

5. GROUND CONDITIONS ENCOUNTERED

5.1 Strata encountered

The sequence of strata encountered beneath the site generally comprised;

- Made Ground;
- Glacial Deposits; and
- Hughes Member Sandstone.

A summary of each stratum depth is provided in Table 2 below, with descriptions of each stratum detailed in the subsequent sections. Exploratory hole logs including photographic plates can also be seen in Appendix B.

Table 2 - Summary of strata depths (m bgl) for windowless sample boreholes and soakaways

Location	Depth to base of strata (m bgl)		
	Made Ground	Glacial Deposits	Hughes Member
WS01	GL – 0.1	0.1 – 2.7	2.7 – 2.8*
WS02	GL – 0.2	0.2 – 0.55*	ne
WS03	GL – 0.1	0.1 – 3.0*	ne
WS05	GL – 0.2	0.2 – 2.9*	ne
SA01	GL – 1.1	1.1 – 1.5*	ne

* Base of stratum not proven
ne denotes not encountered

5.1.1 Made Ground

Made Ground was encountered in all locations, to a maximum depth of 1.10m bgl in SA01, however the majority of locations revealed thicknesses of between 0.10m to 0.20m bgl.

All exploratory positions comprised hardstanding Tarmacadam between GL and 0.10m bgl (to 0.03m bgl in SA01). WS02 and WS05 comprised Made Ground deposits of dark brown to black sandy clayey gravel. SA01 comprised Made Ground deposits of quartzite gravel to 0.05m bgl followed by light brown gravelly clayey silt to 1.10m bgl.

A faint olfactory indication of possible contamination was recorded within SA01 which is thought to be attributed to the breaking out of a large area of asphalt for the soakaway test pit.

Please see exploratory hole logs in Appendix B for full descriptions of each position.

5.1.2 Glacial Deposits

Glacial deposits were in all exploratory holes and were proven to a depth of 3.00m bgl in WS03. The Glacial deposits were generally encountered as soft to firm orangish brown and light brown to brown gravely slightly sandy clay with varying cobble content. Shallow coarse grained deposits were encountered in WS01 and WS03 to a maximum depth of 1.40m bgl in WS01 and 0.20m bgl in WS03. Coarse grained deposits generally comprised light brown clayey gravel with varying cobble content.

5.1.3 Hughes Member

The Hughes Member Sandstone was encountered in WS01 at a depth of 2.70m bgl. It was recovered as a brown laminated mudstone gravel.

5.2 Groundwater

During drilling, groundwater was only encountered within WS01 at 1.0m bgl. The groundwater level within WS01 is interpreted as perched and is therefore assumed to not be representative of the groundwater water table.

5.3 In Situ Testing

5.3.1 Standard Penetration Testing

Standard Penetration Tests (SPTs) were undertaken throughout all window sample positions at approximately 1.0m intervals, where possible and at the base of each window sample boreholes where shallow refusal was observed.

The results are presented in the exploratory hole logs included in Appendix B.

5.3.2 Continuous Dynamic Probing

Continuous dynamic probing was carried out in the base of WS02 and WS03. The results are presented on the exploratory hole logs included in Appendix B.

5.4 Visual or Olfactory Evidence of Contamination

During the site investigation a faint olfactory sign of contamination was encountered in SA01 comprising a slight hydrocarbon odour possibly attributed to the breaking out of a large area of



asphalt for the soakaway test.

6. LABORATORY TESTING

6.1 Geotechnical Testing

A programme of laboratory testing was carried out on samples taken from the various strata encountered during the site investigation. Geotechnical testing was scheduled by WYG and carried out by GSTL Ltd, an approved supplier in accordance with the requirements of WYG quality system and UKAS accredited for a range of geotechnical tests. The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of the specific tests used in each case are given in Table 3. Laboratory geotechnical test results are given in Appendix D.

Table 3 - Summary of Geotechnical Testing

Test	No.	Test Method
Moisture Content	5	BS1377:1990 Part 2: 3.2
4 Point Liquid and Plastic Limit	5	BS1377:1990 Part 2: 4.3 & 5.3
PSD: Wet Sieve method	5	BS1377:1990 Part 2: 9.2
BRE Reduced Suite: pH, Acid Soluble Sulphate, Water Soluble Sulphate and Total Sulphur	3	BS1377:1990 Part 3 & BRE CP2/79 (non-accredited test)

6.2 Environmental Testing

Environmental chemistry was investigated by specialist chemical analysis of selected soil samples carried out by ALS Environmental Laboratories, an approved supplier in accordance with the requirements of WYG quality system and UKAS and MCERTS accredited for a range of chemical analyses. The testing was scheduled by WYG and is summarised in Table 4 for soil samples. The test results are included in Appendix E.

