

Geo-Environmental Investigation & Assessment

For a site at

Xaverian College, New Science Block

Undertaken for

Xaverian College c/o AA Projects

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Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
-	07/06/2023	First Issue	TPB	SCS	SCS
A	10/07/2024	Additional chemical analyses undertaken post-demolition	TPB	-	-

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Executive Summary

Site Location	The site comprises land within the Xaverian College, Lower Park Road, Manchester. It is centred on approximate Ordnance Survey National Grid Reference 385313E, 395378N with an indicative postcode of M14 5RB.
Development Proposals	The project comprises the construction of a new building located on the south western corner of the existing College Campus. The new build 3-storeys structure is to be located on the existing Sunbury Building footprint which is to be demolished as part of these works.
Ground Conditions	Ground conditions encountered during the intrusive investigation generally comprised made ground to depths of between 0.70 and 1.10mbgl, underlain by glacial till to maximum proven depth of 4.00mbgl.
Site Preparation and Earthworks	<p>Demolition of existing structures was not to proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor.</p> <p>Historical/existing foundations and floor slabs will need to be broken out to suitable depths below formation levels where they are to impinge on the proposed buildings. Such materials removed as part of the clearance work, subject to appropriate screening and crushing, will be suitable for re-use as bulk fill.</p> <p>Construction near any retained trees and importantly within any RPA's should be undertaken with due regard to guidance provided in BS5837:2012 'Trees in relation to design, demolition and construction – recommendations'.</p> <p>Site enabling works will need to take account of the integrity of any existing/ adjacent services at the site.</p>
Foundations	<p>The new structures may be supported on traditional spread foundations constructed within firm clay, at a depth of at least 1.00mbgl. In order for total and differential settlements to be kept to tolerable limits, such foundations would need to be designed on a presumed net allowable bearing pressure of no more than 100kN/m².</p> <p>Ground bearing floor slabs will be suitable for any the structure where underlain the existing made ground has been removed and replaced with granular fill which has been compacted to an appropriate specification.</p>
New Pavements	New road pavement design should be based on a California Bearing Ratio (CBR) value of no more than 3.0% in untreated made ground and natural cohesive strata.
Soakaways	Soakaways are not considered a feasible drainage option for the site.
Concrete Classification	The typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1 respectively.
Ground Contamination	<p>The test results indicate that the made ground beneath the site contains elevated concentrations of PAH compounds which are attributable to fragments of ash and/or asphalt within the made ground matrix.</p> <p>Therefore, it is recommended that made ground exposed at the surface within new landscaped areas is removed or is surfaced by 450mm clean cover, usually comprising 150mm of topsoil and 450mm of sub-soil.</p> <p>The risk to controlled waters from contamination is considered very low with no environmental remediation considered necessary.</p>
Ground Gas	No specific gas mitigation measures are required.
Waste Soils	<p>For preliminary guidance based on the current information, it is likely that made ground, would be classified as 'Non-hazardous' with natural soils classified as 'Inert' for landfill disposal.</p> <p>It will be the responsibility of the waste producer to undertake further testing and classification of any waste soils for disposal to an appropriately licenced landfill in accordance with current guidelines and Duty of Care requirements.</p>

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1.0 INTRODUCTION

Appointment

- 1.1 WML Consulting has been commissioned by AA Projects on behalf of Xaverian College, to undertake a Geo-environmental Investigation and Assessment of a site to be redeveloped within the existing Xaverian College campus.

Proposed Development

- 1.2 The project comprises the construction of a new building located on the south western corner of the existing College Campus.
- 1.3 The new build 3-storeys structure is to provide student science labs and associated accommodation. The building is to be located on the existing Sunbury Building footprint which is to be demolished as part of these works.
- 1.4 The location of the Sunbury Building (Building 2) and preliminary proposed plan are included on the unreferenced Xaverian Campus Drawing is included in Appendix 01.

Objective

- 1.5 The objective of the ground investigation and assessment was to provide geotechnical recommendations for construction design purposes together with a geo-environmental risk assessment in terms of possible ground contamination.
- 1.6 To achieve the objective, the following tasks were undertaken:
- Review the existing desk study report for the site and design a Phase 2 Ground Investigation.
 - Characterise the ground conditions in terms of geology, soil geotechnical parameters and ground contamination from information provided by the ground investigation.
 - Provide recommendations regarding suitable foundations together with any other geotechnical considerations that could affect possible future development.
 - Determine a ground conceptual model for the site so as to undertake a ground contamination Generic Quantitative Risk Assessment (GQRA).

Scope

- 1.7 A Phase 1 Desk Study for the site has been undertaken by WML and is presented in the following report:
- Phase 1 Desk Study and Preliminary Geoenvironmental Assessment, Reference 10961G-WML-00-XX RP-G-0001, dated March 2023.
- 1.8 This report includes the findings of a Phase 2 Ground Investigation designed on conclusions and recommendations within the Phase 1 Desk Study. For ease of reference, the findings of the Desk Study are summarised in the following sections. However, the two reports are not exclusive and should be read in conjunction.
- 1.9 The ground investigation comprised the formation of window sample probeholes undertaken with reference to BS5930:2015 + A1:2020 Code of Practice for Ground Investigation and BS10175:2011 together with A2:2017, "Investigation of Potentially Contaminated Sites - Code of Practice" except where superseded by EN ISO 22475-1 "Geotechnical Investigation and Assessment – Sampling by Drilling and Excavation and Groundwater Measurements".
- 1.10 Geotechnical soil testing was undertaken in general accordance with guidelines provided in BS1377:1990 – Parts 1-9, "Method of Test for Soils for Civil Engineering Purposes". Samples for chemical analysis were obtained and handled generally in accordance with the current guidelines (BS10175: 2011 and A2:2017).

2.0 SITE LOCATION AND DESCRIPTION

Site Location

- 2.1 The site comprises land within the Xaverian College, Lower Park Road, Manchester. It is centred on approximate Ordnance Survey National Grid Reference 385313E, 395378N with an indicative postcode of M14 5RB.

Site Description

- 2.2 At the time of the investigation in May 2023 the site was occupied by the centrally located, two to three storey Sunbury Building. It was understood that a partial basement level extends beneath parts of the building. In June 2024 the structure was cleared and the basement was noted to extend to a depth of 1.40mbgl. The floor of which generally comprised brick and cobbles.
- 2.3 The centrally located structure was surrounded by areas of asphalt and concrete hardstanding used for access and car parking.
- 2.4 Two mature deciduous trees are located on the south-western site boundary with a further three immature silver birch trees located in the northern part of the site.
- 2.5 Vehicular access to site was formed by a gateway from Thurloe Street on the south-western site boundary.
- 2.6 The site is generally level and commensurate with the surrounding area at around 39mAOD.

3.0 SUMMARY OF ENVIRONMENTAL AND HISTORICAL SETTING

3.1 The following paragraphs summarise the most relevant findings of the Phase 1 desk study report.

Geology

3.2 The BGS plans indicate that the site is underlain by the Devensian Glacial Till, indicated to mainly comprise clay locally interbedded with sands and gravels. The drift deposits are indicated to be underlain by the Triassic Chester Peddle Beds Formation, indicated to comprise sandstone.

Radon

3.3 The site is not in a Radon Affected Area as defined by the UK Health Security Agency were less than 1% of properties are above the Action Level of exposure. Therefore, no radon protection measures are necessary for new structures as described in publication BR211 by the Building Research Establishment.

Mining and Subsidence

3.4 In consideration of the indicated geology, risks to the development from subsidence relating to shallow, unrecorded abandoned coal mine workings are considered low and can be discounted.

Environmental Setting

3.5 The bedrock underlying the site is classified as a 'Principal Aquifer'. The superficial strata is classified as a 'Secondary Undifferentiated Aquifer'.

3.6 The site is located within an Environment Agency Zone 3 Total Catchment SPZ although no groundwater abstraction licenses are located within 500m of the site. There are no surface watercourses recorded within 250m of the site or surface water abstractions within 500m of the site.

3.7 There are no active landfills located within 500m of the site or historic landfills located within 250m of the site. A petrol filling station is located 243m north-west at 10 Wilmslow Road.

3.8 There are no designated environmentally sensitive sites within 250m of the subject site.

Site History

3.9 The earliest map dated 1849 indicates the site to comprise undeveloped land within Rusholme Park. By 1891 the site had been developed as 'Sunbury', with a centrally located detached residential structure surrounded by gardens and glasshouses to the north-east. By 1934 the structure had become part of Xaverian College and has remained roughly unchanged to present day with the exception of a small extension to the northern elevation sometime in the late 1990's or early 2000's.

Preliminary Contamination Risk Assessment

3.10 The approach at the Phase 1 Desk Study stage was precautionary until such time as uncertainties in the conceptual model could be verified by appropriate site investigation.

3.11 However, based on the site history and the proposed development scenario, potential pollution linkages were considered low or unlikely with associated preliminary risks being assessed as to low.

3.12 Such uncertainties relate in the main to the potential for ACM and asbestos fibres to be present within existing structures and shallow soils resulting from unrecorded historical demolition. The level of historical contamination as a result of the site's brownfield status should also be established.

4.0 SITE INVESTIGATION

Rationale

- 4.1 Intrusive investigations were undertaken primarily to provide geotechnical parameters for structural design purposes but also to verify the preliminary site conceptual model and clarify the low environmental risk.
- 4.2 In order to cause minimal surface disruption to this section of the campus, which was still in use at the time of the investigations, window sample probeholes were undertaken to provide information on near surface deposits and to obtain samples for chemical analysis and geotechnical testing. Due to the small diameter of the probing equipment, the depth of penetration achieved is dependent on favourable ground conditions. As such, ground penetration may be restricted in circumstances where the ground is particularly strong or contains relatively large obstructions such as cobbles and/or boulders.
- 4.3 The investigation locations were chosen so as not to impact on the presence of known/suspected services beneath the site.
- 4.4 Monitoring standpipes have been installed in probeholes for the measurement of gas and groundwater levels.
- 4.5 Chemical analysis of a general suite of contaminants was undertaken on selected samples of soil. This was to clarify the expected contamination risk.

Intrusive Works

- 4.6 The ground investigations were undertaken by LOT Geotechnics Ltd on 11th May 2023. This comprised the formation of 4no window sample probeholes to a maximum depth of 4.00 metres below ground level (mbgl).
- 4.7 Following demolition of the existing structure WML attended site on 24th June 2024 in order to inspect ground conditions in previously inaccessible areas, namely to strata underlying the exposed basement area, to obtain additional soil samples for chemical analysis.
- 4.8 The exploratory hole records are presented in Appendix 02 of this report whilst the exploratory hole locations are shown on drawing 10961G-SK01A in Appendix 01.

Monitoring Standpipes

- 4.9 Monitoring wells for groundwater measurements were installed in 3 No. probeholes, as indicated on the logs presented in Appendix 02.

Geotechnical and Chemical Testing

- 4.10 In-situ geotechnical testing was undertaken at regular intervals during the formation of the window samples and boreholes in the form of Standard Penetration Tests (SPT's). The results for this testing are presented on the descriptive logs in Appendix 02.
- 4.11 Geotechnical soils testing was undertaken on selected samples for the following:
- Natural moisture content
 - Liquid and Plastic limits.
- 4.12 The results of the geotechnical testing are presented in Appendix 03.
- 4.13 Chemical analysis was undertaken on selected soil samples for the following contaminants of concern:

- Total arsenic, boron, cadmium, chromium VI, copper, lead, mercury, nickel, selenium, vanadium, zinc.
- Total cyanide, phenols, sulphur, sulphate.
- Speciated USEPA polycyclic aromatic hydrocarbons (PAH).
- Total petroleum hydrocarbons (TPHCWG).
- BTEX & MTBE.
- Asbestos screen and identification.
- 2:1 water/soil sulphate extract, pH.

4.14 The results of the chemical analysis are presented in Appendix 04.

Leachate Analyses

4.15 In order to assess the potential risk to controlled waters, selected samples of soils were submitted for leachate preparation and analyses of the following suite of contaminants:

- Total arsenic, boron, cadmium, chromium VI, copper, lead, mercury, nickel, selenium, vanadium, zinc.
- Speciated (16) hydrocarbons (PAH).
- Total phenols, sulphur, sulphate.
- Sulphate extract, pH.

