seams located to the south of the site	Carbon dioxide, methane, carbon monoxide and hydrogen sulphide	Lateral migration; bedrock and superficial deposits	Human Health – Future residents and site workers	Unlikely	Coal seams are located c.190m and 260m beneath the site surface and therefore migration of gas unlikely. No record of ground gas issues within the vicinity of the site.
		Vertical migration; bedrock and superficial deposits			
		Inhalation			

5 GROUND INVESTIGATION

5.1 Previous Reports

5.1.1 No information relating to previous ground investigations carried out at the Site has been provided to Caulmert.

5.2 Current Ground Investigation

5.2.1 An intrusive site investigation was completed between the 21st and 25th January 2022. The ground investigation comprised:

- 8no. machined excavated trial pits to depths of between 2.0m and 3.10m bgl;
- 11no. window sample boreholes to max. 2.45m bgl;
- 3no. Infiltration tests.
- 8no. insitu CBR TRL probe tests.
- 6no. Return visits to monitor ground gas and groundwater.

5.2.2 The principal objectives of the study were to examine the ground conditions, provide a preliminary assessment of the environmental liabilities and to determine whether the site is suitable for the proposed development. Specific historical contamination features have been identified in the desk study review and included the former railways, the embankment and the former landfill to the southeast of the site. The site investigation layout was designed to target these features and to provide general site coverage. Exploratory hole locations were restricted by the presence of a water pipes crossing the central area of the site.

5.2.3 The position of the exploratory holes is presented on the Exploratory Hole Plan in Appendix 1.

5.2.4 The window sample boreholes were continuously inspected during drilling to check for indications of contamination and were logged by an experienced Caulmert representative. The window sample borehole logs are presented as Appendix 2.

5.2.5 The trial pits, soakaways and DCP TRL Probes were undertaken and logged by CC Geotechnical. The exploratory hole logs are presented as Appendix 3.

5.2.6 In total 6no. window sample boreholes (WS1,WS2, WS4,WS5, WS10 & WS11) were installed with combined ground gas and groundwater monitoring installations. The remaining boreholes were infilled with arisings in the order of drilling. WS1, WS2, WS4 & WS5 were installed to provide groundwater data across the development area, while provide background ground gas concentrations. WS10 & WS11 were installed to investigate whether

there is any residual ground gas migrating onsite site from the former landfill to the southeast of the site, while also providing site wide groundwater information.

5.2.7 The Infiltration test records are presented in Appendix 3, along with the CBR results from the TRL DCP probes.

5.3 Geotechnical Laboratory Testing

5.3.1 A suite of physical laboratory testing was undertaken on representative soil samples. The laboratory tests comprised:

- 6 no. particle size distribution (PSD) tests;
- 5 no. Atterberg Limit Tests;
- 5 no. Moisture Content;
- 1 no. Compaction Tests and
- 7 no. 2:1 Water Soluble Sulphate and ph.

5.3.2 Testing was scheduled by Caulmert and carried out at out by CC Geotechnical Limited, a UKAS accredited testing laboratory. The geotechnical laboratory testing results are presented in Appendix 3.

5.4 Chemical Laboratory Testing

5.4.1 Fifteen (15no) representative soil samples were collected from the window sample boreholes across the site and submitted to ALS Environmental Limited, a UKAS accredited environmental analytical laboratory.

5.4.2 The soil samples were submitted for an analytical suite comprising:

- Heavy Metals,
- Boron,
- Beryllium,
- Chromium,
- Polyaromatic Hydrocarbons (PAH),
- Total Petroleum Hydrocarbons (TPH) screen,
- Asbestos Screen,
- pH,

5.4.3 The chemical laboratory test results are presented in Appendix 4.

6 GROUND CONDITIONS

6.1 General Stratigraphy

- 6.1.1 The general stratigraphy at the site comprised of Topsoil over Glaciofluvial Sheet Deposits and reflected the published geology.

6.2 Topsoil

- 6.2.1 Topsoil was recorded at ground surface across the site and typically comprised dark grey to dark brown or brown slightly gravelly to gravelly silty organic fine to medium SAND with occasional rootlets. Locally rare pottery and oyster shells noted. The topsoil was generally recorded to 0.30m bgl, but locally to 0.4m bgl.

6.3 Glaciofluvial Sheet Deposits

- 6.3.1 Directly below the topsoil a sequence of Glaciofluvial Sheet Deposits was recorded, which varied laterally and vertically but principally comprised of granular soils with localised interbedded fine-grained clays and silts with no distinct pattern to the distribution of differing materials.
- 6.3.2 The granular soils typically comprised brown to light brown speckled black and creamy brown very silty to silty gravelly to very gravelly SAND or very silty sandy GRAVEL, locally with low to high cobble content.
- 6.3.3 The fine-grained clays and silts typically comprised brown to reddish brown slightly sandy slightly gravelly clayey SILT or brown to light brown and red brown gravelly silty sandy CLAY.
- 6.3.4 Standard Penetration Test (SPT) 'N' values of between 4 and >50 were recorded, but typically 'N' values were greater than 10 and generally increased with depth. A summary of the SPT data and derived strength values are summarised in Table 6.2 below.
- 6.3.5 Six Particle Size Distribution (PSD) were carried out on samples of Glaciofluvial Deposits and confirmed the deposit ranges from gravelly slightly sandy silty CLAY to very gravelly silt fine to coarse SAND to a very sandy silty GRAVEL with low to high cobble content.
- 6.3.6 The PSD results indicate that the granular soils onsite would typically be classified as Class 1A – Well graded granular material and the cohesive soils would be classified as Class 2C – Stony Cohesive material.
- 6.3.7 An Atterberg Limit test on four cohesive samples were undertaken and the results are summarised in Table 6.1 below.

Table 6.1: Atterberg Limits and Volume Change Potential

Sample Location	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index (%)	Modified Plasticity Index (%)	Volume Change Potential
SA3 1.0m	17	36	19	17	8.67	Non-shrinkable
SA3 1.8m	13	24	15	9	7.02	Non-shrinkable
TP6 0.85m	17	27	17	10	9.2	Non-shrinkable
TP6 1.20m	15	27	16	11	10.45	Low

6.3.8 Indicative undrained shear strengths can be derived for the cohesive soils by applying a correlation factor to SPT 'N' values according to the material's plasticity, after Stroud (Ref. 5). Based on worst case plasticity index of 17% for the clay/silt, a correction factor of 6 is derived. SPT 'N' values of between 6 and >50 were recorded within the cohesive unit. Using the above correlation factor an indicative shear strength of between 36kPa and >300kPa was calculated.

6.3.9 Hand Shear Vane tests were undertaken where it was thought appropriate within the cohesive soils, however caution should be placed on the recorded shear strengths given the percentage of coarse-grained granular material within the soils classified as cohesive.

6.3.10 A summary of the derived soil strengths is summarised in Table 6.2 below. A more detailed discussion is presented below.

Table 6.2: Derived Soil Strength

Stratum	SPT (N-value) (Range)	Shear Strength (Range)		Method	No. of Results
		c_u (kPa)	ϕ'_i (°)		
Glaciofluvial - SAND	4->50	n/a	25-40	SPT correlation (Peck et al)	15
Glaciofluvial - Gravel	4-32	n/a	25-36	SPT correlation (Peck et al)	4
Glaciofluvial – Cohesive (SILT)	7->50	42->300		SPT correlation (Stroud 1975)	7
Glaciofluvial – Cohesive (CLAY)	6->50	36->300		SPT correlation (Stroud 1975)	16
		30-50	n/a	HSV	6

6.3.11 The relationship between SPT N values and the angle of shearing resistance was established by Peck et al (Ref. 5.) and indicates a Phi of between 25° and 40°, but typically greater than 30°. There appears to be a number of localised 'N' values that are lower than would be expected. This may be as a result of drilling disturbance or localised groundwater seepages, influencing the test and resulting in a lower than anticipated value.

6.3.12 TRL DCP Probes were undertaken at eight locations across the proposed development area to give an indication of the likely CBR values of the proposed formation. Average CBR values of between 6%-26% were recorded across the site from ground level to shallow depth and a CBR>6% was recorded at anticipated formation (0.3m bgl).

6.4 Installations

6.4.1 The following boreholes were installed with groundwater and gas monitoring standpipes:

- WS1 to 4m (1m plain and 3m slotted).
- WS2 to 4m (1m plain and 3m slotted).
- WS4 to 4m (1m plain and 3m slotted);
- WS5 to 3m (1m plain and 2m slotted);
- WS10 to 3m (1m plain and 2m slotted); and
- WS11 to 2.0m (1m plain and 1m slotted).

6.5 Groundwater

6.5.1 Groundwater was generally not observed within the trial pits or soakaways, although localised seepages were recorded at 0.80mbgl in TP1, 2.30mbgl in TP2 and 2.70mbgl in TP6.

6.5.2 Groundwater was also recorded locally within the Window Sample Boreholes with the following observations noted.

- WS1 wet below 2.8m bgl.
- WS5 wet below 2.4m bgl.
- WS6 wet below 1.8m bgl.
- WS10 wet below 2.1m bgl.

6.5.3 Return groundwater monitoring visits have been undertaken on two occasions to date. A summary of the findings are detailed in Table 6.3 below. Table 6.3: Groundwater Monitoring Summary

Borehole	Date Range	Depth to Groundwater (m bgl)	Approximate Ground Level (mOD)	Approximate Groundwater Elevation (Reduced Level) (mOD)
WS1	14/02/22 – 21/2/22	1.13 – 2.89	111.45	110.32 – 108.56
WS2	14/02/22 – 21/2/22	2.26 - 2.19	110.29	108.03- 108.1
WS4	14/02/22 – 21/2/22	1.93 – 3.02	111.60	109.67-108.50
WS5	14/02/22 – 21/2/22	1.93 - 2.82	110.58	108.65-107.76
WS10	14/02/22 – 21/2/22	0.38 – 1.72	104.09	103.71-102.37
WS11	14/02/22 – 21/2/22	0.81 – 1.36	100.13	99.32- 98.77

6.5.4 Groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

6.5.5 The groundwater monitoring reflect the topography of the site and the surrounding area and indicate groundwater flow is generally towards the south/southeast.

6.5.6 Due to the varied and layered stratigraphy it is likely that lateral continuity of granular horizons will be variable and as such the extent and continuity of granular water bearing horizons will be difficult to determine.

6.6 Ground Gas

6.6.1 Gas and groundwater monitoring standpipes were installed in 6no. window sample boreholes with boreholes with response zones installed within the Glaciofluvial Deposits.

6.6.2 Measurements of carbon dioxide, oxygen and methane have been taken from the monitoring wells installed as part of this investigation on two occasions to date over a range of barometric conditions (including a period of falling pressure). The data are presented in Appendix 6.

6.6.3 The monitoring has recorded a maximum concentration of carbon dioxide of <0.1% v/v v/v and a maximum concentration of methane of <0.1% v/v. Flow measurements have not detected any positive flow rates on all monitoring visits to date.

6.6.4 In addition to the above oxygen concentrations of between 20.2% v/v to 22.0% v/v have been recorded.

6.7 Infiltration Tests

6.7.1 Infiltration testing was undertaken in general accordance with BRE365 and was undertaken on the 19th January 2022 within SA1, SA2 and SA3. A summary of the results is presented Table 6.4.

Table 6.4 – Summary of Falling Head Tests

TP Ref.	Response Zone (m bgl))	Response Zone Strata	Infiltration Rate (m/s)	Comment
SA1	0.5-2.15	Glaciofluvial Sheet Deposits	1.02×10^{-4}	Only one fill cycle possible
SA2	1.15-2.10	Glaciofluvial Sheet Deposits	1.58×10^{-5}	Two fill cycles, but not possible to fill soakaway to preferred depth due to infiltration
SA3	0.63-2.00	Glaciofluvial Sheet Deposits	3.57×10^{-5}	Only one fill cycle possible

6.7.2 The Infiltration Tests indicate that infiltration rates within the Glaciofluvial Sheet Deposits would generally support the use of soakaways. However, the trial pits and window sample boreholes indicate that the sheet deposits have variable permeability strata and therefore careful consideration of the location of any infiltration devices will be required following further investigation. However, it is recommended that an infiltration rate of 2.0×10^{-5} m/s is used for preliminary design purposes.

