WML CONSULTING
Civil, Structural and Geotechnical Engineers

Phase 2 Geo-Environmental Investigation & Assessment

For a site at

Ashmole Academy, London

Undertaken for

Bluesky Design Services

Report No. 7165/G/02

June 2016

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Report Title:	**Ashmole Academy, London** **Geo-environmental Investigation and Assessment**
Report Reference:	**7165/G/02**
Client:	**Bluesky Design Services**
Issue Date:	**27th June 2016**
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Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
-	27/06/2016	Original	TPB	SCS	PGD

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Executive Summary

Site Location	The site comprises land within the western section of the larger Ashmole Academy site, off Cecil Road in London. It is centred on approximate Ordnance Survey National Grid Reference 5291922E, 193977N with an indicative postcode of N14 5RS.
Development Proposals	It is understood that the current proposed development relates to the construction of a new school building with external hardstanding, soft landscaping and mixed use sports pitches.
Site History	Historically, the site remained undeveloped and in rural / agricultural use until it used as allotment gardens sometime prior to 1946. Historical plans show a drain to issue on the north-western site boundary and flow south-east across the site flanked by trees. By the 1960s the site formed playing fields within the larger Ashmole School site.
Ground Conditions	Ground conditions encountered during the intrusive investigation generally confirm those identified in the published literature and in summary comprise Made Ground to depths varying between 2.60m and 4.80mbgl. The Made Ground is underlain by cohesive London Clay to a maximum proven depth of 10.45mbgl. However, in the southern section of the site (namely BH3) the Made Ground was underlain by granular Superficial Deposits of Dollis Hill Gravel to a depth of 4.10mbgl where London Clay was encountered.
Site Preparation and Earthworks	Site clearance will include the removal of all vegetation which should be undertaken in consultation with an ecological specialist. It is anticipated that site-won Topsoil will be suitable for re-use as capping within landscaped areas subject to confirmatory chemical analyses. Services such as the possibly culverted drain may need to be diverted to facilitate construction and a CCTV and detailed service location survey is recommended in this respect. If in existence and once diverted, the redundant culvert should be either filled with grout or excavated, with the resulting excavations being backfilled with suitably compacted granular material. Following removal of topsoil, site formation levels should be covered with a protective layer of suitable granular fill as soon as practically possible to prevent softening effects from inclement weather, which could lead to site trafficability problems. In this respect, this could consist of the piling mat which would be designed to an appropriate thickness to support the piling plant. Construction near retained trees and importantly within the RPA should be undertaken with due regard to guidance provided in BS5837:2012 'Trees in relation to design, demolition and construction – recommendations'. It is not anticipated that significant earthworks, other than localised re-grading, will need to be undertaken in relation to the proposed development. Prior to any development commencing, further trial pit excavations are recommended along the line of the in-filled watercourse, particularly where this is located beneath proposed buildings.
New and Modified Slopes	Any re-grading and/or loading of exisiting slopes as a result of construction activities will need to ensure their stability in both short and long-term situations, taking account of local ground and groundwater conditions. In this respect, slopes with angles of about 1 vertical in 3 horizontal (i.e. about 18 degrees) should be stable in both short and long term conditions although this will need to be confirmed by further development specific site investigation. Should steeper slopes be necessary, more detailed slope stability analysis is recommended to determine the stability in the long and short term.