4.16 The results of the chemical analysis are presented in Appendix 04.

Gas and Groundwater Monitoring

4.17 Gas and groundwater monitoring has been carried out on six occasions between 18th May and 13th September 2023. The monitoring results are presented in Appendix 05.

5.0 GROUND CONDITIONS

General

- 5.1 Ground conditions encountered during the intrusive investigation generally comprised made ground to depths of between 0.70 and 1.10mbgl, underlain by glacial till to maximum proven depth of 4.00mbgl.

Made Ground

- 5.2 Made ground was encountered within all exploratory holes from ground level to depths of between 0.70 and 1.10mbgl.
- 5.3 The made ground comprised a surface horizon of asphalt or concrete paving underlain by brown sand to depths of around 0.15mbgl. This surface horizon was underlain by granular made ground comprising grey to dark brownish grey, variably sandy gravel with a locally low cobble content to depths of between 0.35 and 0.70mbgl.
- 5.4 This was in turn underlain by a lower horizon of cohesive made ground, comprising brown and grey mottled, locally slightly silty, variably sandy and gravelly clay to depths of between 0.70 and 1.10mbgl.
- 5.5 Gravel sized fragments included brick, sandstone, limestone, concrete, ash and clinker. Cobble sized fragments included brick and concrete.

Glacial Till

- 5.6 Glacial till was encountered within all exploratory soils from depths of between 0.70 and 1.10mbgl, extending a maximum proven depth of 4.00mbgl.
- 5.7 The glacial till initially comprised soft, grey mottled, slightly silty, sandy clay to depths of between 1.10 and 1.15mbgl. This was underlain by firm to stiff, brown and locally grey mottled, slightly silty, slightly sandy, slightly gravelly clay.
- 5.8 SPT 'N' values within the glacial till ranged between 9 and in excess of 50 indicating an initially firm, becoming stiff to very stiff consistency.

Geotechnical Testing

- 5.9 Geotechnical testing undertaken on selected samples are summarised in the following table :

Test	Glacial Till
Natural Moisture Content	23 – 27%
Liquid Limit	51 – 57%
Plasticity Index	27 – 31% (Modified to 27 – 31%)
Atterberg Classification	High Plasticity

Visual/Olfactory Evidence of Contamination

- 5.10 No visual and/or olfactory evidence of significant ground contamination was identified within the exploratory holes during the investigation or during the subsequent 2024 inspections beneath the floor slabs.

Groundwater

- 5.11 Groundwater was not encountered during the formation of the exploratory holes.

- 5.12 Groundwater monitoring has recorded perched groundwater at depths of between 0.44 and 3.61mbgl. Standpipes installed within WS01 and WS03 were noted to be dry during the first visit. True phreatic ground water levels are assumed to be at depths beyond the base of the exploratory holes.
- 5.13 It should be appreciated that the groundwater observations described above have been undertaken during a very short period of time. Significant variations in the long-term groundwater regime may occur at other times, particularly with prolonged, extreme weather conditions, and that no account can be taken of such in this report.

General

- 5.14 It should also be appreciated that ground conditions may vary between and away from the exploratory hole positions, and that no account can be taken in this report of such variations.

6.0 GEOTECHNICAL APPRAISAL

Site Preparation

- 6.1 It is considered that the demolition of the structure in June 2024 did not proceed until an appropriate Asbestos survey of the existing building has been undertaken and any Asbestos Containing Materials (ACM) removed by an appropriately licensed contractor. Similarly, any demolition materials present on site and considered for re-use was to be inspected with any ACM removed accordingly prior to crushing.
- 6.2 Historical/existing foundations, ground floor slabs and other buried concrete/brick obstructions associated with current structures are envisaged. These will need to be broken out to suitable depths below formation levels where they are to impinge on the proposed buildings. Such materials removed as part of the clearance work, subject to appropriate screening and crushing, will be suitable for re-use as bulk fill beneath hard cover areas.
- 6.3 Excavation/ breaking out of the floor slabs to the basement structure should be undertaken with due regard to the integrity of adjacent services infrastructure with adequate support measures likely to be required. The basement excavation should be back-filled as soon as practically possible with suitably graded granular fill which should be compacted to an engineering specification.
- 6.4 It is assumed that the current development configuration has been outlined in consideration of retained trees to the south-west of the site boundary and specifically Root Protection Areas (RPA) as would need to be determined by the landscape architect.
- 6.5 Notwithstanding this, construction near any retained trees and importantly within any RPA's should be undertaken with due regard to guidance provided in BS5837:2012 'Trees in relation to design, demolition and construction – recommendations'.
- 6.6 Site enabling works will need to take account of the integrity of any existing/ adjacent services at the site.
- 6.7 No significant earthworks are anticipated to facilitate redevelopment of the site with the exception of localised re-grading.

Foundations

- 6.8 Made ground and any soft / loose natural deposits should be considered unsuitable for the direct support of structural loads as they will be weak and compressible, leading to possibly unacceptable total and differential settlements.
- 6.9 The new structures may be supported on traditional spread foundations constructed within firm clay, at a depth of at least 1.00mbgl. In order for total and differential settlements to be kept to tolerable limits, such foundations would need to be designed on a presumed net allowable bearing pressure of no more than 100kN/m².
- 6.10 Alternatively, structural loads could also be supported on piled foundation with piles being taken down into the underlying firm / stiff clay. Pile design should assume no side support (skin friction) for the pile sections surrounded by made ground and may need to be designed to withstand potentially negative skin friction effects within cohesive strata.
- 6.11 Pile type, selection and design should to be undertaken in conjunction with a reputable, specialist piling contractor, ideally with experience of the local ground conditions. However, for preliminary considerations, a pre-cast driven concrete pile would minimise waste soil arisings but potential noise and vibration effects on adjacent residential properties may render this option unsuitable. Therefore, a bored pile solution would be an alternative solution for the site.

6.12 If / where foundations are located in cohesive strata further consideration will also need to be given to be constructed in clay soils at shallow depth and close proximity to existing and/or removed trees, such as in the north-eastern elevation of the proposed footprint. Identification of the tree species should be undertaken to determine its water demand as provided in Appendix 4.2-A of NHBC Standards 2010, Foundations, Chapter 4.2, Building Near Trees. Assessment as to the soil heave or shrinkage potential should then be undertaken in consideration of a medium volume change potential.

6.13 Foundation construction will need to take account of any remaining and/or new services and, where they are in close proximity, may need to be taken down to beneath the lowest level of the service trench so that their structural integrity is maintained.

Floor Slabs

6.14 Ground bearing floor slabs will be suitable for any the structure where underlain the existing made ground has been removed and replaced with imported granular fill which has been compacted to an appropriate specification.

Excavations and Groundwater

6.15 Excavations at the site will be feasible using conventional hydraulic plant. All excavations at the site and specifically requiring man-entry, will need adequate lateral support, or will need to be battering back to a safe angle to ensure their stability.

6.16 Conventional 'sump and pump' dewatering measures are anticipated to be adequate to keep excavations dry.

External Pavements

6.17 In consideration of the near surface ground conditions, it is recommended that new road pavement design should be based on a California Bearing Ratio (CBR) value of no more than 3.0% in untreated made ground and natural cohesive strata.

6.18 The CBR will need to be reviewed and confirmed by site inspection and possibly suitable in-situ testing at formation levels following any earthwork operations and prior to pavement construction.

6.19 In any event, all formations should be proof-rolled with any soft, loose or otherwise unsuitable material being removed and replaced with compacted granular fill.

Concrete Design

6.20 Design/mix of buried concrete should be undertaken in accordance with the "Aggressive Chemical Environment for Concrete" (ACEC) classification, of BRE Special Digest 1:2005 (Concrete in Aggressive Ground). With reference to the site history, it is deemed appropriate to classify the site as "Brownfield", with respect to BRE Special Digest, assuming mobile groundwater conditions.

6.21 At foundation depths values of 2:1 water/soil extract for sulphate do not exceed 11mg/l.

6.22 Values of pH range from 8.3 to 8.6 indicating slightly alkaline conditions.

6.23 On the basis of these results, the typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1 respectively.

Drainage and Soakaways

6.24 In consideration of the cohesive nature of the natural soils, soakaways are not considered a feasible drainage option for the site.

7.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

General

- 7.1 A review of the readily available information had concluded that the potential for exposure to ground contamination is unlikely to low leading to a low preliminary risk.
- 7.2 However, it has been considered prudent to undertake chemical analysis of the sub-surface soils to confirm the low human health risk status of the site.

Human Health

- 7.3 Selected samples have been analysed for a general suite of contaminants of concern and compared against Screening Levels (SL's) for human health to determine the significance of the measured concentrations in relation to the site conceptual model. Thus, a Generic Quantitative Risk Assessment has been undertaken in line with guidelines provided in Land Contamination Risk Management, October 2020.
- 7.4 The criteria for a limited number of contaminants have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.
- 7.5 Within the document, Category 4 Screening Levels (C4SL's) are described as being more pragmatic than previous screening criteria and represent concentrations in soil that present an 'acceptable' level of risk within the context of Part 2A.
- 7.6 The National Planning Policy Framework states that 'after development, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990'. Therefore, by inference, the C4SL's are appropriate for use in the planning context.
- 7.7 Although the SP1010 document states that C4SL only apply for a 'sandy loam soil with 6% soil organic matter', it is generally accepted that assessment criteria for metals are not sensitive to changes in soil organic content (SOM). The C4SL's have therefore been adopted as assessment criteria in this report for the listed metals within the SP1010.
- 7.8 Subsequent to SP1010, LQM/CIEH have published a document entitled 'The LQM/CIEH S4ULs for Human Health Risk Assessment' 2015. In brief, the document provides updated assessment criteria which have been derived in accordance with UK legislation, national as well as EA policy and using a modified version of the CLEA software and available guidance. The new screening criteria, or Suitable 4 Use Levels (S4ULs), are intended to provide a complete and updated replacement to the previous LQM/CIEH GAC of 2009. As such they are considered appropriate for use in this assessment for other contaminants not covered by C4SL's and/or for organic contaminants assuming a worst-case Soil Organic Matter (SOM) of 1% as an initial conservative assessment.
- 7.9 For each contaminant, S4UL's and C4SL's have been calculated for six land use scenarios, namely:
- Residential with homegrown produce.
 - Residential without homegrown produce.
 - Allotments.
 - Commercial.
 - Public Open Space, near residential housing.
 - Public Parks, remote from residential housing.
- 7.10 In light of the proposed development, the SL's for a "Commercial" end-use are considered appropriate for the assessment at this stage. A table of relevant SL's are provided in Appendix 06.

Controlled Waters

- 7.11 Generic criteria for the assessment of potential groundwater contamination have been derived from very conservative guidelines protective of drinking water and environmental quality, namely:
- UK Drinking Water Standards (DWS) as defined by The Water Supply (Water Quality) Regulations, 2016;
 - UK Environmental Quality Standards (EQS) for Freshwater, leachates are based on a Hardness of Soft <50mg/l, 2000 as determined from United Utilities web-based information. CO3.
- 7.12 A table of relevant SL's are provided in Appendix 06.

Soil Test Results

- 7.13 10no soil samples (7no pre demolition, 3no post demolition) were analysed for a suite of Contaminants of Concern (CoC). The results indicate a range of organic matter contents between 1.8% and 15%. Therefore, it is considered suitable to assume the criteria for soils with a 2.5% SOM.
- 7.14 The majority of the concentrations were measured below the SL's for a "Commercial" end-use with the following exceptions.

Contaminant	Number of Exceedances	SL (mg/kg)	Recorded Concentrations (mg/kg)	Samples
Benzo[b]fluoranthene	3	44	55 - 72	WS01 – 0.20m WS02 – 0.20m WS03 – 0.20m
Benzo[a]pyrene	3	35	57 - 67	WS01 – 0.20m WS02 – 0.20m WS03 – 0.20m
Dibenz[a,h]anthracene	3	3.6	5.3 – 7.3	WS01 – 0.20m WS02 – 0.20m WS03 – 0.20m

- 7.15 Further assessment of the results has been undertaken in an attempt to clarify the site conceptual model and hence the human health risk that may be posed by the PAH compounds.
- 7.16 PAH's can be associated with a diverse range of contaminative sources including petrogenic (for example oil spills and coal storage), pyrolytic (ash, clinker, soot and atmospheric deposition of smoke, coal tars for example) and phytogenic (for example plant-derived peat). Due to the prevailing chemical processes, the profile of PAH mixtures generated at high temperatures (pyrolytic sources) differ from those formed at more moderate temperatures (petrogenic sources).
- 7.17 The concentration ratios of certain PAH congeners can be used to infer a possible source of PAH mixtures and, by plotting each sample in terms of varying ratios, it is possible to further characterise the PAH profiles and conjecture a possible source based on where the results cluster within the plot.
- 7.18 The 'PAH - Double Ratio Plots' for different congeners are presented in Appendix 04 and suggest urban background combustion signatures, for example where organic materials such as wood and coal have been burned at high temperatures resulting in ash and soot.
- 7.19 This would confirm to a degree the site observations, in that no visual or olfactory evidence of hydrocarbon contamination was identified with the investigation logs indicating the presence of ash in the made ground in the majority of locations.