6.7.3 It is recommended that once a development layout is confirmed, BRE 365 Infiltration tests are undertaken at the location of proposed soakaway locations to confirm they are viable and to provide infiltration rates for detailed drainage design by a specialist.

7 CONTAMINATION ASSESSMENT

7.1 Methodology for Contamination Risk Assessment

- 7.1.1 This section assesses the likely potential contamination to be present, and the risk it may pose to human health, the natural environment and the built environment.
- 7.1.2 In the United Kingdom, the legislative regime for identifying and dealing with contaminated land is set out in Part IIA of the Environmental Protection Act 1990. The Act, together with associated Regulations and Guidance (published separately for England, Wales, Scotland and Northern Ireland), describe the regulatory functions and actions aimed at identifying contaminated land, and defining the persons liable for voluntary or enforced remediation.
- 7.1.3 The methodology recommended for identifying contaminated land is outlined in the DEFRA / EA published guidance document, CLR11 “Model Procedures for the Management of Land Contamination” (2004). The methodology takes the form of the identification of potential contaminant sources, pathways and sensitive receptors and their likely predilection to be linked. Under the guidance, this is termed a “pollutant linkage”.
- 7.1.4 For there to be a potential risk from contamination, a complete-source-pathway-receptor pollutant linkage must exist, or potentially exist, during and after development of the Site. Risk can be defined as the combination of the consequence of a harmful effect and the probability of its occurrence. Each aspect of the pollutant linkage is defined below:
- i) Source (contaminant): A substance that is in or under the land that has the potential to cause harm to the receptor.
 - ii) Pathway: The route(s) or means via which a receptor can be exposed to, or affected by, a contaminant.
 - iii) Receptor: The factor (person, built environment or ecosystems) that might adversely be affected by the source.
- 7.1.5 The potential sources, pathways and receptors for each site are encapsulated into a conceptual site model (CSM). A CSM is the means by which the sources, pathways and receptors are systematically considered; and either discounted, or else earmarked as potentially valid and warranting further investigation.
- 7.1.6 In accordance with the approach advocated in CLR11, a CSM has therefore been derived for the Site using information obtained during the desk study and site walkover, as reported earlier in this document, as well as the results from the ground investigation and from the laboratory chemical analyses of the samples collected from Site.

7.2 Human Health - Generic Assessment Criteria (GAC)

- 7.2.1 Eight samples of Topsoil and seven samples of Glaciofluvial soils were selected for laboratory chemical testing. A table showing the comparison of soil analytical results against generic assessment criteria (GAC) for Residential with plant uptake end use is presented in Appendix 5.
- 7.2.2 No visual or olfactory evidence of chemical contamination was encountered during the investigation.
- 7.2.3 The data set for each chemical determinant has been assessed for the presence of potential outliers (based on the conceptual model) and to determine if the data are normally or non-normally distributed.
- 7.2.4 The pH values of the samples ranged between 6.89 and 8.54.
- 7.2.5 The soil organic matter content of the samples ranged between 0.419% and 10.9%. The results have been compared to 1% soil organic matter content values, in the first instance, as the most conservative value.
- 7.2.6 The results of the laboratory testing confirmed that all of the analysed metals, and all poly aromatic hydrocarbons (PAH) are present at concentrations below the appropriate GAC threshold value for residential with plant uptake values.
- 7.2.7 All the samples submitted for testing also underwent asbestos screening, no fibres were identified within any samples.

7.3 Plant Life

- 7.3.1 The site is currently in use as agricultural land with a winter cereal planted and it is anticipated that there is a suitable growing medium onsite. However, as a precaution a preliminary risk assessment has been undertaken with all the chemical data assessed against GAC for determinands which can influence plant life. The data set for each chemical determinant has been assessed for the presence of potential outliers (based on the conceptual model) and to determine if the data are normally or non-normally distributed. No outliers have been removed.
- 7.3.2 All samples were below the GAC threshold criteria contaminant species assessed. Where there is no exceedance of a GAC, the risks are deemed to be insignificant, and the site is suitable for use without further consideration. A summary of the statistical assessment is included in Appendix 5.

- 7.3.3 Further advice from a landscape architect should be sought with regards to reusing the limited existing topsoil onsite and depth of a clean growing medium within proposed landscaped areas.

7.4 Groundwater

- 7.4.1 The European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives establish a consolidated way of controlling water quality. The Environment Agency (July 2008) has issued a revised Groundwater Protection Policy (known as GP3). The UK Government has set out a timetable for the adoption of the WFD which formalises the way in which the quality of surface water and groundwater are to be assessed. This is set out in 'The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions' 2017.
- 7.4.2 A groundwater body is defined as groundwater in an aquifer capable of supporting an abstraction of 10m³/day or 50 people over a sustained period under the WFD. Groundwater bodies are a strategic resource, even if there is no current abstraction. Lesser amounts of groundwater in an aquifer are not considered as receptors in their own right but may still be pathways to other receptors such as surface water bodies or aquatic ecosystems.
- 7.4.3 No potentially contaminative sources have been identified onsite and the soil testing indicates that there are no elevated concentrations of Chemicals of Concern within the soils. Caulmert believe that the site does not pose a significant risk to Controlled Waters and therefore no groundwater samples have been submitted at this stage for chemical analysis. It is concluded that no mitigation measures are required.

7.5 Ground Gas

- 7.5.1 The risks associated with the ground gases methane (CH₄) and carbon dioxide (CO₂) are assessed using BS 8485:2015 (Ref.2) and guidelines from CIRIA 665 (Ref. 3) and the NHBC (Ref.4).
- 7.5.2 Current UK best practice guidance suggests that the ground gas assessment and characterisation for a site is dealt with separately for different types of development. In the above guidance:
- 'Situation A' covers all forms of development (residential and industrial/commercial developments), other than low rise residential development; and
 - 'Situation B' is defined as the specific development of low-rise (one to three storeys in height) housing with beam and block floors, vented sub-floor void and gardens.
- 7.5.3 The development proposals require consideration of Situation B.

- 7.5.4 When assessed against the Traffic Light Classification in general accordance with NHBC guidance and based on the gas monitoring data to date the site may be preliminary classified as Green (subject to ongoing monitoring) and no mitigation measures are likely to be required.

7.6 Conceptual Site Model (CSM)

An updated CSM has been derived from the desk study, site walkover and ground investigation and is presented in Table 7.1 below.

Table 7.1 – Summary of Updated Potential Pollutant Linkages (Conceptual Site Model)

Potential Source	Potential Contaminant	Potential Pathways	Potential Receptor	Pollutant Linkage Present	Comments
Made Ground associated with railway construction and decommissioning	Metals, semi-metals, non-metals, PAH, petroleum hydrocarbons and asbestos	Inhalation	Human Health – End user and on-site worker	Unlikely	No Made Ground recorded within exploratory holes, the site is currently in agricultural use with no sign of crop distress. All contaminants tested were below the GAC.
		Ingestion			
		Direct contact			
		Infiltration	Groundwater and Surface Water Quality		
		Lateral migration; groundwater			
		Vertical diffusion; groundwater			
Natural soils and bedrock	Sulphate and pH	Direct Contact	Building materials durability	Unlikely	No elevated sulphates recorded.
Potential for ground gas generation from Made Ground/Organic soils associated with historic railway	Carbon dioxide, carbon monoxide and hydrogen sulphide	Inhalation	Human Health – Future residents and site workers	Unlikely	No Made Ground or significant organic soils recorded within exploratory holes ground gas monitoring to date has not recorded any elevated ground gas concentrations.
		Migration through potential Superficial Deposits			
Potential gas producing material from historic landfill	Carbon dioxide, methane, carbon monoxide and hydrogen sulphide	Lateral migration through superficial deposits	Human Health – Future residents and site workers	Unlikely	Ground gas monitoring is ongoing but to date to date has not recorded any elevated ground gas concentrations
		Groundwater			
		Inhalation			
Potential contaminated leachate from historic	Metals, semi-metals, non-metals, PAH, petroleum	Lateral migration; groundwater	Human Health – Future residents and site workers	Unlikely	Historic landfills are within 30m of site boundary. However, the historical landfill appears to be downgradient of the site and in particular the

Potential Source	Potential Contaminant	Potential Pathways	Potential Receptor	Pollutant Linkage Present	Comments
landfill	hydrocarbons and asbestos	Vertical migration; groundwater	Groundwater and Surface Water Quality		proposed development area. No visual or olfactory evidence of contamination either within the soils or groundwater onsite.
Potential gas producing material from organic soils associated with the Afon Gwenfro.	Carbon dioxide, methane, carbon monoxide and hydrogen sulphide	Lateral migration through superficial deposits	Human Health – Future residents and site workers	Unlikely	No organic material noted onsite within the exploratory holes. Ground gas monitoring is ongoing but to date to date has not recorded any elevated ground gas concentrations
		Inhalation			
Potential gas producing material from organic soils associated with coal seams located to the south of the site	Carbon dioxide, methane, carbon monoxide and hydrogen sulphide	Lateral migration; bedrock and superficial deposits	Human Health – Future residents and site workers	Unlikely	Coal seams are located c.190m and 260m beneath the site surface and therefore migration of gas unlikely. No record of ground gas issues within the vicinity of the site.
		Vertical migration; bedrock and superficial deposits			
		Inhalation			

8 ENVIRONMENTAL ASSESSMENT AND RECOMMENDATIONS

8.1 Human Health

- 8.1.1 The risk assessment undertaken in Section 8 indicates that there are no contaminants of concern with respect to the proposed Residential end –use. The site is suitable for the proposed end use subject to the break-out and removal of the asphalt and tarmac from beneath residential plots.
- 8.1.2 However, should unforeseen contamination be encountered during the ground works/construction then works should be ceased in that area until it has been assessed by an Environmental Engineer.
- 8.1.3 At this stage, the CSM constitutes a risk assessment which determines only the likelihood of a linkage being present. The CSM should be refined and revised if during site works ground conditions are found to differ and potential contamination is encountered.
- 8.1.4 The identification of a potential pollutant linkage does not necessarily mean that there is a risk, or that the linkage is present, but that further investigation is required to establish whether or not that risk exists. Whereby a risk is identified and verified, the potential consequence of harmful effect and the likelihood of its occurrence should then be established in order to determine whether the risk is acceptable or unacceptable.

8.2 Plant Life

- 8.2.1 The risk assessment undertaken in Section 8 indicates that there are no contaminants of concern in concentrations which may be harmful to plant life present on-site. The results indicate that the topsoil onsite is chemically suitable, however it is recommended that a landscape architect is contacted for further advice regarding the requirements for any growing medium associated with landscaped areas.

8.3 Controlled Waters

- 8.3.1 No contamination sources have been identified and therefore it is concluded that the site is currently unlikely to pose a significant risk to controlled waters.

8.4 Precautions Against Ground Gas

- 8.4.1 The site is located in an area where Radon Protection measures are not required.

8.4.2 No significant ground gas concentrations have been recorded to date, although ground gas monitoring is still ongoing a preliminary classification of Green has been made, in general accordance with NHBC guidance and no mitigation measures are likely to be required.

8.4.3 While risks to construction workers are not generally discussed in this report, all contractors and maintenance workers should be made aware of the possible presence of Carbon Dioxide and depleted oxygen levels within excavations and confined spaces and should take all necessary Health and Safety precautions when working in trenches or confined spaces.

8.5 Water Supply Pipes

8.5.1 Permeation and accelerated deterioration of pipe material can occur due to chemical reactions between the pipe and contaminants in the ground in which it is laid. This can lead to premature failures resulting in leakage and loss of water quality.

8.5.2 No contaminants of concern have been identified and standard PPE water supply pipes are anticipated to be appropriate at the site however water supply pipes should be specified and laid in accordance with the regional water supply company's specifications.

8.6 Waste Management

8.6.1 The handling, re-use or disposal of waste is regulated by The Environment Agency. Any material excavated on-site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. One of the ways this can be achieved is set out in the Development Industry Code of Practice (CoP; Ref. 6). This builds on the Environment Agency guidance document Definition of waste: developing greenfield and brownfield sites (2006). The Agency will take into account the use of the CoP in deciding whether to regulate materials as waste. If materials are dealt with in accordance with the CoP, the Agency considers that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development.

8.6.2 All material proposed for off-site disposal (e.g., during future construction works) should be given a proper description and waste classification assessment as required by the Environmental Protection Duty of Care Regulations (Ref. 7), and in accordance with WM3 and the Environment Agency Technical Guidance on the assessment and classification of Hazardous Waste.