Foundations and Floor Slabs	Due to the locally high and very high plasticity of the Made Ground, ground improvement using vibro-stone columns are not considered to be an appropriate solution due to continued risks of the shrink and heave potential. Therefore, the new structure would need to be supported on a piled foundation solution, with piles being taken down through the Made Ground and granular Dollis Hill Gravel and into the underlying London Clay. Pile design should assume no side support (skin friction) for the pile sections surrounded by Made Ground or Alluvial Deposits associated with the historical drain. 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, the use of pre-cast or cast in-situ driven concrete piles may be considered suitable provided proposed pile locations were cleared of any obstructions. This option would have the advantage of minimising waste soil arisings although potential noise and vibration effects would need to be considered. Such environmental effects would be minimised by the use of a bored pile solution, although ensuring appropriate construction of such piles through potential saturated granular soils could render this option impractical and uneconomical. In consideration of the thickness of Made Ground and the potential high to very high shrinkage potential new floor slabs should be suspended.
Pavements	In consideration of the ground conditions it is recommended that new road pavement construction design should be based on a California Bearing Ratio value of no more than 2.5% in the Made Ground.
Concrete Classification	The typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-3 and AC-3 respectively.
Soakaways	In consideration of the thickness and mainly cohesive nature of the Made Ground and potential for perched groundwater, soakaways are not considered a feasible drainage option for the site, subject to confirmation by appropriate testing at drainage design stage.
Ground Gas	The site classifies as Characteristic Situation (CS) 1 – Very Low Gas Risk' in accordance with BS8485:2015, with no specific gas protection measures required. However concentrations of methane greater than 1% v/v have been recorded. It may therefore be prudent to adopt a precautionary approach at this stage and classify the site as Characteristic Gas Situation (CS) 2 – 'Low Gas Risk' in accordance with BS8485:2015. This would require new structures to incorporate ground gas protection measures to provide a score of 3.5 in accordance with Table 4 of BS8485:2015. One example of a combination of measures which could be used to achieve the required score would be: • Passive sub-floor dispersal and ventilation (by adoption of a suspended floor); • Gas resistant membranes (lapped and taped and taken over cavity walls) in the floor slab construction. • All joints penetrating the membrane to be sealed with a proprietary system. However, these recommendations will be subject to the completion of the ground gas monitoring and updated risk assessment and confirmation with the local Authority Building Control/Contaminated Land Officer prior to construction.
Contamination Assessment	Chemical analysis has indicated that the Made Ground contains sporadic elevated concentrations of lead and PAHs when compared against SL's for "Residential without homegrown produce". Also, asbestos fibres have been detected within 1no sample of Made Ground, namely BH2 at 0.30mbgl. It cannot be discounted that further unidentified ground contamination could be exposed during groundworks operations especially relating to asbestos fibres / ACMs. Where surfaced with buildings and hardstanding, there will be no mechanism for a direct contact pollution linkage. Therefore the risk to the end-user and to the general public will be

	negligible in such areas. Any enabling and ground works presenting a potentially risk to construction workers and the general public should be undertaken under a watching brief by an asbestos specialist with any ACM so encountered being segregated for removal to landfill. Such operations may also need to incorporate specific control measures such as dust suppression, perimeter air monitoring and appropriate Personal Protective Equipment (PPE). It is anticipated that the designated productive garden space for production of potential edible species would be formed within raised planters with uncontaminated imported Topsoil / subsoil of a minimum 600mm in thickness. In proposed soft play/ landscaped areas, it is recommended that Made Ground is capped with 300mm of clean cover. Such works, including confirmation of the clean cover thickness, will need to be subject of a site specific Remediation Strategy which will include procedures for appropriate validation. Notwithstanding the above, if/where significant changes to the proposed end use are anticipated, the GQRA would need to be re-assessed in-line with the most appropriate land use scenario.
Potable Water Supplies	The local water supply body will need to be consulted with regards the selection of suitable water supply pipe materials for the development. It cannot be discounted at this stage that specific materials and measures to protect the water supply from ground contamination would be required. This will need to be confirmed once the development proposals have been finalised.
Waste Soils Classification	For guidance and based on the current information, it is likely that the majority of Made Ground would be classified as Non-hazardous with natural deposits classified as Inert for landfill disposal. However, where excavated Made Ground, following inspection, is found to include significant Asbestos Containing Materials and/or fibres that cannot be segregated, it may classify as Hazardous, subject to further quantification testing. However, it is envisaged that the groundworks contractor, in consultation with the landfill operator, will need to undertake further classification testing of bulk waste soil in line with current guidance, so that it can be appropriately categorised for disposal purposes at a suitably licensed landfill.

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APPENDICES

1.0 INTRODUCTION

Appointment

1.1 WML Consulting was commissioned by Bluesky Design Services to undertake a Phase 2 Geo-environmental Investigation and Assessment of a site located within the existing Ashmole Academy in London, N14 5RS.

Proposed Development

1.2 It is understood that the current proposed development relates to the construction of a new school building with external hardstanding, soft landscaping and mixed use sports pitches.

1.3 A drawing indicating a preliminary layout by Bluesky Architects, (referenced 10065-04-P651, dated March 2016), is presented in Appendix 01.

Objective

1.4 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.