- 7.20 The elevated concentrations of PAH encountered are therefore attributed to these materials being entrained within the shallow soil matrix.
- 7.21 No asbestos was detected within any of the samples analysed.
- 7.22 No exceedances of TPH, BTEX or MBTE were recorded in the samples of made ground tested.

Leachate Testing

- 7.23 3no samples of made ground were submitted for leachate preparation and testing for a range of contaminants of concern.
- 7.24 The majority of results were below the assessment criteria when compared to stringent drinking water and environmental standards (EQS with a water hardness of 0-50mg/l) with the following exceptions.

Contaminant	Ref Value ug/l		Concentration Exceedances ug/l		Sample
	EQS	UKDWS	EQS	UKDWS	
Copper	0.5	2000	0.98 – 5.0	-	WS01 – 0.30m WS02 – 0.40m WS03 – 0.30m
Lead	4	10	11 – 22	11 – 22	WS01 – 0.30m WS02 – 0.40m
Zinc	8	5000	8.1 – 8.5	-	WS01 – 0.30m WS03 – 0.30m
Sum of PAHs	-	0.10	-	41.1 – 85	WS01 – 0.30m WS02 – 0.40m

Discussion and Conclusions

Human Health

- 7.25 The test results indicate that the made ground beneath the site contains levels of certain contaminants that are elevated above their respective SL's. These relate in the main to elevated concentrations of PAH compounds.
- 7.26 As there was no visual or olfactory signs of significant ground contamination, the elevated concentrations are probably attributable to fragments of ash and/or asphalt within the made ground matrix. This is confirmed to a degree using the 'PAH - Double Ratio Plots'.
- 7.27 As the site is currently in transient use, the risk to human health from direct contact with these contaminants is considered low.
- 7.28 Notwithstanding this, where surfaced with hardstanding, there will be no mechanism for a long-term direct contact contamination linkage. Therefore the risk to end-users and to the general public will be negligible in the long-term.
- 7.29 However, a direct contact pollution linkage will still exist in new landscaped areas and it is recommended that made ground exposed at the surface in such areas is removed or is covered by clean sub-soil and topsoil thus removing the pollution linkage. This will normally comprise a 450mm clean cover, with a minimum 150mm thickness of topsoil and 450mm thickness of sub-soil, over the existing made ground.

Controlled Waters

- 7.30 Localised elevated leachable concentrations of lead and PAH compounds were recorded within the made ground when compared to the stringent drinking water standards. In addition, when the results were

compared against the EQS values for surface water concentrations of copper, lead and zinc exceeded the reference values.

- 7.31 The relatively low permeability of the cohesive glacial till underlying the site will limit vertical migration of any mobile contamination from the site towards the underlying 'Principal' bedrock aquifer.
- 7.32 The site is located within an Environment Agency Zone 3 Total Catchment SPZ. However, there are no groundwater abstractions within 500m of the site.
- 7.33 Following development, the site will include new structures and hardstanding, thus continuing to limit downward movement of surface water and hence the potential for leachate generation.
- 7.34 Therefore, the risk to controlled waters from contamination beneath site is considered low with no environmental remediation considered necessary.

8.0 GROUND GAS RISK ASSESSMENT

Methodology

- 8.1 Current guidance for the assessment of risk associated with the presence of hazardous ground gases (principally methane and carbon dioxide) is provided in two key documents, namely:
- Code of practice for the Characterisation and remediation from Ground Gas in Affected Developments. British Standard Institution (BS 8485: 2015 & A1:2019); and
 - Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA (C665, 2007).
- 8.2 The assessment presented herein is primarily based on the BS8485 document.
- 8.3 Hazardous ground gas qualitative risk assessment is based on a conceptual model similar to that used for soil and groundwater contamination sources (i.e., source-pathway-receptor pollutant linkages). A semi-quantitative estimate of risk can be assessed based on knowledge of the conceptual model and a measure of hazardous gas concentration and gas flow at the site within monitoring standpipes.
- 8.4 Based on the measured flow rates and hazardous gas concentrations, individual "hazardous gas flow rates" (Q_{hg}) can be derived for each monitoring point, from which the "site characteristic hazardous gas flow rate" (Q_{hgs}), and then the "Characteristic Situation" (CS) can be determined.
- 8.5 BS8485 provides guidance on the level of gas protection requirements based upon the characteristic situation and the proposed development based on building type as outlined in Table 3.

Table 3 - Building Types

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial/ Public, possible multiple	Commercial / Public	Commercial / Industrial
Control (Change of use)	None	Some but not all	Full	Full
Room Sizes	Small	Small/ medium	Small to Large	Large Industrial/ Retail Park

- 8.6 The proposed development therefore is indicated to comprise the construction of Type C buildings which include private or commercial structures with small to medium room sizes.

Ground Gas Conceptual Model

- 8.7 The site is not in Radon Affected Area, defined by the UK Health Security Agency as less than 1% of properties are above the Action Level of exposure. Therefore, no radon protection measures are necessary for new structures as described in publication BR211 by the Building Research Establishment.
- 8.8 There are no active landfills located within 500m of the site or historic landfills located within 250m of the site.
- 8.9 The presence of ground gas resulting from shallow unrecorded mine workings is considered unlikely.
- 8.10 No appreciable thickness of made ground or other soil with significant organic content have been encountered beneath the site.
- 8.11 In consideration of the above, a very low risk to the proposed development from ground gas was assessed until such time as uncertainties in the conceptual model could be verified by gas monitoring.

However, it was considered prudent to undertake ground gas monitoring, primarily for methane and carbon dioxide, with associated flow rates, on six occasions between 18th May and 13th September 2023.

Results and Recommendations

- 8.12 The results indicate the presence of methane concentrations ranging from below the instrument limit of detection of 0.1% by volume in air (v/v), to a maximum peak and steady state of 1.8% v/v. All detectable concentrations of methane were recorded within WS02 during four of the six monitoring rounds.
- 8.13 Concentrations of steady state carbon dioxide ranged from 0.7 to 12.9%, with concentrations in excess of 5% all within WS01 and WS02.
- 8.14 Within WS01 and WS02 peak flow rates of up to 104.7 l/hr were recorded which quickly reduced to steady state flows ranging from below detectable limits of <0.1 to 0.1 l/hr. In consideration of the water levels during the monitoring visits with the peak flows such are considered to represent pumping conditions, where the perched water is at or close to the unslotted section of the standpipe, rather than to reflect the presence of a source of gas generation.
- 8.15 Therefore, based on the potential for the higher flows to be associated with pumping conditions the composite Q_{hg} value of 0.01l/hr (based on 0.1l/hr flow and 12.90% v/v carbon dioxide) has been determined.
- 8.16 The calculated Q_{hg} values initially indicate that the site could be classified as Characteristic Situation (CS) 1 – 'Very Low Risk'. However, BS8485 recommends further assessment where concentrations of methane above 1% v/v and / or concentrations of carbon dioxide above 5% v/v are recorded. In such cases consideration should be given to increasing the classification to CS2 'Low Risk'.
- 8.17 In consideration of the lack of viable ground gas generation sources, such as mine workings, active or historic landfills, natural or made ground with significant organic / deleterious materials within the site or surrounding areas it is considered that:-
- The steady state carbon dioxide concentrations recorded in excess of 5% are considered likely to be the result of biological respiration within the glacial till and therefore are not considered to indicate the presence of a significant source of ground gas. Although concentrations of methane marginally exceeded 1% v/v, during the first three of six visits (and within WS02 only), the low steady state flows and the low concentrations would be unlikely to be exceeded.
 - Wilson and Card (GGIS Sheet 1) note that "during biological respiration in the glacial till there may also be trace amounts of methane up to about 3% caused by anaerobic decomposition in small anaerobic hotspots or the reduction of carbon dioxide by methanogens. Oxygen concentrations may be depleted but in this scenario oxygen deficient air is not likely to be emitted quickly from the ground and it does not pose a risk".
- 8.18 Therefore, on the basis that no evidence of sources of significant gas generation were identified within the site, it is considered that the initial classification of CS1 remains applicable to the development. As such no specific gas mitigation measures are anticipated to be required.

9.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS

Excavated Soils

- 9.1 Excavation works undertaken during the development are likely to produce waste soils for which appropriate waste management will be required. In line with current sustainability principals, any waste soils should firstly be considered for re-use where possible by incorporation into the development.
- 9.2 However, due to the extent of the proposed redevelopment, it is envisaged that excavated soil such as topsoil will, in the main, need to be removed from site under appropriate duty of care.
- 9.3 It should be noted that the chemical analysis results for disposal classification are assessed against different assessment criteria to those relating to contamination risk assessment. Soils that are deemed suitable for use in terms of risk to human health and the environment may not necessary be un-contaminated and could be classified as Non-Hazardous or even Hazardous for disposal purposes.
- 9.4 For preliminary guidance based on the current information, it is likely that made ground, would be classified as 'Non-hazardous' with natural soils classified as 'Inert' for landfill disposal.
- 9.5 However, excavated soils which are contaminated with TPH compounds may classify as 'Hazardous' if disposed to landfill. Any soils containing ACM or significant asbestos fibres may also classify as 'Hazardous' following further quantification analysis.
- 9.6 In addition, for Inert and Hazardous waste disposal, allowance will need to be made for adequate Waste Acceptance Criteria (WAC) testing with appropriate consideration of the additional time and cost associated with this.
- 9.7 It will be the responsibility of the waste producer to undertake further testing and classification of any waste soils for disposal to an appropriately licenced landfill in accordance with current guidelines and Duty of Care requirements.

Imported Fill

- 9.8 Imported fill will be subject to specific quality requirements and should be accompanied by appropriate certification to confirm its suitability. Allowance should also be made for testing imported fill materials prior to placement to ensure suitability.

Water Supply Pipes

- 9.9 The relevant water supply provider will need to be consulted with regards the selection of suitable water supply pipe materials for the development, should these be required. In light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination are not anticipated.