- 8.6.3 At this stage it is not anticipated that any soils onsite will require off-site disposal. However, based on the total chemical laboratory results it is anticipated that the soils onsite would be classified as 'inert'. This should be confirmed through appropriate testing and classification of the materials actually being disposed of from the site.

8.7 Outline Remedial Measures

- 8.7.1 No specific risks have been identified which require remedial action at this stage.

9 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

9.1 Geotechnical Categorization of the Proposed Development

9.1.1 Eurocode 7, Section 2 advocates the use of geotechnical categorization of the proposed structure(s) to establish the design requirements. Initial categorisation can be made before site investigation and can be used to define the scope and extent of geotechnical investigation required. For the purposes of this investigation, the proposed structures have been classed as follows:

- Geotechnical Category 1.

9.2 Site Preparation, Earthworks, Groundworks and Landscaping

9.2.1 There are two water supply routes which cross the site, while these are anticipated to lie outside of the development area, excavation in close proximity these will need to ensure that the excavation walls are stable or appropriately battered to a safe angle. Temporary slope stability works may be required in any deep excavations. In addition, protection may be required for any plant movement over these routes. It is recommended that Welsh Water are contacted prior to any enabling works to confirm any requirements.

9.2.2 No relic structures or obstructions were recorded other than boulders, which may result in localised over excavation. It is anticipated that any shallow (1.5m bgl) excavations should not present any difficulty for conventional plant and equipment. A number of instabilities were noted in the trial pits and the soakaway pits, and it is anticipated that shallow excavations will require temporary support to ensure excavations remain open.

9.2.3 Topsoil is present across the site and a topsoil strip should be undertaken at the start of the groundworks. Topsoil should be appropriately stockpiled.

9.2.4 Generally localised minor groundwater seepages were encountered at depths of between 0.8m and 2.7m bgl, but typically beyond 2.0m bgl was encountered during the ground investigation, and it is anticipated that groundwater will be at depth and therefore any groundwater seepages will generally be minor to moderate and may be controlled by sump pumping methods. Care should be taken to ensure no significant loss of fines.

9.2.5 It should be noted that groundwater levels may vary from the time of the investigation, due to seasonal variations.

- 9.2.6 Where entry to trenches is unavoidable, gas monitoring should be undertaken, and entry should be made if safe to do so. In addition, entry should be restricted to the absolute minimum time necessary depending on the monitoring and assessment by a competent person.
- 9.2.7 It is understood that there is likely to be some minor earthworks required to reduce the high point in the north of the site and create development platforms. It is anticipated that the majority of the soils onsite will be classified as either Class 1A – Well graded granular material or Class 2C-Stony cohesive material. It is recommended that a 'Cut & Fill' assessment is undertaken once a development layout has been finalised. A detailed earthworks specification can be produced to ensure the appropriate management and reuse of the existing soils. However, further earthworks testing of targeted soils will be required.

9.3 Foundations

- 9.3.1 It is understood that the development will principally comprise two storey residential houses. Although no layout has been set and loadings are not known at this stage it is anticipated that any loadings associated with the development will generally be light to moderate.
- 9.3.2 The preliminary foundation designs in this section are based on the parameters given in Section 6. It is recommended that a detailed foundation assessment is undertaken on a plot-by-plot basis once a development layout is confirmed and site levels have been set.
- 9.3.3 It is anticipated that standard shallow foundations can be adopted across the site, any new foundations should be taken down through any Topsoil into the Glaciofluvial Sheet Deposits at a minimum depth of 0.75m bgl where an allowable bearing capacity of up to 100kN/m² can be assumed for foundation design, which should limit the total foundation settlement to less than 25mm and differential settlement to half this value.
- 9.3.4 As foundations are likely to span founding materials of different stiffness mesh reinforcement should be placed top and bottom of the foundation.
- 9.3.5 The depth of foundations should be designed, and the formations inspected, by a competent geotechnical engineer. Any sub-formation materials deemed as unsuitable, such as soft or loose zones, should be excavated and replaced with well compacted suitable granular fill or lean mix concrete.
- 9.3.6 Foundation excavations should be protected from water and inclement weather including frost and any water should be removed by pumping from a sump in the base of

the excavation. Care should be taken to prevent the removal of fines when controlling groundwater. Further guidance should be sought if further groundwater control measures are required.

9.4 Ground Floor Slabs

9.4.1 A development layout and site levels are yet to be finalised and it is anticipated that a suspended floor slab solution is likely to be adopted at the site.

9.4.2 However, as an alternative the following preliminary recommendations are relevant. Granular, non-plastic soils were typically recorded at shallow depth across the site and therefore ground bearing floor slabs can be designed to accommodate a bearing pressure of 50kPa. subject to the following criteria being satisfied:

- The Topsoil/made ground is excavated and removed and replaced with well-compacted granular material to an agreed engineering specification.
- It is demonstrated that the soils are non-shrinkable, and desiccation is not present in sub-formation soils.

9.4.3 Prior to the placement of the founding materials and the construction of the ground bearing floor slab, the sub-formation and formation will need to be inspected and checked by a geotechnical engineer to ensure the ground conditions are as expected.

9.4.4 If low bearing and soft strata are identified at the formation, this should be reported to the Geotechnical Engineer immediately and remedial actions agreed.

11.6 Roads and Pavements

9.4.5 Based on the observations during intrusive site works it is considered that a minimum CBR of 5% will be achievable over the majority of the site and can be used for preliminary design, subject to insitu testing during construction. A full review of ground conditions should be undertaken once final site levels have been confirmed.

9.4.6 Proof rolling of the formation level will be required and any loose or soft spots to be removed and replaced with an engineered fill, in accordance with a suitable Specification. The formation level will also need to be protected during inclement weather from deterioration.

9.4.7 Prior to the placement of the founding materials and the construction of the road pavement, the sub-formation and formation will need to be inspected and checked in accordance with a suitable Specification to ensure the ground conditions are as expected. All testing should be carried out in accordance with the strategy outlined in

DMRB IAN 73/06 and confirm that the ground conditions at time of construction are consistent with the previous design parameters.

9.5 Protection of Buried Concrete

9.5.1 Three samples submitted for chemical and geotechnical testing were tested for pH and sulphate content (2:1 water soluble extraction). The testing results were as follows:

Table 9.1 – Assessment of Aggressive Chemical Environment for Concrete

	Results Range
pH (units)	7.5-8.3
Water soluble sulphate (SO ₄) (g/l)	<0.02

9.5.2 The results have been compared to the guidance contained in BRE Special Digest 1, Concrete in aggressive ground, 2005. Based on Greenfield conditions and a mobile groundwater regime, in the range of proposed foundations, the site is classed as follows:

Table 9.2 – Assessment of Concrete Classification

Design Sulphate class	DS-1
ACEC Class	AC-1

9.5.3 Concrete below ground must comply with the requirements of Parts D to F of Special Digest 1, as appropriate.

10 FURTHER WORK

The infiltration tests undertaken to date indicate that soakaways would provide a viable drainage solution at the site. However, it is recommended that Infiltration tests are undertaken in accordance with BRE365 at the locations and depths of proposed soakaways once a development layout is finalised to confirm suitability and provide infiltration rates for detail design.

It is recommended that a foundation assessment is undertaken on a plot-by-plot basis once the layout and final site levels have been set, along with an Earthworks Specification if required.

Additional specific earthworks material testing is recommended if significant earthworks are required.

11 REFERENCES

- [1] Phase 1 Geoenvironmental Desk Study – Caulmert Ltd December 2020 – 4863-XX-XX-RP-O-0300.S0.P0
- [2] British Standards Institution (2015): *Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings* BS8485:2015
- [3] CIRIA C665:2007 - *Assessing the risk posed by hazardous ground gases to buildings.*
- [4] NHBC – Ground Gas Guidance 2007
- [5] Peck et al. 1974. Correlation of SPT N Values.
- [6] CL:AIRE (2008): *Definition of Waste: Development Industry Code of Practice* (September 2008).
- [7] Environmental Protection (Duty of care Regulations 2009).

APPENDIX 2

Window Sample Borehole Logs

		Project:		Ref:	
		Berse Road, New Broughton		WS1	
Boring date:		Logged by:		Client:	
25.01.2022		DK		MEDRA	
Elevation		~111.45m AOD		Coordinates	
Depth (m)		Description			
from	to				
0	0.3	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].			
0.3	0.8	Firm orange brown slightly sandy slightly gravelly silty CLAY. Gravel fine to coarse subangular to subrounded of siltstone, sandstone and mudstone. [GLACIOFLUVIAL SHEET DEPOSITS]			
0.8	1.5	Firm orange brown very gravelly slightly sandy slightly silty CLAY. Gravel fine to coarse subangular to subrounded of siltstone, sandstone and mudstone. Possible cobbles. [GLACIOFLUVIAL SHEET DEPOSITS]			
1.5	1.9	Firm to stiff red brown very slightly sandy silty CLAY with very rare gravel. Gravel fine to medium subangular to subrounded of siltstone, sandstone and mudstone. [GLACIOFLUVIAL SHEET DEPOSITS]			
1.9	2.8	Soft to firm red brown slightly gravelly sandy CLAY with rare fine gravel size fragment of charcoal. [GLACIOFLUVIAL SHEET DEPOSITS]			
2.8	4.0	Medium Dense, becoming very dense Wet light brown slightly gravelly clayey SAND. Gravel fine to medium subangular to subrounded of siltstone, sandstone and mudstone. [GLACIOFLUVIAL SHEET DEPOSITS]			
Terminated at 4.45m					
Installed 1m plain 3m slotted.					
Notes.		Borehole scanned with CAT prior to drilling			
		Window Samples formed by Exploration Ltd under supervision of Caulmert Limited			
		Groundwater – Wet from 2.8m bgl			

		Project: Berse Road, New Broughton		Ref: WS2
Boring date: 25.1.2022		Logged by: DK		Client: MEDRA
Elevation		~110.29m AOD		Project ID: 5073
Coordinates				
Depth (m)		Description		
from	to			
0	0.3	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].		
0.3	2.5	Loose Brown slightly sandy clayey GRAVEL. Gravel fine to coarse subrounded to subangular of sandstone and siltstone. Poor recovery 1-2.5m possible cobbles? [GLACIOFLUVIAL SHEET DEPOSITS]		
2.5	4.0	Firm to stiff light brown slightly gravelly slightly sandy clayey SILT. Gravel fine to medium tabular to subangular of siltstone and sandstone. Becoming very stiff below 3.5m and in places very sandy. [GLACIOFLUVIAL SHEET DEPOSITS]		
Refused at 4.0m				
Installed 1m plain 3m slotted.				
Notes.	Borehole scanned with CAT prior to drilling			
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited			
	Groundwater – No groundwater encountered.			

Sampling & Recovery Details (m)				SPT test details			
Depth (m)		Recovery (%)	comments	Depth (m)	Blow count	N	Comment
from	to						
0	1	100		1-1.45m	2,3; -1,2,1,2,	6	
1	2	50		2.-2.45	2,2; -1,1,0,2,	4	
2	3	75		3-3.45	4,3; -3,4,5,9,	21	
3	4	100		4.-4.45	5,5; 5,9,36 for 60mm,	50+	
							

		Project:		Ref:	
		Berse Road, New Broughton		WS3	
Boring date:		Logged by:		Client:	
25.1.2022		DK		MEDRA	
Elevation				Coordinates	
Depth (m)		Description			
from	to				
0	0.3	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet and very rare fragment of pottery. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone [TOPSOIL].			
0.3	1.6	Brown fine to medium SAND with rare medium gravel size fragment of charcoal. Below 0.6m grading into. Brown and orange brown sandy GRAVEL. Gravel fine to coarse subangular to rounded of sandstone, siltstone and limestone. [GLACIOFLUVIAL SHEET DEPOSITS]			
1.6	3.2	Firm to stiff red brown very slightly sandy slightly gravelly silty CLAY. Gravel fine to medium subangular to subrounded of sandstone and siltstone. Fine to medium SAND band between 2.2-2.4m Below 2.8m 2no. cobbles. [GLACIOFLUVIAL SHEET DEPOSITS]			
3.2	3.9	Brown fine to medium SAND. [GLACIOFLUVIAL SHEET DEPOSITS]			
3.9	5.0	Brown speckled black and creamy brown slightly gravelly coarse to medium SAND with closely spaced fine to medium sand partings. [GLACIOFLUVIAL SHEET DEPOSITS]			
Terminated at 5.45m					
No installation, backfilled with arisings.					
Notes.					
Borehole scanned with CAT prior to drilling					
Window Samples formed by Exploration Ltd under supervision of Caulmert Limited					
Groundwater – No groundwater encountered.					