1.5 To achieve the objective, the following tasks were undertaken:

- Review existing report for the site and nearby area and design an appropriate Phase 2 Ground Investigation in accordance with the Environment Agency (2004) Model Procedures for the Management of Land Contamination, CLR11.
- Characterise the ground conditions in terms of geology, soil geotechnical parameters, mining and ground contamination from information provided by an appropriate Ground Investigation.
- Provide recommendations regarding suitable foundations, floor slabs and new pavement construction, together with any other geotechnical considerations that could affect possible future development.
- Determine a ground conceptual model for the site so as to undertake an appropriate Phase 2 Generic Quantitative Risk Assessment (GQRA).

Scope

1.6 A Phase 1 Desk Study has been undertaken by Soil Environmental Services Ltd (SES) and is presented in the following report:

- SES Contaminated Land Risk Assessment Phase 1 Desk Top Study (Reference SES/GMS/AA/1#1, dated January 2016).

1.7 This report includes the findings of an appropriate Phase 2 Ground Investigation designed on a review of the SES Phase 1 Report. For ease of reference, the findings of the SES Phase 1 Desk Study are summarised in the following sections, along with an updated Preliminary Conceptual Model (PCM). The two reports however are not exclusive and should be read in conjunction.

1.8 The ground investigation comprised the formation of 5no window sample probeholes and 3no cable percussive boreholes, undertaken in general accordance with BS5930:2015 Code of Practice for Ground Investigation.

1.9 The site investigation has also been undertaken in general accordance with BS10175:2011 and A1:2013, "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 has been undertaken in 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 A1:2013) relating to the anticipated nature of possible contamination sources and the intended end use.

1.11 The ground investigation has also been undertaken in general accordance with BS8576:2013, Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).

2.0 SITE LOCATION AND DESCRIPTION

Site Location

2.1 The site comprises land within the western section of the larger Ashmole Academy site, off Cecil Road in London. It is centred on approximate Ordnance Survey National Grid Reference 5291922E, 193977N with an indicative postcode of N14 5RS.

2.2 The proposed development site is bounded to the north and east by playing fields and the south-east and south by an area of woodland, all within the grounds of the existing Ashmole Academy. To the south-west and west the site is bounded by the residential properties of Summit Close and Summit Way respectively. To the north-west the site is bounded by residential properties with Arlington Road beyond.

2.3 A location plan is presented in Appendix 01.

Site Description

2.4 The site is roughly rectangular in shape and covers an area of approximately 1.0 Hectare.

2.5 The site occupies an area of land located within the western corner of the large Ashmole Academy site and is currently in use as a maintained grassed sports field.

2.6 It was noted during the site inspection on 14th April 2016 that the south-eastern, southern and south-western boundaries of the site are densely vegetated with low lying shrubs and mature deciduous trees of varying species.

2.7 An electricity sub-station is located immediately to the north-east of the site, adjacent to Summit Way.

2.8 Anecdotal information from the school caretaker indicated that historically the site was up-filled with waste soil arisings from the formation of the underground railway 100m south-east of the site, although the exact thicknesses was not known.

2.9 The site is accessed from Summit Way via a double gate at the western corner.

2.10 The main area of proposed development reduces in elevation by approximately 2.50m from around 68.95m Above Ordnance Datum (AOD) in the north-west to 65.75m AOD in the south-eastern section. The south-eastern and southern most sections of the site form the crest of fairly steep southern and south-easterly facing slopes. The base of the south-easterly facing slope is at approximately 61.50mAOD where a southerly flowing drain extends generally north to south. The south-westerly facing slope reduces in elevation to approximately 63.00mAOD to the boundary with Summit Close.

2.11 A topographical survey of the site has been undertaken by Indigo Surveys Ltd, referenced 24209-01. The survey drawing is presented in two sections in Appendix 01.

2.12 Surrounding land to the north-west and south-west is predominantly occupied by residential developments and associated hardstanding and soft landscaping. Surrounding land to the north-east and south-east is occupied by playing fields with the existing Ashmole Academy beyond.

2.13 Photographs of the site are presented in Appendix 02.

3.0 SUMMARY OF ENVIRONMENTAL AND HISTORICAL SETTING

3.1 The following paragraphs summarise the most relevant findings of the SES Phase 1 Desk Study report as referenced in Paragraph 1.6.