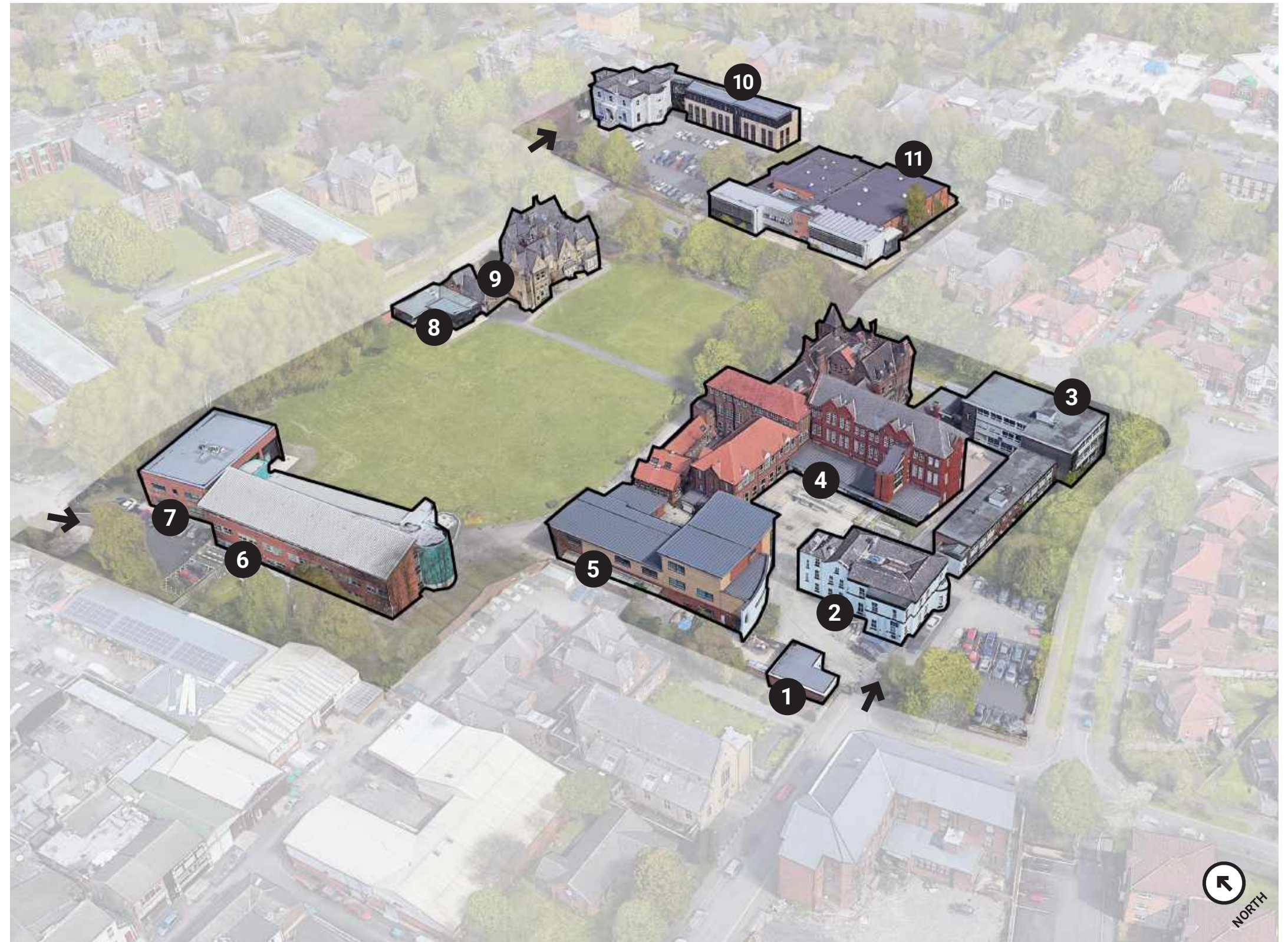
APPENDIX 01

Drawings

Existing Site.

Xaverian Campus Buildings

1. Estate Workshop / Gatehouse
Staff spaces
2. Sunbury
RE (Pastoral)
3. Xavier
Science
Lecture Theatre
4. Firwood (Grade II Listed)
General Teaching (main block)
Admin Spaces
Social / Dining & associated kitchens.
Chapel
5. Ryken
General Teaching
Main Reception
LRC (Library)
6. Mayfield
General Teaching
7. Theresa Quinn
General Teaching
8. The Pavilion
Social / Dining
9. Marylands (Grade II Listed)
General Teaching
10. Ward Hall (Grade II Listed)
Art / DT / Graphics
11. Birtles
Main Hall / Exams
Performing Arts
Sport



Google Earth View of Xaverian Campus

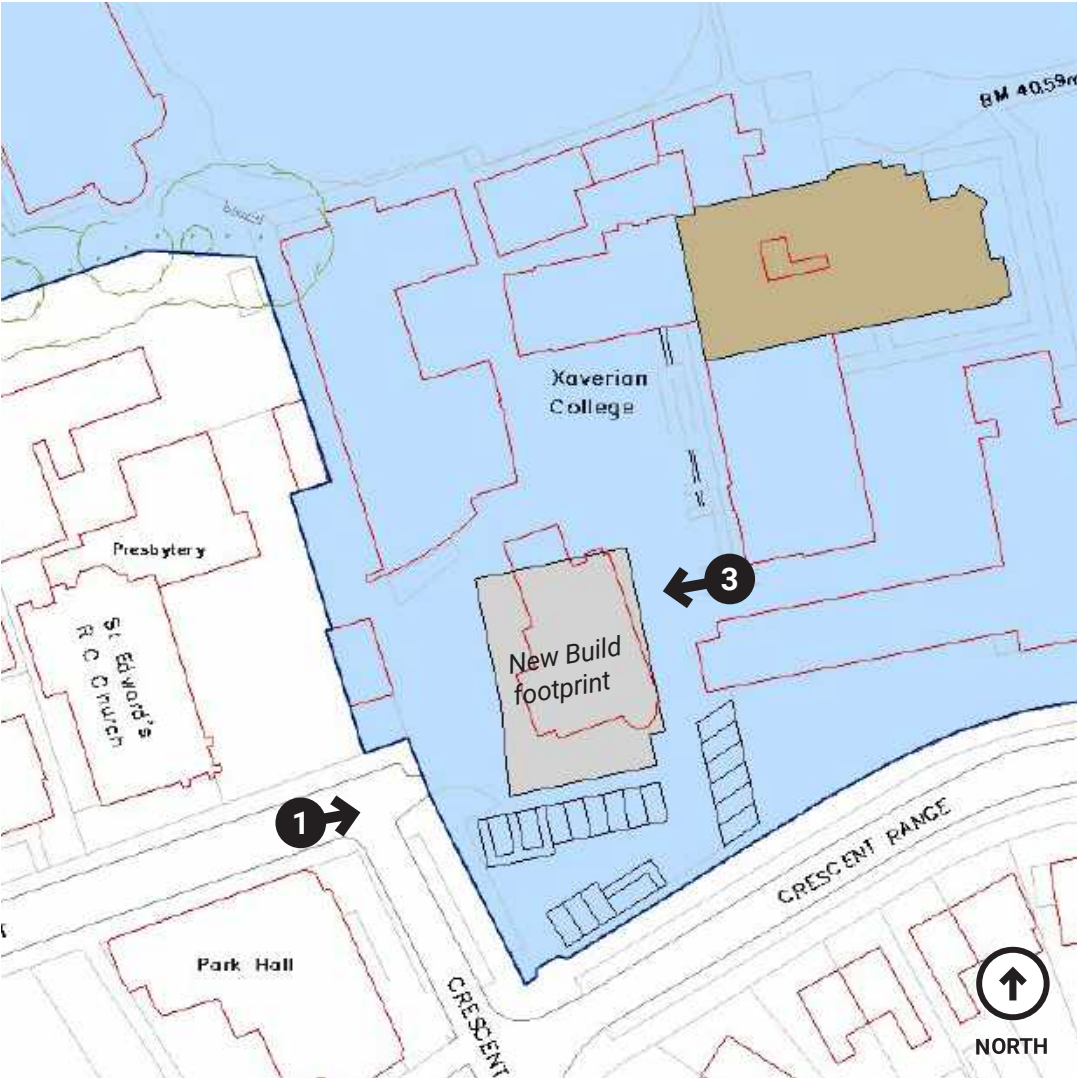
Proposed Elevations (draft).



1 | Elevation - west facing
1 : 100



3 | Elevation - east facing
1 : 100



Elevation Key Plan

Project: Xaverian College
Drg Title: Exploratory Hole Plan
Job No: 10961G By: TPB
Drg No: SK-01 Rev: -
Date: 12/05/2023 Scale: NTS

KEY



WINDOW SAMPLE LOCATION - MAY 2023



ADDITIONAL SAMPLES FROM BELOW
BASMENT FLOOR - JUNE 2024

Station	Easting	Northing	Level
1	385293.736	395387.768	39.256
2	385387.757	395349.494	39.084

Abbreviations/Symbols (Measured Building Surveys):

C:	Window Cill Height
H:	Window Head Height
BH:	Beam Height
DH:	Door Height
COL:	Column
SVP:	Soil Vent Pipe
FL:	Floor Level
TH:	Threshold Level
FC:	Floor to Ceiling Height
VC:	Vaulted Ceiling

Line types

---	Hedge Lines
---	Drainage Runs
---	Overhead Electricity Cables
---	Overhead Telephone Cables

Symbols

○	Tree/Bush	□	Glass House
⊕	Control Station	⬆	Osbn
⊙	Borehole		
⊗	Trial Hole		

Abbreviations (Topographic Survey):

AH:	Arch Height
AV:	Air Valve
BB:	Belted Beacon
BOL:	Electricity Box, Cables Box, Etc.
BOL:	Bollard
BS:	British Telecom Inspection Chamber
BS:	Bus Stop
BS/LP:	Bus Stop / Lamp Post
CAIV:	CAIV Inspection Chamber
CCIV:	Closed Circuit Television
CL:	Cellar Light
C.PIL:	Catch Pit
ER:	Earth Road
EC:	Electricity Inspection Chamber
EP:	Electricity Pole
EH:	Fire Hydrant
FP:	Flag Pole
GV:	Gas Valve
G:	Gully
IC:	Inspection Chamber
KO:	Kerb Outlet
LP:	Lamp Post
LB:	Letter Box
LC:	Lighting Column
MR:	Marker
MH:	Manhole
MP:	Mooring Point
MS:	Mile Stone
NYNEX:	Nynex Inspection Chamber
O/H:	Over Hang
P:	Post
PO/IC:	Post Office Inspection Chamber
R/S:	Road Sign
RE:	Rodding Eye
RTW:	Retaining Wall
S/P:	Sign Post
SNP:	Street Name Plate
ST:	Stop Tap
SV:	Stop Valve
T:	Telecom Inspection Chamber
TCB:	Telephone Call Box
TH:	Threshold Level
TL:	Traffic Light
TP:	Telegraph Pole
TROUGH:	Trough
WO:	Water Outlet
WM:	Water Meter

Fence Descriptions:

B/W:	Barbed Wire
C/B:	Close Boarded
C/BARRIER:	Crash Barrier
C/L:	Chain Link
C/P:	Chestnut Paving
C/I:	Corrugated Iron
I/R:	Iron Rolling
MIS/C:	Miscellaneous
P/R:	Post & Rail
P/W:	Post & Wire
P/C:	Post & Chain
S/PAL:	Steel Palisade
W/M:	Wire Mesh

Survey Notes:

Coordinates and Levels related to Ordnance Survey Datum - GPS OSGB36

Revision	Date	Description



Chris Parlington Land Surveyors

44a Green Lane
Sale
Cheshire
M33 5PP
t: 0161 976 1194
www.cpls.co.uk esurvey@cpls.co.uk



Client
AA Projects

Project
Xaverian College, Rusholme
Site Survey

Scale 1:200	Surveyed By J C	Date Feb 2023
Drawing No. 140223JC-01	Checked By CPLS	Date Feb 2023
	Drawn By J C	Date Feb 2023

APPENDIX 02

Exploratory Hole Records

		Project Title: Xaverian College Science Block				<h1>WS01</h1>	
		Project Number: 10961G		Client: Xaverian College			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 11/05/2023		Method: Window Sample		Driller: LOT Geotechnics Ltd		Logged By: TPB	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe	
0.20	E				0.15	Asphalt. (MADE GROUND)			
0.30	E				0.40	Brown SAND. (MADE GROUND)			
0.50	E				0.70	Grey, sandy, angular to subangular, fine to coarse GRAVEL including brick, ash and concrete. (MADE GROUND)			
1.20	D	N=10			1.00	Brown, slightly gravelly, sandy CLAY. Gravel is subangular, fine to coarse, including sandstone and brick. (MADE GROUND)			
1.30	J				1.10		Soft, grey mottled, slightly silty, sandy CLAY. (GLACIAL TILL)		
		N=27			2.00	Firm to stiff, brown and locally grey mottled, slightly silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular, fine to coarse, of mixed lithologies. (GLACIAL TILL)			
									
		N=50			3.00				
									
		pp 50/255mm			4.00	End Of Borehole At 4.00 m			

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level		REMARKS No Groundwater Encountered Hole refused at 4mbgl.  Scale: 1:30	Water Strikes					
			Date	Strike	Level	Minutes	Casing	Sealed
			Daily Log Of Depths			Chiselling		
			Date	Casing	Water	From	To	Hours

		Project Title: Xaverian College Science Block				<h1>WS02</h1>	
		Project Number: 10961G		Client: Xaverian College			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 11/05/2023		Method: Window Sample		Driller: LOT Geotechnics Ltd		Logged By: TPB	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20	E	N=9			0.15	Concrete paving slab. (MADE GROUND)		
0.40	E				0.50	Brown SAND. (MADE GROUND)		
0.70	E				0.75	Dark grey, sandy, angular to subangular, fine to coarse GRAVEL including brick, concrete, ash and clinker. Low cobble content. Cobbles and subangular, of brick and concrete. (MADE GROUND)		
1.00	D				1.00			
1.20	J				1.15	Dark grey, slightly silty, slightly gravelly, sandy CLAY. Gravel is subangular, fine to coarse, including ash and brick. (MADE GROUND)		
		N=22				Soft, grey mottled, slightly silty, sandy CLAY. (GLACIAL TILL)		
					2.00	Firm to stiff, brown and locally grey mottled, slightly silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular, fine to coarse, of mixed lithologies. (GLACIAL TILL)		
		N=51						
								