Sampling & Recovery Details (m)					SPT test details			
Depth (m)		Recovery (%)	comments		Depth (m)	Blow count	N	Comment
from	to							
0	1	100			1.0-1.45	4,6;-7,10,6,6	29	
1	2	100			2.-2.45	8,9;-9,7,5,4	25	
2	3	100			3-3.45	2,2;-2,2,3,2	9	
3	4	80			4.-4.45	1,1;-1,1,1,1	4	
4	5	60				16, 9 for 40mm;-12,6,8,9	35	



The photograph shows four soil samples, each approximately 400mm long, laid out horizontally on a dark, moist soil surface. A yellow measuring tape is positioned above the samples, indicating their length. The samples are composed of various soil types, including dark brown silty clay, lighter brown sandy soil, and some reddish-brown soil. The samples are arranged in a row, with some showing signs of disturbance or fragmentation. The background shows a grassy area and a wooden fence.

		Project: Berse Road, New Broughton		Ref: WS4
Boring date: 26.1.2022	Logged by: DK	Client: MEDRA		Project ID: 5073
Elevation	~111.60m AOD	Coordinates		
Depth (m)		Description		
from	to			
0	0.3	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].		
0.3	1.8	Firm soft in places light brown becoming red brown slightly gravelly sandy CLAY with medium spaced thinly bedded very sandy clay and rare medium gravel sized fragment of charcoal. [GLACIOFLUVIAL SHEET DEPOSITS]		
1.8	2.1	Firm to stiff brown slightly sandy CLAY with very rare gravel and very rare coarse sand fragment of charcoal. Gravel fine to medium subrounded of siltstone. [GLACIOFLUVIAL SHEET DEPOSITS]		
2.1	5.0	Stiff light brown to light creamish brown mottled grey and in places mottled orange brown slightly gravelly silty CLAY. Gravel fine to medium subangular of weathered micaceous siltstone. Below 3m stiff. Below 4.8m light grey. [GLACIOFLUVIAL SHEET DEPOSITS]		
Terminated at 5.45m				
Installed with 1m plain and 4m slotted.				
Notes.				
Borehole scanned with CAT prior to drilling				
Window Samples formed by Exploration Ltd under supervision of Caulmert Limited				
Groundwater – No groundwater encountered.				

Sampling & Recovery Details (m)				SPT test details			
Depth (m)		Recovery (%)	comments	Depth (m)	Blow count	N	Comment
from	to						
0	1	100		1.0-1.45	2,2: - 2,2,3,3,	10	
1	2	100		2.-2.45	3,2: -3,3,3,5	14	
2	3	100		3-3.45	4,8;-6,6,6,6	24	
3	4	100		4.-4.45	9,11;-12,12,13,13 for 75mm	50+	



		Project: Berse Road, New Broughton		Ref: WS5	
Boring date: 25.1.2022		Logged by: DK		Client: MEDRA	
				Project ID: 5073	
Elevation		~110.58m AOD		Coordinates 507592.1864 347301.4804 11.414	
Depth (m)		Description			
from	to				
0	0.4	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].			
0.4	1.0	Firm to stiff light brown slightly sandy silty CLAY. [GLACIOFLUVIAL SHEET DEPOSITS]			
1.0	2.0	No Recovery.			
2.0	2.4	Medium Dense Brown slightly clayey sandy GRAVEL. Gravel fine to coarse subangular to subrounded of sandstone and siltstone. [GLACIOFLUVIAL SHEET DEPOSITS]			
2.4	3.6	Wet soft(N value doesn't suggest soft – possibly high sand/silt content caused it to dilate in liner?) disturbed very sandy silty CLAY. Becoming firm slightly sandy slightly silty CLAY with rare fine gravel size fragment of charcoal. Below 3.0m with closely spaced thickly laminated very sandy CLAY. [GLACIOFLUVIAL SHEET DEPOSITS]			
3.6	5.0	Firm to stiff light creamish brown very slightly sandy gravelly SILT/CLAY with very rare gravel. Gravel fine to coarse subangular of siltstone. [GLACIOFLUVIAL SHEET DEPOSITS]			
Terminated at 5.0m					
Notes.					
Borehole scanned with CAT prior to drilling					
Window Samples formed by Exploration Ltd under supervision of Caulmert Limited					
Groundwater – wet below 2.4m.					

Sampling & Recovery Details (m)					SPT test details			
Depth (m)		Recovery (%)	comments		Depth (m)	Blow count	N	Comment
from	to							
0	1	100			1.0-1.45	4,2:- 2,2,2,3	9	
1	2	0			2.-2.45	3,3;-3,2,2,2	9	
2	3	70			3-3.45	2,3;-3,3,3,4	13	
3	4	80			4.-4.45	4,4;5,6,6,7	24	
4	5	100			5-5.45	6,6;-5,8,6,6	25	
								

		Project: Berse Road, New Broughton		Ref: WS6
Boring date: 26.1.2022	Logged by: DK	Client: MEDRA		Project ID: 5073
Elevation		Coordinates		
Depth (m)		Description		
from	to			
0	0.3	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].		
0.3	1.5	Firm brown slightly sandy very gravelly CLAY. Gravel fine to coarse subangular to subrounded of siltstone and sandstone. Poor recovery between 1.0-1.5m. [GLACIOFLUVIAL SHEET DEPOSITS]		
1.5	2.5	Medium Dense Brown slightly clayey gravelly fine to coarse SAND. Gravel fine to coarse subangular to subrounded of siltstone and sandstone. Wet below 1.8m [GLACIOFLUVIAL SHEET DEPOSITS]		
2.5	3.0	Soft to firm brown sandy CLAY with rare coarse sand to fine gravel size fragment of charcoal. [GLACIOFLUVIAL SHEET DEPOSITS]		
Terminated at 3.45m collapsed above.				
No install backfilled with arisings.				
Notes.	Borehole scanned with CAT prior to drilling			
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited			
	Groundwater – Wet below 1.8m			

Sampling & Recovery Details (m)					SPT test details			
Depth (m)		Recovery (%)	comments		Depth (m)	Blow count	N	Comment
from	to							
0	1							
		100			1.0-1.45	2,1: - 1,1,2,2	6	
					2.-2.45	5,5;-5,6,4,2	17	
					3-3.45	3,2;-3,2,3,3	11	
								

			Project: Berse Road, New Broughton		Ref: WS7		
Boring date: 26.1.2022		Logged by: DK		Client: MEDRA		Project ID: 5073	
Elevation				Coordinates			
Depth (m) from to		Description					
0 0.3		Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].					
0.3 2.0		Medium dense, becoming very dense grey brown and black gravelly fine to coarse SAND with rare cobble and widely spaced pocket of coarse sand sized fragments of charcoal. Gravel fine to coarse subangular to subrounded of siltstone and sandstone. [GLACIOFLUVIAL SHEET DEPOSITS]					
Refused at 2.00							
No install, backfilled with arisings.							
Notes.		Borehole scanned with CAT prior to drilling					
		Window Samples formed by Exploration Ltd under supervision of Caulmert Limited					
		Groundwater – No groundwater encountered.					
Sampling & Recovery Details (m)				SPT test details			
Depth (m) from to		Recovery (%)	comments	Depth (m)	Blow count	N	Comment
0 1		100		1.0-1.45	4,4;-3,4,5,6	18	
1 2		100		2.-2.45	11,13;-12,12,13,13	50	
							

		Project: Berse Road, New Broughton		Ref: WS8
Boring date: 25.1.2022	Logged by: DK	Client: MEDRA		Project ID: 5073
Elevation		Coordinates		
Depth (m)		Description		
from	to			
0	0.3	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].		
0.3	2.0	Poor recovery, possible cobbles? Light brown very slightly clayey gravelly SAND Gravel fine to coarse subangular to subrounded of siltstone and sandstone. [GLACIOFLUVIAL SHEET DEPOSITS]		
2.0	2.8	Light brown and yellowish brown very sandy GRAVEL with very rare fine gravel size fragment of charcoal Gravel fine to coarse subangular to rounded of siltstone and sandstone. [GLACIOFLUVIAL SHEET DEPOSITS]		
2.8	4.0	Firm to stiff reddish brown very slightly sandy slightly gravelly CLAY. Gravel fine to coarse subangular to rounded of siltstone and sandstone. [GLACIOFLUVIAL SHEET DEPOSITS]		
Terminated at 4.0m, collapsed above.				
No install backfilled with arisings.				
Notes.	Borehole scanned with CAT prior to drilling			
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited			
	Groundwater – No groundwater encountered.			

Sampling & Recovery Details (m)				SPT test details			
Depth (m)		Recovery (%)	comments	Depth (m)	Blow count	N	Comment
from	to						
0	1	100		1.0-1.45	1,1;-2,2,3,3	10	
1	2	100		2.-2.45	6,7;-8,9,8,7	32	
2	3	100		3-3.45	5,7;-6,5,7,10	28	
3	4	100		4.-4.45	8,10;-10,11,12,12	45	
3	4	100					
4	5	20					
							

		Project: Berse Road, New Broughton		Ref: WS9
Boring date: 26.1.2022	Logged by: DK	Client: MEDRA		Project ID: 5073
Elevation		Coordinates		
Depth (m)		Description		
from	to			
0	0.3	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].		
0.3	0.9	Firm brown light yellow brown slightly sandy clayey SILT. [GLACIOFLUVIAL SHEET DEPOSITS]		
0.9	2.1	Firm brown light yellowish brown slightly gravelly slightly sandy clayey SILT. Gravel fine to medium subrounded to subangular of siltstone, sandstone and mudstone. [GLACIOFLUVIAL SHEET DEPOSITS]		
2.1	3.6	Firm reddish brown clayey SILT. [GLACIOFLUVIAL SHEET DEPOSITS]		
3.6	5.0	Wet light brown slightly clayey silty fine to medium SAND. Poor recovery between 4.0-5.0m. [GLACIOFLUVIAL SHEET DEPOSITS]		
Terminated at 5.0m				
No install, backfilled with arisings.				
Notes.	Borehole scanned with CAT prior to drilling			
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited			
	Groundwater – No groundwater encountered.			

Sampling & Recovery Details (m)				SPT test details			
Depth (m)		Recovery (%)	comments	Depth (m)	Blow count	N	Comment
from	to						
0	1	100		1.0-1.45	1,1;-1,1,2,3	7	
1	2	100		2.0-2.45	5,5;-2,4,3,4	13	
2	3	100		3.0-3.45	3,3;-4,5,6,11	26	
3	4	70		4.0-4.45	5,6;-5,7,7,7	26	
4	5	30		5.0-5.45	11,14 for75mm;-17,24,9 for25mm	50+	



		Project: Berse Road, New Broughton		Ref: WS10
Boring date: 26.1.2022	Logged by: DK	Client: MEDRA		Project ID: 5073
Elevation		~104.09m AOD	Coordinates	
Depth (m)		Description		
from	to			
0	0.4	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].		
0.4	0.9	Firm brown becoming light brown slightly gravelly slightly silty sandy CLAY. Gravel fine to coarse subrounded to subangular of sandstone and siltstone. [GLACIOFLUVIAL SHEET DEPOSITS]		
0.9	2.1	Firm slightly sandy very gravelly CLAY. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. Cobble 1.9-2.0m [GLACIOFLUVIAL SHEET DEPOSITS]		
2.1	2.8	Wet firm to stiff reddish brown very slightly sandy silty CLAY. [GLACIOFLUVIAL SHEET DEPOSITS]		
2.8	3.5	Medium Dense Wet reddish brown very slightly clayey fine to medium SAND. Poor recovery 3.0-3.5m [GLACIOFLUVIAL SHEET DEPOSITS]		
3.5	5.0	Firm to Stiff brown very slightly sandy slightly silty CLAY. No recovery 4.0-5.0m [GLACIOFLUVIAL SHEET DEPOSITS]		
Terminated at 5.0m				
No install, backfilled with arisings.				
Notes.				
Borehole scanned with CAT prior to drilling				
Window Samples formed by Exploration Ltd under supervision of Caulmert Limited				
Groundwater –Seepage/wet 2.1-3.5m.				