Table 4 - Summary of environmental testing

Test suite	No.
<u>Soil Samples:</u> WYG Suite C - Heavy metals including Chromium (Hexavalent), Boron (water soluble), Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium and Zinc; - Inorganics – including pH, Water soluble Sulphate as SO₄ (2:1 Extract), Cyanide (Easily liberatable- low level); - Speciated Petroleum Hydrocarbons (TPH CWG); - Speciated Polyaromatic Hydrocarbons (USEPA 16); - BTEX and MTBE; - Asbestos Screen; and, - Phenol.	3
<u>Soil Derived Leachate Samples</u> WYG Leachate Suite C - Heavy metals including Antimony, Boron, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium and Zinc; - Inorganics – including pH, Sulphate, Chloride, Nitrite, Nitrate, Total Cyanide, Ammoniacal Nitrogen and NH₃ and NH₄ and Total Alkalinity - Speciated Petroleum Hydrocarbons (TPH CWG); - Speciated Polyaromatic Hydrocarbons (USEPA 16); - BTEX and MTBE; - Phenol.	2

7. SOIL INFILTRATION TESTING

7.1 Background

On 7th January 2019, the Welsh Government introduced Schedule 3 of the Flood and Water Management Act 2010 which requires new developments to consider the feasibility of Sustainable Drainage Systems (SuDS) at the design stage. New developments over 100m² or including more than one property must obtain approval of the drainage system from the SuDS Approval Body (SAB) prior to the commencement of construction.

To support the assessment study, preliminary soil infiltration testing has been undertaken as part of the site investigation to provide information on the potential infiltration rates within the sub-strata on the site.

Soil infiltration tests have been undertaken in line with BRE 365 (2016) methodology and any deviations from this approach are documented within the following section. Where possible, locations and depths of test pits were determined based on the proposed drainage design.

7.2 Test Locations

The location of the exploratory pit was determined on site based on access limitations and the the current us as a playground. As such, the exploratory pit was situated in the north east corner of the site in an area less trafficked by children. Based on the findings of the wider ground investigation, the ground conditions in this area are believed to be representative of the wider site.

7.3 Soil Infiltration Tests

One soil infiltration test was undertaken within a machine excavated trial pit as summarised in the following table.

Table 5 Summary of Soil Infiltration Test Locations

Test Location	Depth to Base (m bgl)	Target strata
SA01	1.50	Glacial Till

Three repeat fills were undertaken within the test location over a period of four days. Test locations were securely fenced and covered until the testing period was completed and excavations

backfilled on completion.

The results of the soil infiltration tests are presented in the following table. Full test results are included in **Error! Reference source not found.** of this report.

Table 6 - Summary of Soil Infiltration Test Results

Test Location	Soil Infiltration Rate (m/s)		
	Test 1	Test 2	Test 3
SA01	8.89×10^{-7} (Extrapolated)	FAIL (water Level Rose)	8.01×10^{-7} (Extrapolated)

7.4 Ground Conditions

7.4.1 Depth to groundwater

A groundwater strike was not recorded in the soakaway pit while being advanced however a water strike as encountered following the start of the test at 1.00m bgl in WS01. This is thought to be perched water and unlikely to represent the groundwater table and was encountered during heavy rainfall. Other exploratory test locations advanced as part of the wider ground investigation did not record any groundwater strikes.

7.4.2 Strata Type

Based on soil descriptions included in the trial pit logs, the test strata consisted of made ground over Glacial Till consisting of sandy gravelly clay with a low cobble content. Full draft logs of the exploratory pits are included in **Error! Reference source not found.**

7.4.3 Ground Contamination

Ground contamination was identified during the ground investigation the ground investigation in the made ground deposits, a contamination assessment is presented in Sections **Error! Reference source not found.** and **Error! Reference source not found.**

7.5 Constraints and Limitations

The information presented above is intended to assess the feasibility of soakaway drainage in order to support the development of the drainage strategy. Further testing, groundwater monitoring and ground investigation may be required to support a full SAB application or to inform the development of the final design process.

Ground conditions can vary throughout the year, including the location of the groundwater table.

Consideration should be given to the potential effects of seasonal variation when reviewing the data above.