					3.00			
								
								
		pp 50/260mm			4.00			
						End Of Borehole At 4.00 m		

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level		REMARKS No Groundwater Encountered Hole refused at 4mbgl. 		Water Strikes																									
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Date	Casing	Water	From	To	Hours																								

		Project Title: Xaverian College Science Block				<h1>WS03</h1>	
		Project Number: 10961G		Client: Xaverian College			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 11/05/2023		Method: Window Sample		Driller: LOT Geotechnics Ltd		Logged By: TPB	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20	E				0.15	Concrete paving slab. (MADE GROUND)		
0.30	E				0.35	Brown SAND. (MADE GROUND)		
0.50	E				0.70	Dark brownish grey, slightly sandy, angular to subangular, fine to coarse GRAVEL including brick, sandstone, ash and concrete. (MADE GROUND)		
1.30	D	N=11			1.00	Dark brown grey, slightly clayey, sandy, subangular, fine to coarse GRAVEL including ash, clinker and brick, with occasional clay pockets. (MADE GROUND)		
1.40	J				1.10			
		N=24			2.00	Brownish grey mottled, slightly gravelly, sandy CLAY. Gravel is subangular, fine to coarse, including brick. (MADE GROUND)		
		N=42			3.00	Firm to stiff, brown and locally grey mottled, slightly silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular, fine to coarse, of mixed lithologies. (GLACIAL TILL)		
								
								
		pp 50/250mm			4.00	End Of Borehole At 4.00 m		

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level		REMARKS No Groundwater Encountered Hole refused at 4mbgl.	Water Strikes <table border="1"> <thead> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Date	Strike	Level	Minutes	Casing	Sealed																		
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Date	Casing	Water	From	To	Hours																						

		Project Title: Xaverian College Science Block				<h1>WS04</h1>	
		Project Number: 10961G		Client: Xaverian College			
		GL (mAOD):		N Coord: 0		E Coord: 0	
Date: 11/05/2023		Method: Window Sample		Driller: LOT Geotechnics Ltd		Logged By: TPB	

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20	E				0.15	Asphalt. (MADE GROUND)		
					0.35	Brown SAND. (MADE GROUND)		
					0.80	Grey, slightly sandy, angular to subangular, fine to coarse GRAVEL including sandstone, limestone, brick and ash. Low cobble content. Cobbles are subangular, of brick. (MADE GROUND)		
		N=9			1.00			
					1.10	Brown, slightly gravelly, sandy CLAY. Gravel is subangular, fine to coarse, including sandstone and brick. (MADE GROUND)		
						Soft, grey mottled, slightly silty, sandy CLAY. (GLACIAL TILL)		
		N=24			2.00	Firm to stiff, brown and locally grey mottled, slightly silty, slightly sandy, slightly gravelly CLAY. Gravel is subangular, fine to coarse, of mixed lithologies. (GLACIAL TILL)		
								
		N=48			3.00			
								
								
		N=52			4.00			
						End Of Borehole At 4.00 m		
								
								
								
								
								
								
								
								
								

KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed W - Water Sample S - Standard Penetration Test C - Cone Penetration Test N - Penetration Test 'N' Value V - Hand Shear Vane kPa  - Groundwater Strike  - Groundwater Level		REMARKS No Groundwater Encountered Hole refused at 4mbgl. 	Water Strikes <table border="1"> <thead> <tr> <th>Date</th> <th>Strike</th> <th>Level</th> <th>Minutes</th> <th>Casing</th> <th>Sealed</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Date	Strike	Level	Minutes	Casing	Sealed																																									
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Scale: 1:30

APPENDIX 03

Geotechnical Testing Results



LABORATORY REPORT



Contract Number: PSL23/3827

Report Date: 26 May 2023

Client's Reference: 10961G

Client Name: WML Consulting
No 8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

For the attention of: Tom Booth

Contract Title: Xaverian College

Date Received: 22/5/2023

Date Commenced: 22/5/2023

Date Completed: 26/05/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Xaverian College

Contract No:

PSL23/3827

Client Ref:

10961G

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



Xaverian College

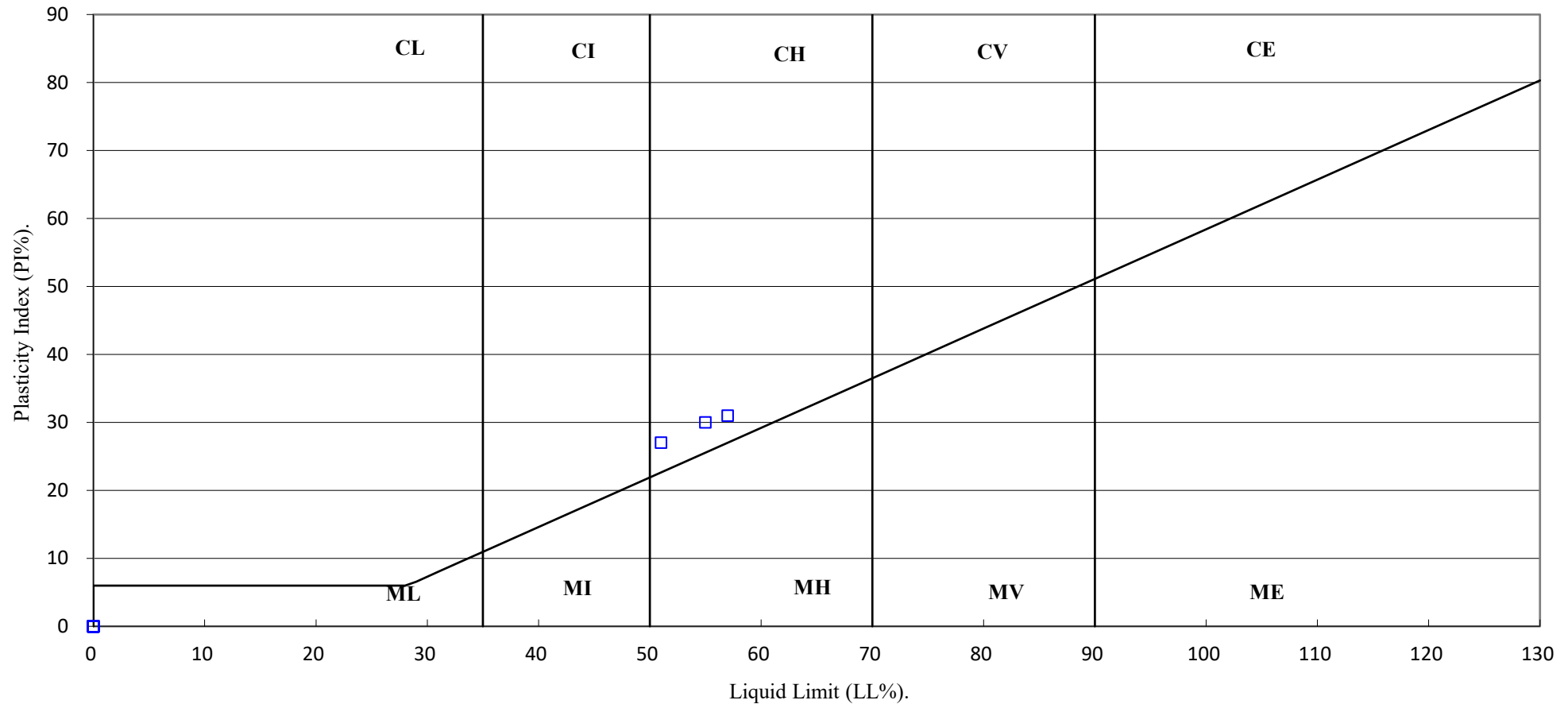
Contract No:

PSL23/3827

Client Ref:

10961G

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Xaverian College

Contract No:

PSL23/3827

Client Ref:

10961G

APPENDIX 04

Chemical Analytical Results



Final Report

Report No.: 23-15989-1

Initial Date of Issue: 23-May-2023

Re-Issue Details:

Client WML Consulting Ltd

Client Address: Third Floor South
Metropolitan House
Station Road
Cheadle Hulme
Cheshire
SK8 7AZ

Contact(s): Tom Booth

Project 10961G Xaverian College

Quotation No.: **Date Received:** 15-May-2023

Order No.: 10961G **Date Instructed:** 15-May-2023

No. of Samples: 5

Turnaround (Wkdays): 7 **Results Due:** 23-May-2023

Date Approved: 23-May-2023

Approved By:

Details: Stuart Henderson, Technical
Manager

Results - Leachate

Project: 10961G Xavierian College

Client: WML Consulting Ltd		Chemtest Job No.:		23-15989	
Quotation No.:		Chemtest Sample ID.:		1639160	
Order No.: 10961G		Client Sample Ref.:		E	
		Sample Location:		WS01	
		Sample Type:		SOIL	
		Top Depth (m):		0.30	
		Date Sampled:		11-May-2023	
Determinand	Accred.	SOP	Type	Units	LOD
pH	U	1010			N/A
Sulphur	N	1220		mg/l	1.0
Sulphate	U	1220		mg/l	1.0
Hardness	U	1415		mg/l	15
Arsenic (Dissolved)	U	1455		µg/l	0.20
Boron (Dissolved)	U	1455		µg/l	10.0
Cadmium (Dissolved)	U	1455		µg/l	0.11
Copper (Dissolved)	U	1455		µg/l	0.50
Mercury (Dissolved)	U	1455		µg/l	0.05
Nickel (Dissolved)	U	1455		µg/l	0.50
Lead (Dissolved)	U	1455		µg/l	0.50
Selenium (Dissolved)	U	1455		µg/l	0.50
Vanadium (Dissolved)	U	1455		µg/l	0.50
Zinc (Dissolved)	U	1455		µg/l	2.5
Chromium (Hexavalent)	U	1490		µg/l	20
Naphthalene	U	1800		µg/l	0.10
Acenaphthylene	U	1800		µg/l	0.10
Acenaphthene	U	1800		µg/l	0.10
Fluorene	U	1800		µg/l	0.10
Phenanthrene	U	1800		µg/l	0.10
Anthracene	U	1800		µg/l	0.10
Fluoranthene	U	1800		µg/l	0.10
Pyrene	U	1800		µg/l	0.10
Benzo[a]anthracene	U	1800		µg/l	0.10
Chrysene	U	1800		µg/l	0.10
Benzo[b]fluoranthene	U	1800		µg/l	0.10
Benzo[k]fluoranthene	U	1800		µg/l	0.10
Benzo[a]pyrene	U	1800		µg/l	0.10
Indeno(1,2,3-c,d)Pyrene	U	1800		µg/l	0.10
Dibenz(a,h)Anthracene	U	1800		µg/l	0.10
Benzo[g,h,i]perylene	U	1800		µg/l	0.10
Total Of 16 PAH's	U	1800		µg/l	2.0
Total Phenols	U	1920		mg/l	0.030