Sampling & Recovery Details (m)				SPT test details			
Depth (m)		Recovery (%)	comments	Depth (m)	Blow count	N	Comment
from	to						
0	1	100		1.0-1.45	2,2;-3,2,3,2	10	
1	2	100		2.-2.45	3,2;-4,5,4,5	18	
2	3	100		3-3.45	3,3;-2,4,4,5	15	
3	4	50		4.0-4.45	4,4;-4,5,5,6	20	
4	5	0		5.0-5.45	6,5;-5,5,7,7	24	



		Project: Berse Road, New Broughton		Ref: WS11
Boring date: 25.1.2022	Logged by: DK	Client: MEDRA		Project ID: 5073
Elevation	~100.13m AOD	Coordinates		
Depth (m)		Description		
from	to			
0	0.4	Dark brown slightly gravelly silty fine to medium SAND with occasional rootlet. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [TOPSOIL].		
0.4	0.8	Firm light creamish brown slightly sandy clayey SILT. [GLACIOFLUVIAL SHEET DEPOSITS]		
0.8	1.8	Medium Dense Brown speckled black gravelly fine to coarse SAND. [GLACIOFLUVIAL SHEET DEPOSITS]		
1.8	2.0	Firm reddish brown to brown and light brown slightly sandy very gravelly CLAY. Gravel fine to coarse subrounded to subangular of siltstone, sandstone and mudstone. [GLACIOFLUVIAL SHEET DEPOSITS]		
2.0	2.7	Medium Dene Wet brown slightly gravelly clayey SAND. [GLACIOFLUVIAL SHEET DEPOSITS]		
2.7	4.0	Firm to stiff greyish to purplish brown clayey SILT. Poor recovery 3.0-4.0m [GLACIOFLUVIAL SHEET DEPOSITS]		
Terminated at 4.0m due to collapse to 2m.				
Installed with 1m plain and 1m slotted.				
Notes.	Borehole scanned with CAT prior to drilling			
	Window Samples formed by Exploration Ltd under supervision of Caulmert Limited			
	Groundwater – No groundwater encountered.			

Sampling & Recovery Details (m)				SPT test details			
Depth (m)		Recovery (%)	comments	Depth (m)	Blow count	N	Comment
from	to						
0	1	100		1.0-1.45	3,4;-4,8,7,7	26	
1	2	100		2.-2.45	3,2;-5,5,4,3	17	
2	3	100		3-3.45	3,2;-3,4,4,4	15	
3	4	100		4.-4.45	5,7;-8,8,10,11	37	
							

APPENDIX 3

CC Geotechnical Factual Report

APPENDICES

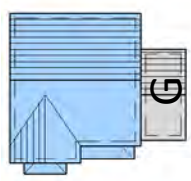
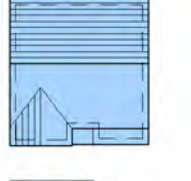
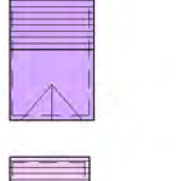
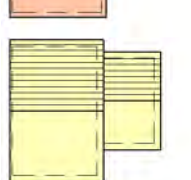
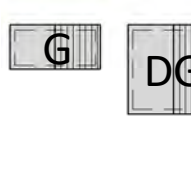
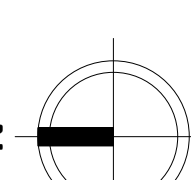
APPENDIX 1

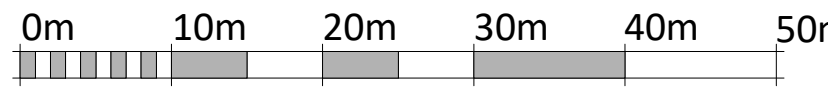
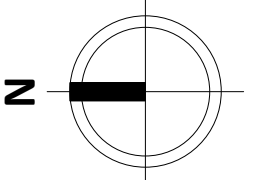
Figures and Drawings

DEVELOPMENT INSIDE LDP AREA ALLOCATED FOR HOUSING = 1.74 HECTARES
23.5 HOUSES PER HECTARE



1 | PROPOSED SITE LAYOUT
SCALE: 1 : 500

HOUSE TYPE	TOTAL
 4 BED DETACHED + ATTACHED GARAGE	x 4
 4 BED DETACHED + INTEGRATED GARAGE	x 5
 4 BED TOWNHOUSE (2.5 STOREY)	x 7
 3 BED SEMI	x 14
 2 BED SEMI (AFFORDABLE)	x 5
 3 BED (AFFORDABLE)	x 5
 4 BED (AFFORDABLE)	x 1
 SINGLE + DOUBLE GARAGE	41



VISUAL SCALE 1:500 @ A1

REV	DESCRIPTION	DATE	BY
A	NOTES ON DENSITY ADDED	19/01/22	IO

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PROJECT

BERSE RD, WREXHAM
for MEDRA

DRAWING TITLE

PROPOSED SITE LAYOUT -
LDP OVERLAY - OPTION 2

SCALE	DATE	DRAWN	CHECKED
1 : 500 @ A1	17/01/22	IO	SV

DRAWING STATUS

PRELIMINARY

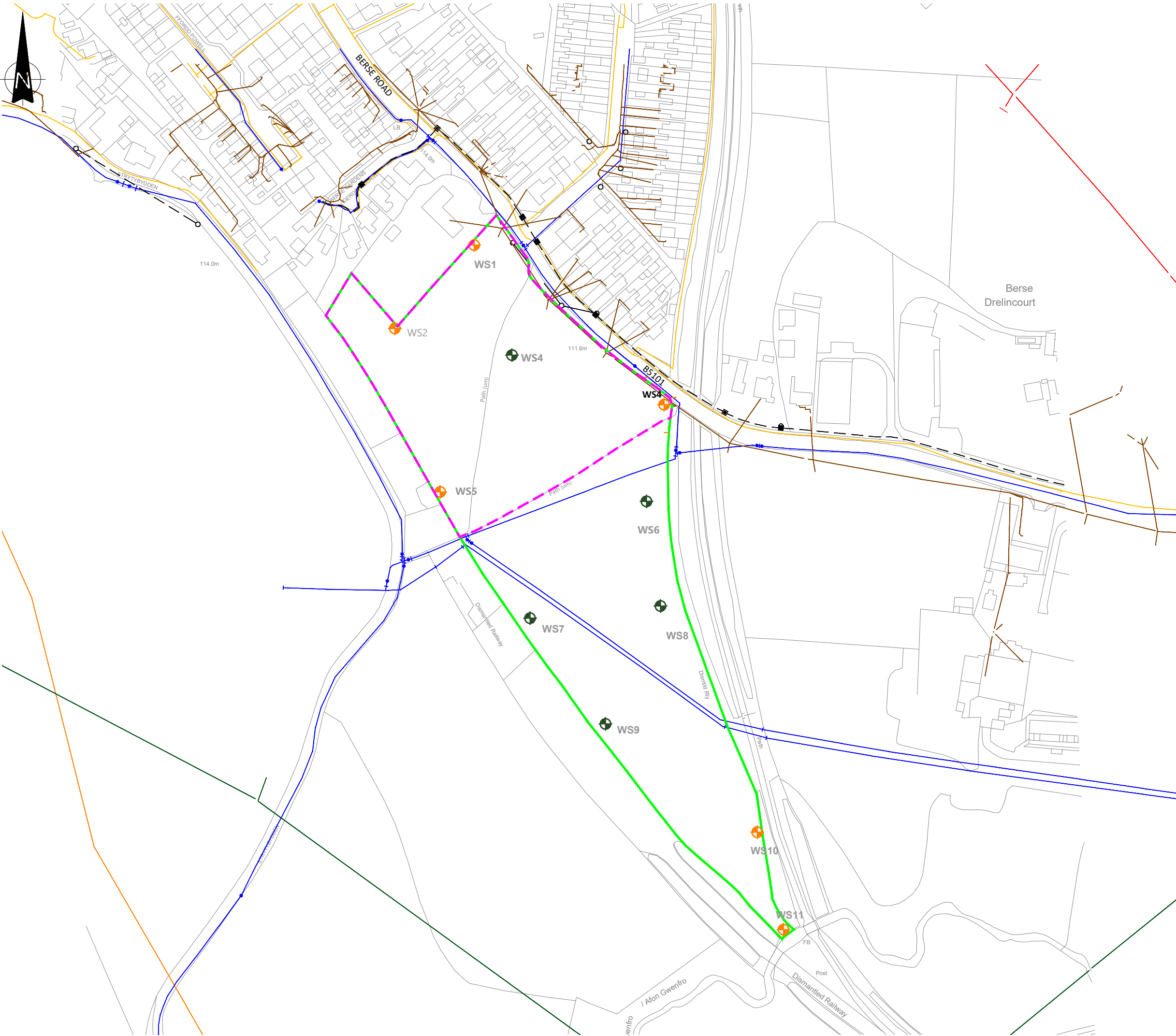
JOB No	DRAWING No	REVISION
C1091	004	A



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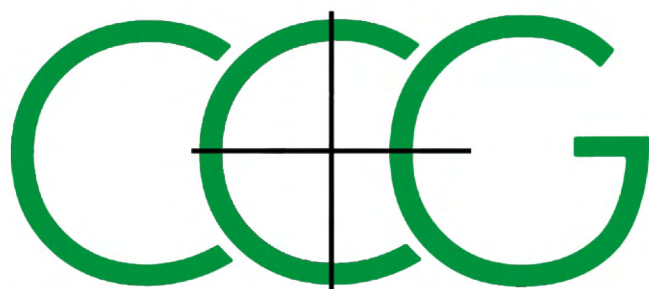
PRINTED: 19/01/2022 15:13:14



LEGEND

- LAND OWNERSHIP BOUNDARY
- PROPOSED DEVELOPMENT AREA
- WINDOW SAMPLE BOREHOLE
- WINDOW SAMPLE BOREHOLE INSTALLED
- EXISTING ELECTRIC HV
- EXISTING ELECTRIC 33KV
- EXISTING ELECTRIC LV
- EXISTING MEDIUM PRESSURE GAS MAINS
- EXISTING LOW PRESSURE GAS MAINS
- EXISTING WATER TRUNK MAINS
- EXISTING WATER HYDRANT
- EXISTING WATER AIR VALVE
- EXISTING TELECOM - BT OPENREACH CABLE (LIVE)
- EXISTING TELECOM - BT OPENREACH BOX (LIVE)
- EXISTING TELECOM - BT OPENREACH MANHOLE (LIVE)
- EXISTING TELECOM - BT OPENREACH POLE (LIVE)

P01	ISSUED FOR INFORMATION	EJD	DK	DK	14.12.21
REV	MODIFICATIONS	BY	RE	AP	DATE
PURPOSE OF ISSUE				STATUS	
FOR INFORMATION				S2	
CLIENT:					
					
PROJECT:					
BERSE ROAD, NEW BROUGHTON					
TITLE:					
BOREHOLE LOCATION PLAN					
DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY		
EJD	EJD	DK	DK		
DATE	SCALE @ A3	JOB REF:	REVISION		
01.12.2021	1:2000	5073	P01		
DRAWING NUMBER					
5073-CAU-XX-XX-DR-C-1802					
					



CCG-C-21-12809

GROUND INVESTIGATION REPORT FOR

**BERSE ROAD,
NEW BROUGHTON, WREXHAM**

FEBRUARY 2022

Prepared by:

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**DOCUMENT CONTROL FORM**

Client:	Caulmert Ltd
Project Title:	Ground Investigation report for site at Berse Road, New Broughton, Wrexham
Reference Number:	CCG-C-21-12809
Main Author:	Samuel Parry BSc (Hons)
Signature:	
Reviewed by:	Chris Bolan MSc CEng MICE CEnv
Signature:	
Approved for Issue by:	Chris Bolan MSc CEng MICE CEnv
Signature	

FOR AND BEHALF OF CC GEOTECHNICAL LTD

Date:	February 2022
Revision Number:	1
Comments:	Inclusion of ELAB environmental report
Status:	Final
Distribution:	

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1.0 INTRODUCTION

CC GEOTECHNICAL LIMITED (CCG) was commissioned by **CAULMERT LTD (The Client)** to provide geotechnical fieldwork investigation and laboratory testing services in connection with the proposed development of land at Berse Road, New Broughton, Wrexham. The site lies within the administrative jurisdiction of **Wrexham County Borough Council**

The proposed site layout is as annotated on Drawing: 12809-1 contained herein.