3.2 The BGS plans indicated that drift deposits are absent across the majority of the site although the northern and western edges of the site are underlain by the Dollis Hill Gravel Member. These generally comprise sand and gravel, locally with lenses of silt, clay or peat and organic material. The remaining areas of the site, and Superficial Deposits where present, is indicated to be underlain by the London Clay Formation, comprising predominantly clay but locally including silt and sand.

3.3 In consideration of the underlying geology and information within the SES report, the risks of shallow, unrecorded mine workings occurring beneath the site is considered low and can be discounted.

3.4 The property is not in a Radon Affected Area as defined by the Health Protection Agency as less than 1% of properties are above the Action Level of exposure. No radon protection measures are therefore necessary for new properties as described in publication BR211 by the Building Research Establishment.

3.5 The Superficial Dollis Hill Gravel Member inferred to exist beneath the north and west sections of the site is classified as a Secondary A Aquifer (former Minor Aquifer). The underlying London Clay bedrock is classified by the Environment Agency as Unproductive.

3.6 There is no Environment Agency Source Protection Zone within 250m of the site. There are no Groundwater Abstraction Licences within 1km of the site.

3.7 There are no recorded pollution incidents within 250m of the site.

3.8 There are no Detailed River Network Features within 250m of the site. The nearest is Pymme's Brook located 454m south-west. However, the historical records indicate a drain extends north-west to south-east across the central section of the site, which may have been diverted / culverted. An additional drain is located close to the eastern site boundary.

3.9 There are 2no historic landfills recorded within 500m of the site. The nearest of these relates to East Barnet Sewage Works, infilled with inert, commercial and household wastes, 455m west. The second relates to the Great Northern Cemetery, 488m south-west.

3.10 There are no potentially contaminative industrial sites within 125m of the subject site.

3.11 Historically, the site remained undeveloped and in rural / agricultural use until it was used as allotment gardens sometime prior to 1946. Historical plans show a drain to issue on the north-western site boundary and flow south-east across the site and to be flanked by trees. By the 1960s the site formed playing fields within the larger Ashmole School site.

3.12 The surrounding area historically comprised undeveloped rural / agricultural land with localised residential development. A number of ponds and gravel pits were present some 200m north and east of the site which had been infilled by 1914. The area immediately surrounding the site underwent extensive residential redevelopment during the 1930's and an underground railway line was constructed to the south-east. By the 1970's Ashmole School had been developed to the north-east of the site and a sub-station had been constructed immediately to the west.

4.0 PRELIMINARY CONTAMINATION RISK ASSESSMENT

4.1 The following paragraphs outline a Preliminary Risk Assessment (PRA) for the site as defined by DEFRA and the EA Model Procedures for the Management of Land Contamination, CLR11 (2004).

4.2 The table in Paragraph 4.5 provides a Preliminary Conceptual Model (PCM) which defines the site in terms of a potential pollution linkage, that is, whether a pathway exists between a contamination source and a sensitive environmental receptor (Source-Pathway-Receptor relationship).

4.3 The table considers whether a pollution linkage is potentially present or not and provides a preliminary qualitative assessment of risk, based on the information currently available and in accordance with guidance provided in the CIRIA document C552 (2001) Contaminated Land Risk Assessment – 'A Guide to Good Practice'. The risk evaluation process is described further in Appendix 07.

4.4 Where a possible linkage is identified, it does not necessarily mean that a significant risk exists, but indicates that further information is required through appropriate site investigation to substantiate the conceptual model.

Preliminary Conceptual Model

4.5 The PCM/PRA is based on the proposed development of a new school building with external hardstanding, soft landscaping and mixed use sports pitches.