Results - Soil

Project: 10961G Xavierian College

Client: WML Consulting Ltd	Chemtest Job No.:				23-15989	23-15989	23-15989	23-15989
Quotation No.:	Chemtest Sample ID.:				1639159	1639161	1639162	1639163
Order No.: 10961G	Client Sample Ref.:				E	E	J	E
	Sample Location:				WS01	WS01	WS01	WS02
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.20	0.50	1.30	0.20
	Date Sampled:				11-May-2023	11-May-2023	11-May-2023	11-May-2023
	Asbestos Lab:				COVENTRY	COVENTRY		COVENTRY
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-	-		-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected
Moisture	N	2030	%	0.020	11	17	15	20
pH	U	2010		4.0	8.7	8.4	8.3	8.6
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	0.71		0.91
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010	0.18	0.015	0.020	0.13
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50		< 0.50
Sulphate (Total)	U	2430	mg/kg	100	2500	120		1200
Arsenic	U	2455	mg/kg	0.5	4.5	2.1		16
Cadmium	U	2455	mg/kg	0.10	7.7	< 0.10		0.27
Copper	U	2455	mg/kg	0.50	19	5.6		74
Mercury	U	2455	mg/kg	0.05	0.12	< 0.05		0.54
Nickel	U	2455	mg/kg	0.50	16	12		11
Lead	U	2455	mg/kg	0.50	77	6.2		590
Selenium	U	2455	mg/kg	0.25	0.26	< 0.25		0.33
Vanadium	U	2455	mg/kg	0.5	18	9.1		17
Zinc	U	2455	mg/kg	0.50	1100	15		160
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50		< 0.50
Aliphatic VPH >C5-C6	U	2780	mg/kg	0.05	< 0.05			< 0.05
Aliphatic VPH >C6-C7	U	2780	mg/kg	0.05	< 0.05			< 0.05
Aliphatic VPH >C7-C8	U	2780	mg/kg	0.05	< 0.05			< 0.05
Total Aliphatic VPH >C5-C10	U	2780	mg/kg	0.25	< 0.25			< 0.25
Aliphatic EPH >C10-C12	U	2690	mg/kg	2.00	4.0			2.5
Aliphatic VPH >C8-C10	U	2780	mg/kg	0.05	< 0.05			< 0.05
Aliphatic EPH >C12-C16	U	2690	mg/kg	1.00	6.8			6.7
Aliphatic EPH >C16-C21	U	2690	mg/kg	2.00	19			16
Aliphatic EPH >C21-C35	U	2690	mg/kg	3.00	35			32
Aliphatic EPH >C35-C40	N	2690	mg/kg	10.00	39			< 10
Total Aliphatic EPH >C10-C35	U	2690	mg/kg	5.00	< 5.0			< 5.0
Total Aliphatic EPH >C10-C40	N	2690	mg/kg	10.00	39			< 10
Aromatic VPH >C5-C7	U	2780	mg/kg	0.05	< 0.05			< 0.05
Aromatic VPH >C7-C8	U	2780	mg/kg	0.05	< 0.05			< 0.05
Aromatic VPH >C8-C10	U	2780	mg/kg	0.05	< 0.05			< 0.05
Total Aromatic VPH >C5-C10	U	2780	mg/kg	0.25	< 0.25			< 0.25
Aromatic EPH >C10-C12	U	2690	mg/kg	1.00	< 1.0			3.6
Aromatic EPH >C12-C16	U	2690	mg/kg	1.00	25			78

Results - Soil

Project: 10961G Xavierian College

Client: WML Consulting Ltd	Chemtest Job No.:				23-15989	23-15989	23-15989	23-15989
Quotation No.:	Chemtest Sample ID.:				1639159	1639161	1639162	1639163
Order No.: 10961G	Client Sample Ref.:				E	E	J	E
	Sample Location:				WS01	WS01	WS01	WS02
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.20	0.50	1.30	0.20
	Date Sampled:				11-May-2023	11-May-2023	11-May-2023	11-May-2023
	Asbestos Lab:				COVENTRY	COVENTRY		COVENTRY
Determinand	Accred.	SOP	Units	LOD				
Aromatic EPH >C16-C21	U	2690	mg/kg	2.00	240			860
Aromatic EPH >C21-C35	U	2690	mg/kg	2.00	700			2400
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00	200			300
Total Aromatic EPH >C10-C35	U	2690	mg/kg	5.00	970			3400
Total Aromatic EPH >C10-C40	N	2690	mg/kg	10.00	1200			3700
Total VPH >C5-C10	U	2780	mg/kg	0.50	< 0.50			< 0.50
Total EPH >C10-C35	U	2690	mg/kg	10.00	1000			3400
Total EPH >C10-C40	N	2690	mg/kg	10.00	1300			3700
Organic Matter	U	2625	%	0.40	15	2.2		6.4
Benzene	U	2760	µg/kg	1.0	< 1.0			< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0			< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0			< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0			< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0			< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0			< 1.0
Naphthalene	U	2800	mg/kg	0.10	0.30	< 0.10		0.68
Acenaphthylene	N	2800	mg/kg	0.10	1.4	< 0.10		2.9
Acenaphthene	U	2800	mg/kg	0.10	1.1	< 0.10		1.7
Fluorene	U	2800	mg/kg	0.10	0.99	< 0.10		1.9
Phenanthrene	U	2800	mg/kg	0.10	24	0.21		38
Anthracene	U	2800	mg/kg	0.10	8.5	< 0.10		12
Fluoranthene	U	2800	mg/kg	0.10	69	0.44		100
Pyrene	U	2800	mg/kg	0.10	60	0.41		91
Benzo[a]anthracene	U	2800	mg/kg	0.10	39	0.19		64
Chrysene	U	2800	mg/kg	0.10	34	0.10		53
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	56	0.37		72
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	22	< 0.10		28
Benzo[a]pyrene	U	2800	mg/kg	0.10	57	0.25		67
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	40	0.29		42
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	5.4	< 0.10		7.3
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	29	0.24		28
Total Of 16 PAH's	N	2800	mg/kg	2.0	450	2.5		610
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10		< 0.10

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8–C10 Aromatics: >C5–C7,>C7–C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenzo[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



Final Report

Report No.: 23-16176-1

Initial Date of Issue: 26-May-2023

Re-Issue Details:

Client WML Consulting Ltd

Client Address: Third Floor South
Metropolitan House
Station Road
Cheadle Hulme
Cheshire
SK8 7AZ

Contact(s): Tom Booth

Project 10961G Xaverian College

Quotation No.: **Date Received:** 17-May-2023

Order No.: 10961G **Date Instructed:** 17-May-2023

No. of Samples: 8

Turnaround (Wkdays): 7 **Results Due:** 25-May-2023

Date Approved: 26-May-2023

Approved By:

Details: Stuart Henderson, Technical
Manager

Results - Leachate

Project: 10961G Xavierian College

Client: WML Consulting Ltd	Chemtest Job No.:					23-16176	23-16176
Quotation No.:	Chemtest Sample ID.:					1640015	1640019
Order No.: 10961G	Client Sample Ref.:					E	E
	Sample Location:					WS02	WS03
	Sample Type:					SOIL	SOIL
	Top Depth (m):					0.40	0.30
	Date Sampled:					11-May-2023	11-May-2023
Determinand	Accred.	SOP	Type	Units	LOD		
pH	U	1010			N/A	8.6	8.6
Sulphur	N	1220		mg/l	1.0	1.2	2.0
Sulphate	U	1220		mg/l	1.0	3.7	6.0
Hardness	U	1415		mg/l	15	< 15	< 15
Arsenic (Dissolved)	U	1455		µg/l	0.20	10	2.1
Boron (Dissolved)	U	1455		µg/l	10.0	< 10	< 10
Cadmium (Dissolved)	U	1455		µg/l	0.11	< 0.11	< 0.11
Copper (Dissolved)	U	1455		µg/l	0.50	1.7	0.98
Mercury (Dissolved)	U	1455		µg/l	0.05	< 0.05	< 0.05
Nickel (Dissolved)	U	1455		µg/l	0.50	< 0.50	< 0.50
Lead (Dissolved)	U	1455		µg/l	0.50	11	1.9
Selenium (Dissolved)	U	1455		µg/l	0.50	0.85	0.69
Vanadium (Dissolved)	U	1455		µg/l	0.50	2.7	1.5
Zinc (Dissolved)	U	1455		µg/l	2.5	7.3	8.5
Chromium (Hexavalent)	U	1490		µg/l	20	< 20	< 20
Naphthalene	U	1800		µg/l	0.10	< 0.10	< 0.10
Acenaphthylene	U	1800		µg/l	0.10	< 0.10	< 0.10
Acenaphthene	U	1800		µg/l	0.10	4.5	< 0.10
Fluorene	U	1800		µg/l	0.10	< 0.10	< 0.10
Phenanthrene	U	1800		µg/l	0.10	6.8	< 0.10
Anthracene	U	1800		µg/l	0.10	4.5	< 0.10
Fluoranthene	U	1800		µg/l	0.10	63	6.3
Pyrene	U	1800		µg/l	0.10	43	6.7
Benzo[a]anthracene	U	1800		µg/l	0.10	15	4.4
Chrysene	U	1800		µg/l	0.10	14	< 0.10
Benzo[b]fluoranthene	U	1800		µg/l	0.10	13	< 0.10
Benzo[k]fluoranthene	U	1800		µg/l	0.10	6.1	< 0.10
Benzo[a]pyrene	U	1800		µg/l	0.10	16	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1800		µg/l	0.10	12	< 0.10
Dibenz(a,h)Anthracene	U	1800		µg/l	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1800		µg/l	0.10	10	< 0.10
Total Of 16 PAH's	U	1800		µg/l	2.0	210	17
Total Phenols	U	1920		mg/l	0.030	< 0.030	< 0.030

Results - Soil

Project: 10961G Xavierian College

Client: WML Consulting Ltd	Chemtest Job No.:				23-16176	23-16176	23-16176	23-16176	23-16176	23-16176
Quotation No.:	Chemtest Sample ID.:				1640016	1640017	1640018	1640020	1640021	1640022
Order No.: 10961G	Client Sample Ref.:				E	J	E	E	J	E
	Sample Location:				WS02	WS02	WS03	WS03	WS03	WS04
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.70	1.20	0.20	0.50	1.40	0.20
	Date Sampled:				11-May-2023	11-May-2023	11-May-2023	11-May-2023	11-May-2023	11-May-2023
	Asbestos Lab:				DURHAM		DURHAM	DURHAM		DURHAM
Determinand	Accred.	SOP	Units	LOD						
ACM Type	U	2192		N/A	-		-	-		-
Asbestos Identification	U	2192		N/A	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected		No Asbestos Detected
Moisture	N	2030	%	0.020	25	27	14	24	24	10
pH	U	2010		4.0	8.5	8.6	8.4	8.4	8.5	8.4
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.51		0.44	0.84		0.71
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.027	0.011	0.026	0.010	< 0.010	0.071
Total Sulphur	U	2175	%	0.010	0.19	0.23	0.20	0.11	0.025	0.18
Cyanide (Total)	U	2300	mg/kg	0.50	0.80		0.80	0.60		0.70
Sulphate (Total)	U	2430	mg/kg	100	1300		1200	1700		1700
Arsenic	U	2455	mg/kg	0.5	7.5		7.7	14		12
Cadmium	U	2455	mg/kg	0.10	0.53		1.5	0.40		0.69
Copper	U	2455	mg/kg	0.50	23		21	31		35
Mercury	U	2455	mg/kg	0.05	0.36		0.50	0.67		0.80
Nickel	U	2455	mg/kg	0.50	12		11	30		17
Lead	U	2455	mg/kg	0.50	97		110	100		170
Selenium	U	2455	mg/kg	0.25	0.35		< 0.25	0.69		0.46
Vanadium	U	2455	mg/kg	0.5	17		12	42		21
Zinc	U	2455	mg/kg	0.50	46		66	83		74
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50	< 0.50		< 0.50
Aliphatic VPH >C5-C6	U	2780	mg/kg	0.05			< 0.05			
Aliphatic VPH >C6-C7	U	2780	mg/kg	0.05			< 0.05			
Aliphatic VPH >C7-C8	U	2780	mg/kg	0.05			< 0.05			
Total Aliphatic VPH >C5-C10	U	2780	mg/kg	0.25			< 0.25			
Aliphatic EPH >C10-C12	U	2690	mg/kg	2.00			< 2.0			
Aliphatic VPH >C8-C10	U	2780	mg/kg	0.05			< 0.05			
Aliphatic EPH >C12-C16	U	2690	mg/kg	1.00			< 1.0			
Aliphatic EPH >C16-C21	U	2690	mg/kg	2.00			8.5			
Aliphatic EPH >C21-C35	U	2690	mg/kg	3.00			4.3			
Aliphatic EPH >C35-C40	N	2690	mg/kg	10.00			< 10			
Total Aliphatic EPH >C10-C35	U	2690	mg/kg	5.00			13			
Total Aliphatic EPH >C10-C40	N	2690	mg/kg	10.00			13			
Aromatic VPH >C5-C7	U	2780	mg/kg	0.05			< 0.05			
Aromatic VPH >C7-C8	U	2780	mg/kg	0.05			< 0.05			
Aromatic VPH >C8-C10	U	2780	mg/kg	0.05			< 0.05			
Total Aromatic VPH >C5-C10	U	2780	mg/kg	0.25			< 0.25			
Aromatic EPH >C10-C12	U	2690	mg/kg	1.00			1.3			
Aromatic EPH >C12-C16	U	2690	mg/kg	1.00			30			