The purpose of the investigation was to obtain sufficient geotechnical data on the substrata to allow the preparation of a report outlining ground conditions and potential use of soakaway drains.

It must be borne in mind that the data and opinions contained in this report should be read in conjunction with the Notes on Limitations contained herein.

Materials were carefully excavated from each trial pit in thin layers, and the arisings stockpiled adjacent to the excavation. On encountering each new stratum, the excavation was stopped, while physical measurements and, where relevant, soil samples taken. Soil samples were collected in polythene tubs and amber glass jars, which were sealed and labelled before shipment to the laboratory.

All trial pits were backfilled immediately after excavation, with the materials being replaced in the reverse order to which they have been excavated to preserve insofar as was possible, the original lithology. Excavated materials were thoroughly tamped as each layer was placed to produce a dense reinstatement matching, as near as possible, the profile of the surrounding ground.

Logs of the trial pits annotated with sampling details and and HSV undrained shear strength (Cu-kN/m²) results are given in Appendix C.

2.0 SITE LOCATION & DESCRIPTION

The site is located at Berse Road, New Broughton, Wrexham. The **ORDNANCE SURVEY** coordinates for the approximate site centre are E: 331376 N: 350972.

Photographs of trial pits and soakaway pits are presented in Appendix G

3.0 FIELDWORK

3.1 Introduction

The ground investigation was undertaken in January 2022, and comprised the following:

- ✦ The CAT scanning and mechanical excavation of 8nr trial pits.
- ✦ The subsampling of trial pit arisings for engineering classification and environmental contamination testing.
- ✦ The performance of 3nr soakaway tests conducted in SA1, SA2 and SA3 to the method specified in BRE Digest 365.
- ✦ The backfilling and reinstatement of trial pit positions to ground level.
- ✦ The performance of 8nr TRL DCP tests.

The works were carried out in accordance with BS10175: 2011 and BS5930: 2015, and BS1377: 1990 insofar as they related to the specified scope.

The locations of the trial pits are shown on Drawing: 12809-2

3.2 Trial Pits

In accordance with the ground investigation plan 8nr trial pits and 3nr soakaway pits were excavated using an 8-tonne tracked excavator.

Each proposed trial pit location was positioned to be clear of all services shown on record drawings. Each location was scanned by CAT service locator before and continuously during the excavation.

4.0 OBSERVED STRATIGRAPHY

The observed ground conditions are summarised as:

Table 1: Observed Stratigraphy

Observed Stratigraphy	
TP1	TOPSOIL comprising of SAND extending to 0.30mbgl Overlying Brown Silty gravelly cobbly SAND to 0.60mbgl Overlying Brown silty cobbly sandy GRAVEL to 1.40mbgl Overlying Brown sandy gravelly clayey SILT to termination at 3.10mbgl
	TOPSOIL comprising of SAND extending to 0.30mbgl Overlying Slightly gravelly sandy silty CLAY to 2.30mbgl Overlying Brown cobbly sandy GRAVEL to termination at 3.00mbgl
	TOPSOIL comprising of SAND extending to 0.30mbgl Overlying Brown gravelly cobbly silty SAND to 1.20mbgl Overlying Brown silty gravelly cobbly SAND to termination at 2.30mbgl
	TOPSOIL comprising of SAND extending to 0.30mbgl Overlying Brown sandy silty cobbly GRAVEL to 1.80mbgl Overlying Brown very sandy very gravelly COBBLES to termination at 2.40mbgl
TP5	TOPSOIL comprising of SAND extending to 0.30mbgl Overlying Brown sandy silty cobbly GRAVEL to termination at 3.10mbgl
	TOPSOIL comprising of SAND extending to 0.40mbgl Overlying Soft brown slightly sandy slightly gravelly silty CLAY to 2.70mbgl Overlying Brown sandy silty GRAVEL to termination at 2.80mbgl
TP6	TOPSOIL comprising of SAND extending to 0.35mbgl

TP8	Overlying Brown silty sandy GRAVEL to 2.90mbgl at termination
	TOPSOIL comprising of SAND extending to 0.30mbgl
SA1	Overlying Brown cobbly gravelly SAND to 2.00mbgl at termination
	TOPSOIL comprising of SAND extending to 0.30mbgl
SA2	Overlying Soft to firm brown gravelly slightly sandy silty CLAY to termination at 2.15mbgl
	TOPSOIL comprising of SAND extending to 0.30mbgl
SA3	Overlying Light brown silty sandy cobbly GRAVEL to termination at 2.10mbgl
	TOPSOIL comprising of SAND extending to 0.30mbgl
	Overlying Brown clayey gravelly SAND to 0.70mbgl
	Overlying Soft brown gravelly slightly sandy silty CLAY to 1.50mbgl
	Overlying Firm reddish brown sandy slightly gravelly silty CLAY to termination at 2.00mbgl

8.0

TRL DCP

8nr DCP tests were conducted across the site. The results of the test are presented in Appendix E

9.0

EXCAVATIONS

Excavations may be undertaken by light hydraulic excavators. Excavations in excess of 1.2mbgl will require side support.

10.0

GROUNDWATER MANAGEMENT

Groundwater was struck at 0.80mbgl in TP1, 2.30mbgl in TP2 and 2.70mbgl in TP6. A prudent contractor would allow for some minor pumping to maintain dry working conditions during foundation construction and/or service installations, particularly during heavy and/or prolonged periods of precipitation.

Further descriptions can be observed within Appendix C.

There was no visual and/or olfactory evidence of contamination and/or biodegradable materials affecting the ground mass at any sampling position.

5.0 ENVIRONMENTAL LABORATORY TESTING

14nr soil samples were retrieved and passed onto The Client on site for testing. The laboratory report for these samples is not included In this report.

7nr soil samples were subject to pH and SO_4 analysis. The ELAB analysis report is presented in Appendix H

6.0 LABORATORY TESTING

The following testing was undertaken at the UKAS accredited laboratory of CCG.

- Determination of Moisture Content in accordance with BS 1377-2:1990.
- Determination of Atterberg Limits in accordance with BS 1377-2:1990.
- Determination of Particle Size Distribution. in accordance with BS1377-2:1990.
- Dry Density / Moisture Content Relationship in accordance with BS1377-4: 1990

The soil classification test results and certificates are presented in Appendix D.

7.0 SOAKAWAY RESULTS

The soil infiltration rate at SA1 was calculated to be 1.02×10^{-4} and at SA3 calculated to be 1.58×10^{-5} . Both SA1 and SA3 have been calculated based on a single charge of water. The infiltration rate at SA2 was 3.57×10^{-5} . SA2 infiltration has been calculated based on two charges of water. SA2 could not be filled to the required pipe invert level of ≈ 0.50 mbgl due to the water soaking away faster than was possible to fill the pit. During the first charge of water the pit suffered a minor collapse from 2.10mbgl to 1.80mbgl. The soakaway results are presented in Appendix F



CC GEOTECHNICAL LIMITED
Consulting Geotechnical and Geoenvironmental Engineers

APPENDIX A

DRAWINGS



Legend



Site Boundaries



CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
CAULMERT LTD

Project:
Berese Road, New Broughton, Wrexham

Title:
Site Location Plan

Scale:
NTS

Issue:
1

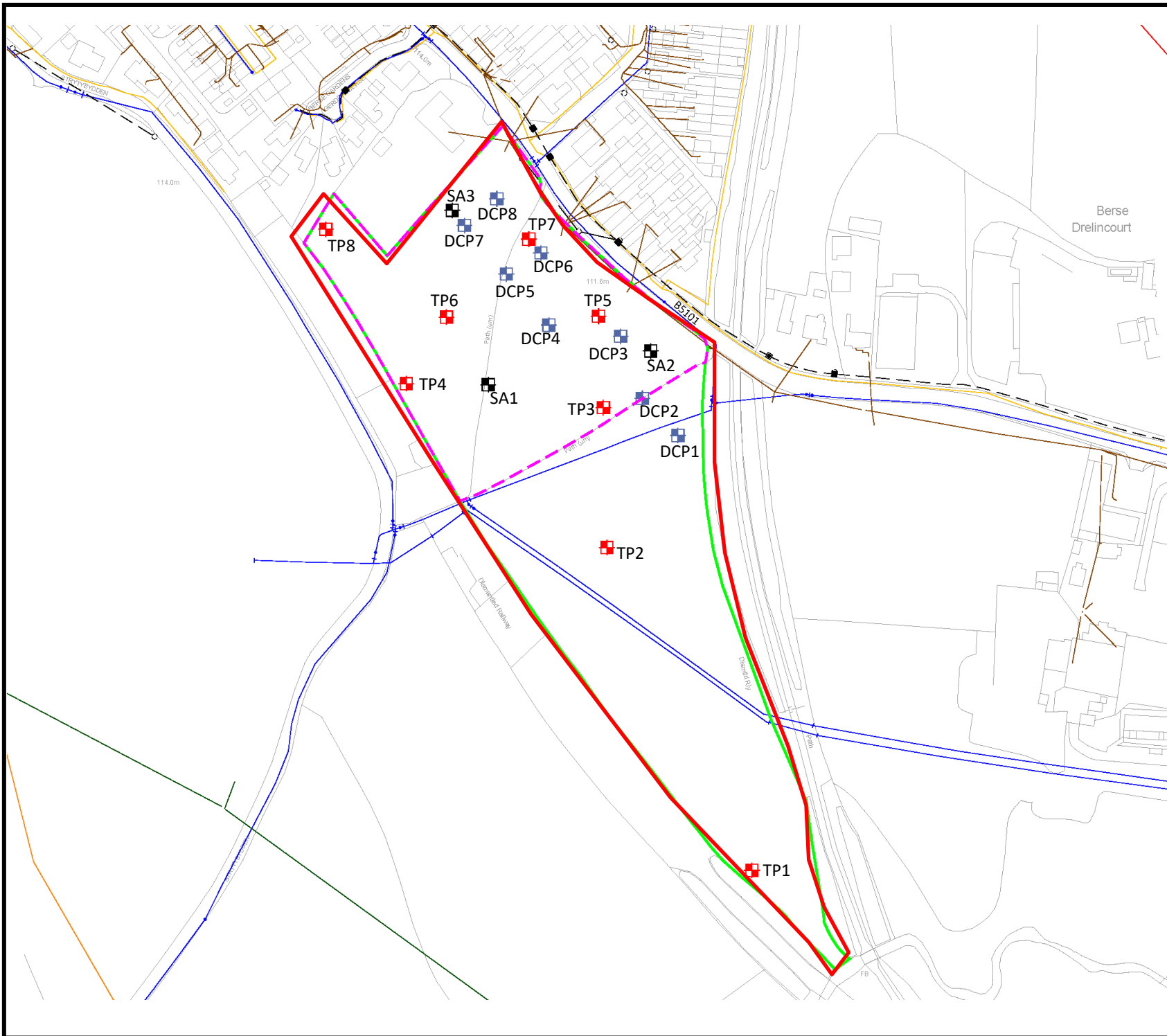
Drawn by:
SP

Date:
February 2022

Project No.
CCG-C-12809

Drawing No.
12809-1

CC GEOTECHNICAL LIMITED



Legend



Trial Pit



DCP



Soakaway



Site Boundaries



CC GEOTECHNICAL LIMITED
UNIT 1 DELTIC WAY
KNOWSLEY INDUSTRIAL ESTATE
LIVERPOOL
L33 7BA
0151 545 2750

Client:
CAULMERT LTD

Project:
Berese Road, New Broughton, Wrexham

Title:
Ground Investigation Location Plan

Scale:
NTS

Issue:
1

Drawn by:
SP

Date:
February 2022

Project No.
CCG-C-12809

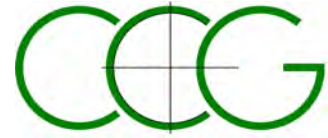
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12809-2

CC GEOTECHNICAL LIMITED



APPENDIX B

SAMPLING METHODOLOGY



SAMPLING, SAMPLE TRANSPORTATION, AND FIELD MONITORING PROTOCOLS

Soil, water and gas sampling and monitoring methodologies employed by **CC GEOTECHNICAL LTD** are presented hereunder.

SAMPLING OF SOIL FOR CHEMICAL ANALYSIS

Soil samples may be recovered from a variety of intrusive investigation methods including *inter alia* dynamic sampling boreholes, cable percussion boreholes, machine or manual excavation of trial pits.

All equipment which has the potential to introduce extraneous materials into soils – borehole casings, sampling drilling rods, borehole sampling tools, hand tools such as trowels and spades etc. – must be cleaned by jet washing before initial use and between sampling positions.

Cable Percussion Boreholes

In this method of investigation disturbed bulk and small disturbed samples are recovered at regular depth increments throughout the length of the borehole. Each bulk/small disturbed sample is uniquely labelled with the Project Name / Project No / Borehole No / Depth / Date. Where possible, samples are immediately scanned by PID.

Light Dynamic Sampling Boreholes

In this method of investigation samples are recovered in relatively undisturbed 1m long Perspex liners. Each liner is uniquely labelled with the Project Name / Project No / Borehole No / Depth / Date. The liner tubes are sealed by air tight caps fitted at each end, and are temporarily stored out of sunlight. Where possible, samples are immediately split, scanned by PID, logged and subsampled. In the event that splitting and logging on site is not practicable, then the liners are immediately transported to the laboratory where they are immediately split, scanned by PID, logged and subsampled.

Trial Pits

Samples are to be taken from the bucket of an excavator and placed in appropriate airtight containers. Each container is uniquely labelled with the Project No / Trial Pit No / Depth / Date. The samples are then immediately placed in a cool box chilled by ice packs, and the boxes are sealed for transportation to the chemical laboratory.

Sampling Containers

Containers used to store soil samples are selected dependant on the required analysis. The testing laboratory will be consulted should there be any doubt as to the correct sampling container. Typically, a minimum of 1nr 1kg plastic tub, 1nr 500g plastic tub, 1nr 250g amber glass jar and 2nr glass vials are taken at each sample depth. Samples held on site awaiting same day courier collection are stored at 4°C in a cool box. Only in circumstances where same day collection cannot be arranged are samples held overnight, and in this event all samples are refrigerated at 4 °C either on site (if a refrigerator is available) or at CC GEOTECHNICAL soil laboratory. Courier collection is then arranged for immediate pick up the following day.

Chain of Custody records

A Chain of Custody Record (CoC) is to be sent with each batch of samples submitted to the testing laboratory. A copy of the CoC will be made available for inspection by the client, their agents, or any requesting regulatory authority.

HEADSPACE ANALYSES

Duplicate subsamples of all soil samples selected for laboratory analysis may be taken for headspace analyses.

Headspace analysis is undertaken using a MiniRae 2000 Photo Ionisation Detector (PID). In the test method, an amber glass jar is half filled with soil, and the lid is sealed with aluminium foil secured by an elastic band. The jar and contents are agitated for 30 seconds and left for a minimum of 30 minutes out of direct sunlight for the headspace to achieve equilibrium. The PID then pierces the seal and the maximum reading is recorded. Prevailing weather conditions and ambient air temperature are also recorded.

The PID headspace results are recorded on the exploratory borehole or trial pit logs.

PID headspace data is then used to inform the chemical testing schedule for volatile organic compounds analyses.

SAMPLING OF GROUNDWATER FOR CHEMICAL ANALYSIS

Groundwater is sampled from standpipes or piezometers installed during borehole drilling. On completion of the construction of the standpipe, the installation is initially developed by removing up to 10 x the internal volume of the

installation. The volume of water purged is recorded. The installation is then typically left for a week for hydraulic equilibrium to be restored.

Prior to sampling the standpipe, the depth to the water table, and the depth to the base of the installation are monitored using an electronic dipmeter. In circumstances where free phase product is suspected to be present, then an 'Interface Meter' is used to determine the free phase film thickness.

A minimum of 3 x the installation volume is then removed. The pH of the water is then monitored and the sample is taken when the change in pH between any two consecutive extracts is less than 10%. The volume of water removed is recorded.

A sample comprises of a minimum of 3 litres. Two litres are taken in amber glass bottles, and one litre in a plastic bottle.

To avoid cross-contamination one bailer is used per position.

The samples are uniquely labelled with Project Name / Project No / Borehole No / Depth / Date Sampled. They are placed in a cool box chilled by ice packs, and the containers are sealed for transportation to the laboratory.

Once the samples are received in the **CC GEOTECHNICAL LTD** laboratory, the samples are stored in a refrigerator and returned to the cool boxes once collected.

Water taken from the installations are taken back to the **CC GEOTECHNICAL LTD** laboratory and disposed.

Other data recorded in the sampling comprises:

- Volume of water removed during development of well
- Volume of water removed during purging of the well
- Results of on-site pH analyses
- Sample appearance – colour, suspended solids

MONITORING OF GAS

Prior to embarking on a gas-monitoring round, all equipment is checked for functionality and the calibration status is confirmed.

At the commencement of the monitoring round, the prevailing weather conditions, air temperature, barometric pressure and direction of movement of barometric pressure are recorded.

The flow meter is first attached to the standpipe valve, and the flow rate is measured (peak and steady flow) for 1 minute. The results are recorded in l.hr^{-1} . The flow meter tube is protected from the effects of wind by aligning the exhaust downwind.

Following measurement of borehole flow rate, the installation is left for a minimum of 10 minutes for the headspace to restore equilibrium.

Once the gas in the installation has regained equilibrium, the gas analyser is connected and monitoring commences. The peak and steady state readings for CH_4 , CO_2 , CO , H_2S and CO are recorded. The steady state is monitored for a minimum of one minute, and possibly up to a maximum of 10 minutes where fluctuations continue.

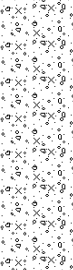
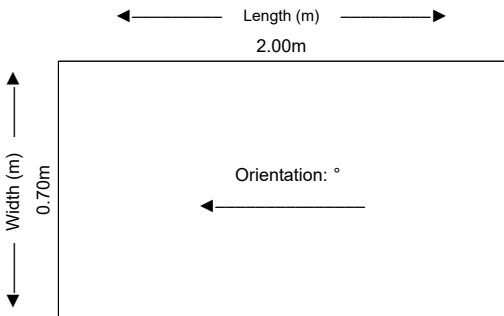
When the monitoring is complete, the depth to the water table, and the depth to the base of the well are monitored using an electronic dipmeter. In circumstances where free phase product is suspected to be present, then an 'Interface Meter' is used to determine the free phase film thickness.



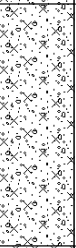
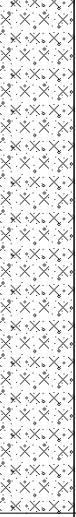
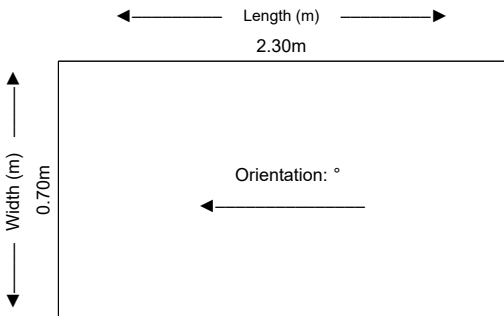
APPENDIX C

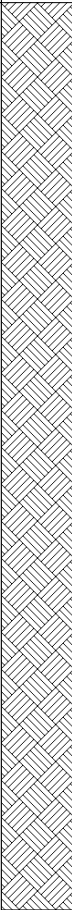
TRIAL PIT LOGS

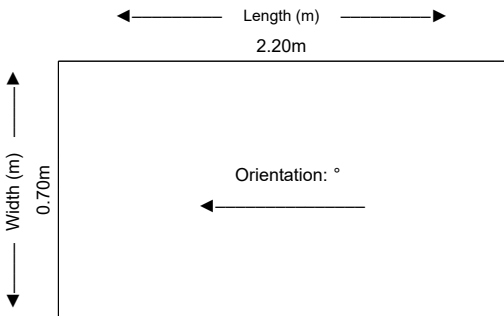
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	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25										
Trial Pit Log		Weather:			Hole Termination:		Stability: Stable									
Samples & In Situ Testing				Strata Details					Water	Backfill						
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description										
0.20	B			(0.30)		Dark grey gravelly silty organic SAND. Gravel is fine to coarse sub-rounded mudstone and sandstone			1							
0.50	B			0.30		Soft to firm brown gravelly slightly sandy silty CLAY with medium cobble content of sandstone. Gravel is fine to coarse sub-rounded to rounded sandstone and mudstone (Too gravelly for HSV)										
1.00	B			(1.85)					2							
1.50	B															
2.00	B			2.15		End of Trial Pit at 2.15m			3							
Dimensions:											General Remarks:					
Final Depth: 2.15m																
← Length (m) → 2.00m ↑ Width (m) ↓ 0.70m Orientation: ° ←																
Inclination: °											Water Strikes					
											Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
														0		SA DRY
CC GEOTECHNICAL LTD 0151 545 2750 www.ccgteotechnical.com																

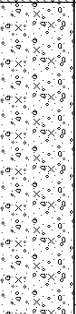
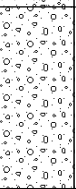
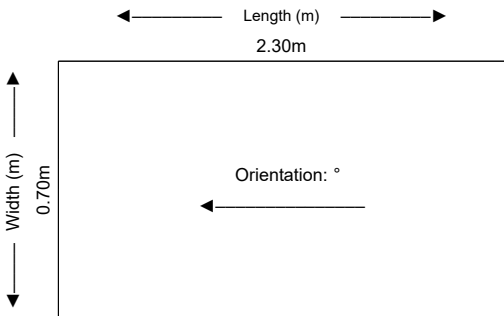
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	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1															
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25															
	Weather:		Hole Termination:		Stability: Unstable. Partial Collapse During Water Charge																
Samples & In Situ Testing			Strata Details					Water	Backfill												
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description															
0.20	B			(0.30)		Dark grey silty gravelly organic SAND. Gravel is fine to coarse sub-angular to rounded mudstone and sandstone		1													
0.50	B			0.30		Light brown silty very sandy GRAVEL with high cobble content of sandstone. Gravel is fine to coarse sub-angular to rounded sandstone.															
1.50	B			(1.80)				2													
				2.10		End of Trial Pit at 2.10m															
								3													
Dimensions:					General Remarks:																
Final Depth: 2.10m					Soakaway collapsed during first charge to 1.80mbgl																
																					
Inclination: °																					
					Water Strikes																
					<table><tr><td>Strike (m)</td><td>Casing (m)</td><td>Sealed (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td>0</td><td></td><td>SA DRY</td></tr></table>					Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks				0		SA DRY
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks																
			0		SA DRY																
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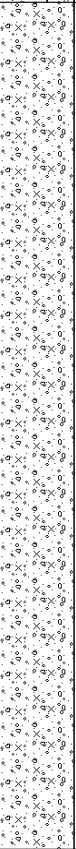
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	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1																					
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25																					
	Weather:		Hole Termination:		Stability: Stable																						
Samples & In Situ Testing			Strata Details					Water	Backfill																		
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																					
0.20	B	HVP=30kPa		(0.40)		Grassed TOPSOIL. Recovered as grey silty gravelly organic SAND. Gravel is fine to medium sub-angular to rounded mudstone		1																			
0.50	B			0.40 (0.30)		Brown very clayey very gravelly SAND with a medium cobble content of sandstone. Gravel is fine to coarse sub-angular to rounded coal and sandstone.																					
1.00	B			0.70 (0.80)		Soft brown gravelly slightly sandy silty CLAY. Gravel is fine to coarse subangular sandstone																					
1.80	B	HVP=45kPa		1.50 (0.50)		Firm reddish brown sandy slightly gravelly silty CLAY. Gravel is fine to medium subangular sandstone		2																			
				2.00	End of Trial Pit at 2.00m																						
								3																			
Dimensions:			General Remarks:																								
Final Depth: 2.00m																											
← Length (m) → 2.50m ↑ Width (m) ↓ 0.70m Orientation: ° ←																											
Inclination: °			<table><tr><th colspan="6">Water Strikes</th></tr><tr><th>Strike (m)</th><th>Casing (m)</th><th>Sealed (m)</th><th>Time (mins)</th><th>Rose to (m)</th><th>Remarks</th></tr><tr><td></td><td></td><td></td><td>0</td><td></td><td>SA DRY</td></tr></table>							Water Strikes						Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks				0		SA DRY
Water Strikes																											
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks																						
			0		SA DRY																						
CC GEOTECHNICAL LTD 0151 545 2750 www.cogeotechnical.com																											