Results - Soil

Project: 10961G Xavierian College

Client: WML Consulting Ltd	Chemtest Job No.:				23-16176	23-16176	23-16176	23-16176	23-16176	23-16176
Quotation No.:	Chemtest Sample ID.:				1640016	1640017	1640018	1640020	1640021	1640022
Order No.: 10961G	Client Sample Ref.:				E	J	E	E	J	E
	Sample Location:				WS02	WS02	WS03	WS03	WS03	WS04
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.70	1.20	0.20	0.50	1.40	0.20
	Date Sampled:				11-May-2023	11-May-2023	11-May-2023	11-May-2023	11-May-2023	11-May-2023
	Asbestos Lab:				DURHAM		DURHAM	DURHAM		DURHAM
Determinand	Accred.	SOP	Units	LOD						
Aromatic EPH >C16-C21	U	2690	mg/kg	2.00			400			
Aromatic EPH >C21-C35	U	2690	mg/kg	2.00			1100			
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00			110			
Total Aromatic EPH >C10-C35	U	2690	mg/kg	5.00			1500			
Total Aromatic EPH >C10-C40	N	2690	mg/kg	10.00			1600			
Total VPH >C5-C10	U	2780	mg/kg	0.50			< 0.50			
Total EPH >C10-C35	U	2690	mg/kg	10.00			1500			
Total EPH >C10-C40	N	2690	mg/kg	10.00			1600			
Organic Matter	U	2625	%	0.40	4.0		11	3.7		8.8
Benzene	U	2760	µg/kg	1.0			< 1.0			
Toluene	U	2760	µg/kg	1.0			< 1.0			
Ethylbenzene	U	2760	µg/kg	1.0			< 1.0			
m & p-Xylene	U	2760	µg/kg	1.0			< 1.0			
o-Xylene	U	2760	µg/kg	1.0			< 1.0			
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0			< 1.0			
Naphthalene	U	2800	mg/kg	0.10	0.32		0.60	0.30		< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	1.1		1.8	0.98		0.60
Acenaphthene	U	2800	mg/kg	0.10	1.1		0.95	1.8		1.3
Fluorene	U	2800	mg/kg	0.10	0.95		0.93	1.2		1.1
Phenanthrene	U	2800	mg/kg	0.10	21		17	18		24
Anthracene	U	2800	mg/kg	0.10	7.4		6.9	6.2		6.9
Fluoranthene	U	2800	mg/kg	0.10	60		70	46		43
Pyrene	U	2800	mg/kg	0.10	47		60	36		36
Benzo[a]anthracene	U	2800	mg/kg	0.10	30		44	22		19
Chrysene	U	2800	mg/kg	0.10	25		36	18		19
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	36		55	25		23
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	16		24	11		9.1
Benzo[a]pyrene	U	2800	mg/kg	0.10	35		54	24		20
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	21		34	16		12
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	3.4		5.3	2.6		2.0
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	15		25	10		11
Total Of 16 PAH's	N	2800	mg/kg	2.0	320		440	240		230
Total Phenols	U	2920	mg/kg	0.10	< 0.10		< 0.10	< 0.10		< 0.10

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8–C10 Aromatics: >C5–C7,>C7–C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenzo[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 24/06370
Issue Number: 1

Date: 08 July, 2024

Client: WML Consulting Ltd
Third Floor South
Metropolitan House
Station Rd
Cheadle Hulme
Cheshire
SK8 7AZ

Project Manager: Sam Seddon
Project Name: Xaverian College
Project Ref: 10961G
Order No: 10961G
Date Samples Received: 27/06/24
Date Instructions Received: 28/06/24
Date Analysis Completed: 08/07/24

Approved by:



Amy Riding
Administration Assistant

Envirolab Job Number: 24/06370

Client Project Name: Xaverian College

Client Project Ref: 10961G

Lab Sample ID	24/06370/1	24/06370/2	24/06370/3					Units	Limit of Detection	Method ref
Client Sample No	1	1	1							
Client Sample ID	S1	S2	S3							
Depth to Top										
Depth To Bottom										
Date Sampled	24-Jun-24	24-Jun-24	24-Jun-24							
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES							
Sample Matrix Code	6ABE	4A	6ABE							
% Stones >10mm _A	<0.1	<0.1	10.9					% w/w	0.1	A-T-044
pH _D ^{M#}	8.18	8.13	8.12					pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.20	0.34	1.94					g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	690	900	6000					mg/kg	200	A-T-028s
Sulphur (total) _D	351	324	2090					mg/kg	50	A-T-024s
Cyanide (total) _A ^{M#}	1	<1	<1					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2					mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	4.9	3.4	1.8					% w/w	0.1	A-T-032s
Arsenic _D ^{M#}	6	5	4					mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0					mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5	<0.5	<0.5					mg/kg	0.5	A-T-024s
Copper _D ^{M#}	31	24	18					mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1					mg/kg	1	A-T-040s
Lead _D ^{M#}	82	67	364					mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	0.37					mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	40	36	15					mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1					mg/kg	1	A-T-024s
Vanadium _D ^{M#}	45	35	26					mg/kg	1	A-T-024s
Zinc _D ^{M#}	66	58	61					mg/kg	5	A-T-024s

Envirolab Job Number: 24/06370

Client Project Name: Xaverian College

Client Project Ref: 10961G

Lab Sample ID	24/06370/1	24/06370/2	24/06370/3					Units	Limit of Detection	Method ref
Client Sample No	1	1	1							
Client Sample ID	S1	S2	S3							
Depth to Top										
Depth To Bottom										
Date Sampled	24-Jun-24	24-Jun-24	24-Jun-24							
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES							
Sample Matrix Code	6ABE	4A	6ABE							
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD							A-T-045
Asbestos Matrix (visual) _D	-	-	-							A-T-045
Asbestos Matrix (microscope) _D	-	-	-							A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A							A-T-045

Envirolab Job Number: 24/06370

Client Project Name: Xavierian College

Client Project Ref: 10961G

Lab Sample ID	24/06370/1	24/06370/2	24/06370/3					Units	Limit of Detection	Method ref
Client Sample No	1	1	1							
Client Sample ID	S1	S2	S3							
Depth to Top										
Depth To Bottom										
Date Sampled	24-Jun-24	24-Jun-24	24-Jun-24							
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES							
Sample Matrix Code	6ABE	4A	6ABE							
PAH-16MS										
Acenaphthene _A ^{M#}	0.18	<0.01	0.22					mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.05	<0.01	0.06					mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	1.19	0.06	0.81					mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	4.86	0.24	2.30					mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	4.05	0.20	1.91					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	4.93	0.24	2.25					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	1.85	0.11	0.95					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	2.09	0.10	0.89					mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	4.43	0.25	2.10					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.40	<0.04	0.21					mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	11.5	0.46	4.87					mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.16	0.01	0.21					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	1.98	0.11	0.99					mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	4.73	0.20	2.93					mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	9.08	0.40	4.03					mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	51.5	2.38	24.7					mg/kg	0.01	A-T-019s

Envirolab Job Number: 24/06370

Client Project Name: Xavierian College

Client Project Ref: 10961G

Lab Sample ID	24/06370/1	24/06370/2	24/06370/3					Units	Limit of Detection	Method ref
Client Sample No	1	1	1							
Client Sample ID	S1	S2	S3							
Depth to Top										
Depth To Bottom										
Date Sampled	24-Jun-24	24-Jun-24	24-Jun-24							
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES							
Sample Matrix Code	6ABE	4A	6ABE							
TPH CWG with Clean Up										
Ali >C5-C6 _A	-	<0.01	-					mg/kg	0.01	A-T-022s
Ali >C6-C8 _A	-	<0.01	-					mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	-	<1	-					mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	-	<1	-					mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	-	<1	-					mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	-	1	-					mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	-	2	-					mg/kg	1	A-T-055s
Total Aliphatics _A	-	3	-					mg/kg	1	Calc-As Recd
Aro >C5-C7 _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	-	<1	-					mg/kg	1	A-T-055s
Aro >C10-C12 _A	-	<1	-					mg/kg	1	A-T-055s
Aro >C12-C16 _A	-	<1	-					mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	-	1	-					mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	-	3	-					mg/kg	1	A-T-055s
Total Aromatics _A	-	4	-					mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35) _A	-	7	-					mg/kg	1	Calc-As Recd
BTEX - Benzene _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s
MTBE _A [#]	-	<0.01	-					mg/kg	0.01	A-T-022s

Report Notes

General

- This report shall not be reproduced, except in full, without written approval from Envirolab.
- The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client and can affect the validity of results.
- The results reported herein relate only to the material supplied to the laboratory.
- The residue of any samples contained within this report, and any received within the same delivery, will be disposed of **four weeks** after the initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of **six months** after the initial Asbestos testing is completed.
- Analytical results reflect the quality of the sample at the time of analysis only.
- Opinions and Interpretations expressed are outside our scope of accreditation.
- A deviating sample report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
- If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
- Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

Superscript “#”	Accredited to ISO 17025
Superscript “M”	Accredited to MCertS
Superscript “U”	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript “A”	Analysis performed on as-received Sample
Subscript “D”	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript “D” on Asbestos	Analysis performed on a dried aliquot of sample provided.
Subscript “A”	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

Asbestos

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
 Stones etc. are not removed from the sample prior to analysis
 Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing, and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

Soil Chemical Analysis:

All results are reported as dry weight (<40°C).
 For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
 For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
 All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any “D” subscripts.

TPH by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
 Results “with Clean up” indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.
 Where these humic substances have been identified in any IDs from “TPH CWG with clean up” please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: WML Consulting Ltd, Third Floor South, Metropolitan House, Station Rd,
Cheadle Hulme, Cheshire, SK8 7AZ

Project: Xaverian College

Clients Project No: 10961G

Project No: 24/06370

Date Received: 28/06/2024 (am)

Cool Box Temperatures (°C): 17.9

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	24/06370/1	24/06370/2	24/06370/3
Client Sample No	1	1	1
Client Sample ID/Depth	S1	S2	S3
Date Sampled	24/06/24	24/06/24	24/06/24
A-T-019s	04/07/2024	04/07/2024	04/07/2024
A-T-022s		03/07/2024	
A-T-024s	05/07/2024	05/07/2024	05/07/2024
A-T-026s	04/07/2024	04/07/2024	04/07/2024
A-T-027s	03/07/2024	03/07/2024	03/07/2024
A-T-028s	04/07/2024	04/07/2024	04/07/2024
A-T-031s	04/07/2024	04/07/2024	04/07/2024
A-T-032s	03/07/2024	03/07/2024	03/07/2024
A-T-040s	04/07/2024	04/07/2024	04/07/2024
A-T-042sTCN	03/07/2024	03/07/2024	03/07/2024
A-T-044	08/07/2024	08/07/2024	08/07/2024
A-T-045	01/07/2024	01/07/2024	01/07/2024
A-T-050s	05/07/2024	05/07/2024	05/07/2024
A-T-055s		03/07/2024	
Calc-As Recd		03/07/2024	

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

APPENDIX 05

Ground Gas Monitoring

WMLCONSULTING

Date:- 18/05/2023
Start Time:- 13:30
End Time:- 15:00
Ground Conditions:- Dry
Weather Conditions:- Overcast, warm

Atmospheric Pressure
Start:- 1022
End:- 1020
Trend:- Falling

Operator:- T Sheen

[illegible]

Additional Comments

WMLCONSULTING

Atmospheric Pressure
Start:- 1027
End:- 1024
Trend:- Falling

Operator:- T Sheen

[illegible]

Additional Comments

WMLCONSULTING

Atmospheric Pressure
Start:- 1016
End:- 1013
Trend:- Falling

Operator:- T Sheen

[illegible]

Additional Comments

WMLCONSULTING

Atmospheric Pressure
Start:- 1011
End:- 1010
Trend:- Falling

Operator:- T Sheen

Additional Comments
WS02 - water drawn into standpipe after 3 minutes

WMLCONSULTING

Atmospheric Pressure
Start:- 1011
End:- 1009
Trend:- Falling

Operator:- T Sheen

[illegible]

Additional Comments

Gas & Groundwater Monitoring Record Sheet



Project Name:- Xaverian College Science Block
Project No:- 10961G
Client:- Xaverian College

Date:- 13/09/2023
Start Time:- 13:30
End Time:- 15:00
Ground Conditions:- Dry
Weather Conditions:- Sunny, warm

Atmospheric Pressure
Start:- 1018
End:- 1018
Trend:- Steady

Instrument:- Gas Data GFM436

Operator:- T Sheen

Hole ID	Peak Flow l/hr	Steady Flow l/hr	DP	CH4			CO2			Min O2 %	Peak H2S ppm	Peak CO ppm	Hexane %	Water Level mbgl	Base of Hole mbgl
				Peak %	Steady %	Qhg l/hr	Peak %	Steady %	Qhg l/hr						
WS01	<0.1	<0.1	<0.1	0.0	0.0	0.0000	7.5	7.5	0.0075	16.1	0	0	0.000	0.44	4.08
WS02	25.0	<0.1	12 / 0	0.0	0.0	0.0000	3.6	3.6	0.0036	17.0	0	0	0.000	0.58	4.10
WS03	<0.1	<0.1	0	0.0	0.0	0.0000	3.5	3.5	0.0035	16.0	0	0	0.000	1.49	4.10

Additional Comments

Immediate negative flow rate of -44 recorded in WS01 due to change in groundwater level on opening tap, immediate positive flow of 25 recorded in WS02, both returned to <LoD rapidly. Water drawn into sampling tube after 2 mins in WS01 and WS02.