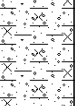
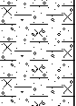
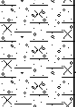
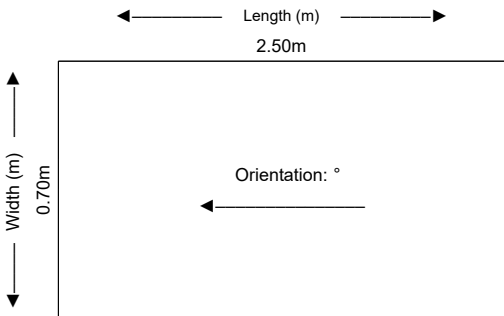
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	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1																											
	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25																											
Trial Pit Log																																	
Weather:		Hole Termination:			Stability: Unstable																												
Samples & In Situ Testing				Strata Details					Water	Backfill																							
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																											
0.20	B			(0.30)		TOPSOIL. Grey silty gravelly organic SAND. Gravel is fine to coarse sub-rounded sandstone and mudstone			1																								
0.40	ES			0.30 (0.30)		Brown very silty gravelly cobbly SAND. Gravel is fine to coarse sub-angular to rounded sandstone and mudstone																											
0.60	B			0.60 (0.80)		Brown very silty very cobbly sandy GRAVEL. High cobble content. Gravel is fine to coarse rounded sandstone and mudstone																											
1.20	B			1.40 (1.70)		Brown slightly sandy slightly gravelly clayey SILT. Gravel is fine to coarse sub-angular sandstone																											
2.00	B								2																								
3.10	B			3.10		End of Trial Pit at 3.10m			3																								
Dimensions:											General Remarks:																						
Final Depth: 3.10m											Trial pit collapsing from 0.50mbgl. Could not excavate beyond 3.10mbgl.																						
																																	
Inclination: °																																	
											Water Strikes																						
											<table><tr><td>Strike (m)</td><td>Casing (m)</td><td>Sealed (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td>0.80</td><td></td><td></td><td>0</td><td></td><td>Seepage</td></tr></table>											Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	0.80			0		Seepage
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks																												
0.80			0		Seepage																												
											CC GEOTECHNICAL LTD 0151 545 2750 www.ccgteotechnical.com																						

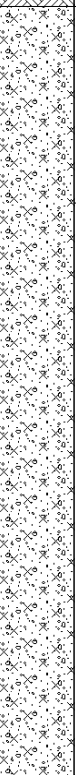
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	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1									
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25									
	Weather:		Hole Termination:		Stability: Unstable										
Samples & In Situ Testing			Strata Details					Water	Backfill						
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description									
0.20 0.20	B ES	HVP=30kPa		(0.30) 0.30		TOPSOIL. Grey silty gravelly organic SAND. Gravel is fine to coarse sub-rounded sandstone and mudstone		1							
0.50	ES					Soft brown silty slightly gravelly sandy CLAY. Gravel is fine to coarse sub-angular sandstone and mudstone									
0.70	B														
1.50	B		HVP=40kPa		(2.00)										
2.30				2.30		Brown silty cobbly sandy GRAVEL with a high cobble and boulder content. Gravel is fine to coarse sub-angular to rounded sandstone and mudstone.		2							
2.70	B			(0.70)											
				3.00		End of Trial Pit at 3.00m		3							
Dimensions:										General Remarks:					
Final Depth: 3.00m										High chance of trial pit collapse. Trial pit not continued to prevent collapse					
← Length (m) → 2.40m ↑ Width (m) ↓ 0.70m Orientation: ° ←															
Inclination: °															
										Water Strikes					
										Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
										2.30			0		Seepage
										CC GEOTECHNICAL LTD 0151 545 2750 www.ccgteotechnical.com					

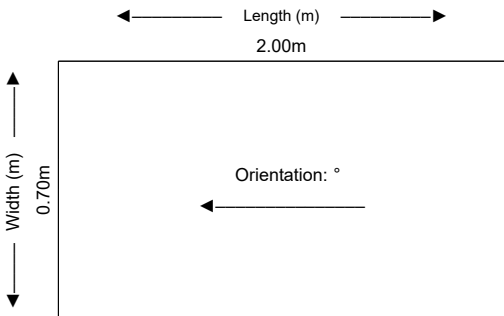
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	Weather:		Hole Termination:		Stability: Unstable																						
Samples & In Situ Testing			Strata Details					Water	Backfill																		
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																					
0.20 0.20	B ES			(0.30) 0.30		TOPSOIL. Grey silty gravelly organic SAND. Gravel is fine to coarse sub-rounded sandstone and mudstone		1																			
0.60	ES					Brown very gravelly cobbly silty SAND with a high cobble content. Gravel is fine to coarse sub-angular to rounded sandstone and mudstone.																					
0.80	B			(0.90)																							
				1.20		Brown slightly silty very gravelly cobbly SAND. Gravel is fine to coarse sub-angular to rounded sandstone, mudstone and limestone		2																			
2.00	B			(1.10)																							
				2.30		COLLAPSING - 2.20mbgl End of Trial Pit at 2.30m		3																			
Dimensions:			General Remarks:																								
Final Depth: 2.30m			Trial pit collapsing from 2.30mbgl. Could not excavate beyond 2.30mbgl.																								
																											
Inclination: °																											
			<table><tr><th colspan="6">Water Strikes</th></tr><tr><th>Strike (m)</th><th>Casing (m)</th><th>Sealed (m)</th><th>Time (mins)</th><th>Rose to (m)</th><th>Remarks</th></tr><tr><td></td><td></td><td></td><td>0</td><td></td><td>TP DRY</td></tr></table>							Water Strikes						Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks				0		TP DRY
Water Strikes																											
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks																						
			0		TP DRY																						
			CC GEOTECHNICAL LTD 0151 545 2750 www.ccgteotechnical.com																								

	Contract Name: Berse Road, New Broughton			Client: Caulmert			Trial Pit ID: TP4		
	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1			
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25			
	Weather:			Hole Termination:		Stability: Unstable			
Samples & In Situ Testing			Strata Details					Water	Backfill
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description			
0.20 0.20	B ES			(0.30) 0.30		TOPSOIL. Grey silty gravelly organic SAND. Gravel is fine to coarse sub-rounded sandstone and mudstone		1	
0.80 1.00	ES B			(1.50)		Brown very sandy silty GRAVEL with high cobble and boulder content of sandstone. Gravel is fine to coarse sub-angular to rounded sandstone and mudstone.			
2.00	B			1.80 (0.60) 2.40		Brown very sandy very gravelly COBBLES. High boulder content		2	
						TRIAL PIT COLLAPSING - 1.30-2.40mbgl		3	
						End of Trial Pit at 2.40m			
Dimensions:			General Remarks:						
Final Depth: 2.40m			Trial pit collapsing from 2.40mbgl Could not excavate beyond 2.40mbgl.						
									
Inclination: °			Water Strikes						
			Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	
						0		TP DRY	
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	Contract Name: Berse Road, New Broughton			Client: Caulmert			Trial Pit ID: TP5								
	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1									
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25									
	Weather:		Hole Termination:		Stability: Unstable										
Samples & In Situ Testing			Strata Details					Water	Backfill						
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description									
0.20 0.20	B ES			(0.30) 0.30		Grey silty gravelly organic SAND. Gravel is fine to coarse sub-rounded sandstone and mudstone. TRIAL PIT COLLAPSING FROM GROUND LEVEL - 0.00mbgl									
1.00	B			(2.80)		Brown very sandy silty GRAVEL with a high cobble content of sandstone. Gravel is fine to coarse sub-angular to rounded sandstone and mudstone.		1							
2.00	B							2							
3.00	B			3.10		End of Trial Pit at 3.10m		3							
Dimensions:										General Remarks:					
Final Depth: 3.10m										Trial pit collapsing from ground level. Could not excavate beyond 3.10mbgl					
← Length (m) → 2.90m ↑ Width (m) ↓ 0.70m Orientation: ° ←															
Inclination: °															
										Water Strikes					
										Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
													0		TP DRY
										CC GEOTECHNICAL LTD 0151 545 2750 www.ccgteotechnical.com					

	Contract Name: Berse Road, New Broughton			Client: Caulmert			Trial Pit ID: TP6				
	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1					
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25					
	Weather:		Hole Termination:		Stability: Unstable						
Samples & In Situ Testing			Strata Details					Water	Backfill		
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description					
0.20 0.30	B ES	HVP=30kPa		(0.40)		TOPSOIL. Grey silty gravelly organic SAND. Gravel is fine to coarse sub-rounded sandstone and mudstone		1			
0.50	ES		0.40		Soft to firm brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse sub-angular to rounded sandstone and coal						
0.85	B										
1.20	B	HVP=50kPa		(2.30)		MEDIUM COBBLE CONTENT - 1.50-2.80mbgl		2			
2.00	B					COLLAPSE - 2.20 - 2.80mbgl					
2.80	B					Brown very sandy silty GRAVEL. Gravel is fine to coarse subangular sandstone					
				2.70 2.80		End of Trial Pit at 2.80m		3			
Dimensions:										General Remarks:	
Final Depth: 2.80m					Trial pit collapsing from 2.20mbgl. Could not excavate beyond 2.80mbgl.						
											
Inclination: °											
Water Strikes											
Strike (m)		Casing (m)		Sealed (m)		Time (mins)		Rose to (m)		Remarks	
2.70						0				Seepage	
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	Contract Name: Berse Road, New Broughton			Client: Caulmert			Trial Pit ID: TP7			
	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1				
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25				
	Weather:		Hole Termination:		Stability: Unstable					
Samples & In Situ Testing			Strata Details					Water	Backfill	
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description				
0.10 0.20	ES B			(0.35)		TOPSOIL. Recovered as grey silty gravelly organic SAND. Gravel is fine to coarse sub-rounded sandstone and mudstone		1		
0.50 0.60	B ES			0.35		HIGH COBBLE CONTENT - 0.35-1.00mbgl Brown silty very sandy GRAVEL with high cobble content of sandstone. Gravel is fine to coarse sub-angular to rounded sandstone and mudstone.				
1.20	B			(2.55)				2		
2.00	B									
2.90	B			2.90		End of Trial Pit at 2.90m		3		
Dimensions:					General Remarks:					
Final Depth: 2.90m					Trial pit collapsing from 2.00mbgl Could not excavate beyond 2.90mbgl					
← Length (m) → 2.80m ↑ Width (m) ↓ 0.70m Orientation: ° ←										
Inclination: °					Water Strikes					
					Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
								0		TP DRY
					CC GEOTECHNICAL LTD 0151 545 2750 www.cogeotechnical.com					

	Contract Name: Berse Road, New Broughton			Client: Caulmert			Trial Pit ID: TP8														
	Contract Number: CCG-C-21-12809	Date Started: 19/01/2022	Logged By: SP	Checked By: CB	Status: FINAL	Sheet 1 of 1															
	Easting:	Northing:	Ground Level:	Plant Used: 8T Tracked Excavator	Date Printed: 21/02/2022	Scale: 1:25															
Trial Pit Log		Weather:			Hole Termination:		Stability: Unstable														
Samples & In Situ Testing			Strata Details					Water	Backfill												
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description															
0.20 0.20	B ES			(0.30) 0.30		Dark grey gravelly silty organic SAND TRIAL PIT COLLAPSING FROM GROUND LEVEL - 0.00mbgl		1													
0.70	ES					Brown cobbly very gravelly SAND with a high cobble and boulder content of sandstone. Gravel is fine to coarse sub-angular to rounded sandstone mudstone.															
1.20	B			(1.70)																	
				2.00		End of Trial Pit at 2.00m		2													
								3													
Dimensions:					General Remarks:																
Final Depth: 2.00m					Trial pit collapsing from ground level. Could not excavate beyond 2.00mbgl.																
																					
Inclination: °																					
					Water Strikes																
					<table><tr><td>Strike (m)</td><td>Casing (m)</td><td>Sealed (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td>0</td><td></td><td>TP DRY</td></tr></table>					Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks				0		TP DRY
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks																
			0		TP DRY																
					CC GEOTECHNICAL LTD 0151 545 2750 www.cogeotechnical.com																