GAS MONITORING METHODOLOGY

1. The following are recorded upon arrival or at each location as the monitoring progresses:-
 - Operator name;
 - Instrumentation name i.e. Gas Data - GFM436;
 - Atmospheric pressure;
 - Time of commencement of the monitoring visit;
 - Ground conditions e.g. wet, dry waterlogged etc.;
 - General weather conditions, as the prevailing conditions may affect the results; and
 - Condition of the monitoring point e.g. damaged, covered etc.
2. The background oxygen concentration in the vicinity of the monitoring point is recorded to ensure that the instrument is zeroed.
3. Where appropriate, both the flow and pressure differential are recorded at each monitoring point prior to obtaining the gas concentrations.
4. Concentrations of light hydrocarbon gas, comprising methane (%v/v), carbon dioxide (%v/v), oxygen (%v/v), hydrogen sulphide (ppm), carbon monoxide (ppm) and hexane % are monitored continuously over a 90 seconds period. The highest concentrations of methane, carbon dioxide, carbon monoxide and hydrogen sulphide and the lowest concentration of oxygen are then recorded.
5. If/where concentrations stabilise after 90 seconds, the steady-state concentrations are recorded. If concentrations are still varying, monitoring is continued until steady-state conditions are attained and concentrations then recorded. The accuracy for light hydrocarbon gases is :-
 - Methane - +/-0.2% at 5%.
 - Carbon dioxide - +/-0.1% at 10%.
6. Depth to water level and base of installation are recorded as the movement of groundwater can affect gas migration and migration pathways to monitoring points.
7. The above steps are to be repeated at each monitoring point.
8. The following are then recorded upon completion of the monitoring process:-
 - Atmospheric pressure;
 - Time of completion of the monitoring visit.

Key For Gas Monitoring Records

BH/WS	- Readings taken from gas valve within borehole or window sample probehole.	PD	- Pressure differential measured in millibars
Flow	- Gas flow measured in litres per hour	%	- Percentage
<0.1	- Where flows are less than 0.1/hr are recorded	ppm	- Parts Per Million
CO ₂	- Carbon Dioxide	l/hr	- Litres per hour
O ₂	- Oxygen	CH ₄	- Methane
H ₂ S	- Hydrogen Sulphide	mbgl	- Metres below ground level
CO	- Carbon Monoxide	GSV	- Gas Screening Value

TEST DATE AND CONDITIONS			
Date		21/10/2022	
Atmospheric Pressure		980	mB
Ambient Temperature		22.1	°C
EnviroNics Serial No.		5089	

**GFM436 Final Inspection & Calibration
Check Certificate**

GAS DATA LTD

Unit 4, Fairfield Court

Seven Stars Estate

Wheler Rd

Coventry

CV3 4LJ

Tel 02476303311



GAS DATA

SYSTEM - ANALYSE - INFORM

Fax 02476307711

Customer	WML Consulting Ltd
Certificate Number	123587
Order Number	332396

Serial Number	12969
Software Version	G436-00.0027/0010

Recalibration DUE Date
21/10/23

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	450	Accept > 200 cc/min	Pump Flow @ -200mB	300	Accept > 200 cc/min
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
Sensor	CH ₄		CO ₂		O ₂	
	Instrument Gas	True Gas Value %	Instrument Gas	True Gas Value %	Instrument Gas	True Gas Value %
	Readings %		Readings %		Readings %	
	59.7	60	40.0	40	20.9	20.9
	Accept ±3.0		Accept ±3.0		Accept ±0.5	
	5.0	5	5.0	5	6.0	6
	Accept ±0.3		Accept ±0.3		Accept ±0.3	
Zero Reading 100% N ₂	0.0	0	0.0	0	0.0	0
	Accept ±0.0		Accept ±0.0		Accept ±0.1	

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings (ppm)			
Gas Type	Range (ppm)		Zero Reading		Instrument Gas Reading	
H ₂ S	5000	1500	0	Accept ±0.0	1500	Accept ±5.0
CO	2000	1000	0	Accept ±0.0	1000	Accept ±5.0
Hexane	2.0%	2.0%	0	Accept ±0.0	1.99	Accept ±10.0

Cross Gas Effects									
Applied Gas (ppm)		Instrument Readings (ppm)							
Gas Type	Concentration	Toxic 1:	H2S	Toxic 2:	CO	Toxic 3:	HEX		
H2S	1500	1500		0		0			
CO	1000	60		1000		0			
Hexane	2.0%	0		0		1.99			

Pressure Checks			
Atmospheric Pressure [AP] (mB)			
Current Atmospheric Pressure (mB)		Instrument Atmospheric Pressure Reading (mB)	
AP Open Ports		980	Accept ± 2.0
AP Port (Internal)	+800 mB	800	Accept ± 5.0
	+1200mb	1200	Accept ± 5.0

Flow Checks					
Borehole Flow			Differential Pressure		
Applied Reading (l/h)	Instrument Reading (l/h)		Applied Pressure (Pa)	Instrument Reading (Pa)	
-30	-30.0	Accept ± 3.0	-377	-377	Accept ± 50
-3	-3.0	Accept ± 1.0	-18	-18	Accept ± 6.0
0	0.0	Accept ± 0.0	0	0	Accept ± 0.5
3	3.0	Accept ± 0.5	17	17	Accept ± 3.0
30	30.0	Accept ± 3.0	376	376	Accept ± 50
60	59.6	Accept ± 6.0	1153	1142	Accept ± 130
90	90.0	Accept ± 9.0	2278	>>>>>	Accept ± 250

Temperature Checks		
Calibration Temperature	Instrument Temperature Reading $^{\circ}\text{C}$	
Applied Temperature $^{\circ}\text{C}$		
-10	-10.0	Accept ± 2.0
0	0.0	Accept ± 1.0
30	30.0	Accept ± 1.0
60	60.0	Accept ± 1.0
100	100.0	Accept ± 1.0

Technician:
Jack Rutland

Date Tested:
21/10/2022

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO14001:2015, BS EN ISO45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

APPENDIX 06

Site Specific Acceptance Criteria

Screening Levels for "Commercial" end use assuming a 2.5% SOM for Hydrocarbons.

Contaminant	Screening Levels for Commercial End Use (mg/kg)
Metals	
Arsenic	640
Boron	240,000
Cadmium	190
Chromium III	8,600
Chromium VI	33
Copper	68,000
Lead*	2330
Mercury	58
Nickel	980
Selenium	12,000
Vanadium	9,000
Zinc	730,000
Non Metals	
Phenol	690
Polyaromatic Hydrocarbons (PAHs)	
Benz[a]anthracene	170
Benzo[a]pyrene	35
Benzo[b]fluoranthene	44
Benzo[ghi]perylene	4,000
Benzo[k]fluoranthene	1,200
Chrysene	350
Dibenz[ah]anthracene	3.6
Fluoranthene	23,000
Indeno[123-cd]pyrene	510
Naphthalene	460 ^f (183) ^{sol}
Pyrene	54,000

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

Contaminant	Screening Levels for Commercial End Use (mg/kg)
Volatile Organic Compounds	
Benzene	47
Ethylbenzene	13,000 ^{vap} (1220)
Toluene	110,000 ^{vap} (1920)
M - Xylene	14,000
O - Xylene	15,000
P - Xylene	14,000
Total Petroleum Hydrocarbons	
Aliphatic C5-6	5,900
Aliphatic C6-8	17,000
Aliphatic C8-10	4,800
Aliphatic C10-12	23,000
Aliphatic C12-16	82,000
Aliphatic C16-35	1,700,000
Aliphatic C35 - 44	1,700,000
Aromatic C5 - 7	46,000
Aromatic C7 - 8	110,000
Aromatic C8-10	8,100
Aromatic C10-12	28,000
Aromatic C12-16	37,000
Aromatic C16-21	28,000
Aromatic C21-35	28,000
Aromatic C35 - 44	28,000

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

The GAC's for the assessment of potential groundwater contamination have been derived from very conservative guidelines protective of drinking water and environmental quality, namely:

- UK Environmental Quality Standards (EQS) for Freshwater, 2000;
- Petroleum Products in Drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality, 2011.

Table 1: Inorganic Tier 1 Water Environment Screening Criteria

Contaminant	Units	Hardness Banding (CaCO ₃ mg/l)	EQS /WFD (Freshwater)	UK DWS
Arsenic	µg/l	-	50	10
Ammonia	mg/l	-	0.2	0.5
Boron	µg/l	-	2000	1000
Cadmium	µg/l	-	5	5
Chromium	µg/l	0-50	2	50
		50-100	10	
		100-150	10	
		150-200	20	
		200-250	20	
Copper	µg/l	0-10	0.5	2000
		10-50	0.5	
		50-200	3	
		200-250	8	
		>250	12	
Cyanide (Free)	µg/l	-	1	-
Cyanide		-	-	50
Iron	µg/l	-	1000	200
Lead	µg/l	0-50	4	10
		50-150	10	
		150-250	20	
		>250	20	
Mercury	µg/l	-	1	1
Nickel	µg/l	0-50	8	20
		50-100	20	
		100-150	20	
		150-250	40	
		>250	40	
Selenium	µg/l	-	-	10
Sulphate (SO ₄)	mg/l	-	400	250
Zinc	µg/l	0-50	8	5000
		50-150	15	
		150-250	50	
		>250	50	
pH	-	-	6-9	-

Table 2: Organic Tier 1 Water Environment Screening Criteria

Contaminant	Units	UK DWS	WHO
PAHs - The sum of <ul style="list-style-type: none"> • Benzo(b)fluoranthene, • Benzo(ghi)perylene, • Benzo(k)fluoranthene, • indeno(1,2,3-c,d)pyrene) 	µg/l	0.1	-
Phenol (total)	µg/l	0.5	-
MTBE	µg/l	-	15
Aliphatic C5-C6	µg/l	-	15,000
Aliphatic C6-C8	µg/l	-	15,000
Aliphatic C8-C10	µg/l	-	300
Aliphatic C10-C12	µg/l	-	300
Aliphatic C12-C16	µg/l	-	300
Aliphatic C16-21	µg/l	-	(300) *
Aliphatic C21-35	µg/l	-	(300)*
Aromatic C6-C7	µg/l	1 (benzene)	10 (benzene)
Aromatic C7-C8	µg/l	-	700 (toluene)
Aromatic C8-C10	µg/l	-	300 (ethylbenzene)
Aromatic C10-12	µg/l	-	100
Aromatic C12-C16	µg/l	-	100
Aromatic C16-C21	µg/l	-	90
Aromatic C21-C35	µg/l	-	90

Notes

The WHO Guideline Values for petroleum products in drinking water have been applied in the absence of current TPH water quality standards. However, for the aromatic TPH bandings of C6-C7, C7-C8 and C8-C10, the more conservative UK specific WQS for benzene, toluene and ethylbenzene have been used.

In the absence of specific WHO Guideline Values for the aliphatic ranges C16-C21 and C21-C35, the guideline values for the aliphatic C8-C10 through to C12-C16 ranges of 300µg/l have been used. This is however considered conservative due to the increased stability and lower volatility of the longer chain aliphatics.