Source	Pathway	Receptor	Likelihood of Linkage	Comment
The likelihood of significant ground contamination sources being present at the site due to its past use is considered low. As the electricity sub-station was constructed just prior to 1989, and is outside the development area, the presence of PCBs is considered unlikely and can be discounted. More localised sources of contamination could include hydrocarbons, pesticides and herbicides within areas of historical allotment gardens, although these are unlikely to be significant.	Direct contact, ingestion of soil, dermal contact, dust exposure pathways.	Current Site Users	Unlikely	The site is currently surfaced with soft landscaping, as such a potential direct contact pollution pathway could exist. However, due to the transient nature of the site use, no significant long-term pollution linkage is considered viable. Therefore the risk to current site users is considered **LOW**.
		Site End Users	Low	The provision of buildings and new hard cover will break the direct pollution linkage significantly, although residual risks of direct exposure will remain within areas of soft landscaping. However, the preliminary risk to site end users is considered **LOW**.
		Construction Workers	Unlikely	Construction workers could potentially be exposed to contaminated soils during earthworks and foundation construction, although the exposure time will be relatively short. Also, any perceived contamination risks will be mitigated by adopting good site working practices including appropriate Health and Safety measures during the works, thus providing a **LOW** preliminary risk.
		Adjacent land users	Unlikely	Contact via wind-blown dust/debris, particularly during the development phase is possible although the exposure time would be relatively short. The current risk is considered **LOW** although this would increase during construction works. Appropriate health and safety measures adopted during site development, including the controlled removal of any detected ACM, will

Source	Pathway	Receptor	Likelihood of Linkage	Comment
				ensure that the risk remains low.
The likelihood of soluble and/or liquid, and therefore mobile contaminants occurring at the site due to its past use is considered low. As the electricity sub-station was constructed just prior to 1989, and is outside the development area, the presence of PCBs is considered unlikely and can be discounted.	Direct downward migration through leaching and/or mobile liquids.	Groundwater	Unlikely	The site is indicated to be underlain by a Secondary A Superficial Aquifer although the underlying London Clay is classified as Unproductive. Therefore the perceived risk to groundwater is considered to be **LOW**, to be confirmed by site investigation.
	Off-site migration in groundwater or surface water flow.	Surface water	Unlikely	The nearest surface water feature is located some 50m east at a lower elevation to the site and may be in hydraulic continuity with groundwater beneath the site. A possible culverted drain could exist beneath the central section of the site. However, no significant sources of mobile contaminants are anticipated and therefore the preliminary perceived risk to surface water is considered **LOW**, to be confirmed by site investigation.
		Groundwater/ surface water abstractions	Unlikely	The site is not within an Environment Agency Source Protection Zone and the nearest surface / groundwater abstraction is sufficiently remote as not to be impacted by the site. Therefore, risks to groundwater/surface water abstractions are considered **LOW**.
		Adjacent Properties	Unlikely	No significant sources of mobile contaminants are anticipated to exist with no driver for significant lateral movement of contaminants. The preliminary perceived risk to adjacent properties is therefore assessed as **LOW**.
		Ecology	Unlikely	There are no Designated Environmentally Sensitive Sites within 500m of the subject site. Therefore risks to the surrounding ecology is considered **LOW.**
The likelihood of volatile contaminants occurring at the site due to its past use is considered low.	Inhalation of harmful vapours (indoor and outdoor airspaces)	Current Site Users	Unlikely	Significant sources of volatile contaminants at the site are not anticipated. Also, with site use being currently transient, no plausible long-term pollution linkage is anticipated. Therefore the preliminary perceived risk to current site users is assessed as **LOW**.
		Site End Users	Unlikely	Significant sources of volatile contaminants at the site are not anticipated. The preliminary risk from inhalation of indoor/outdoor air is considered **LOW**, to be confirmed by site investigation.
		Construction Workers	Unlikely	In the event of construction workers coming into contact with possible volatile compounds, the exposure time will be relatively short. The chronic exposure risk to construction workers, assuming that appropriate health and safety measures will be adopted, is therefore considered **LOW.**

Source	Pathway	Receptor	Likelihood of Linkage	Comment
		Adjacent Properties	Unlikely	Significant sources of volatile contaminants at the site are not anticipated. Therefore the preliminary perceived risk to adjacent properties and users is assessed as **LOW**.
There are no landfills within influencing distance of the site. However, several infilled gravel pits are located in the wider site area which could provide a source, albeit small, of hazardous ground gas. Risks from mine gas can be discounted. Made Ground from the historical up-filling works and Alluvial Deposits associated with the drain could pose a source of hazardous ground gas, although such are not considered likely to be a significant source.	Emissions from the ground beneath the site collecting in confined spaces and excavations	Construction/ services maintenance workers	Unlikely	The potential to generate significant volumes of toxic and/ or flammable/ explosive gas beneath the site is considered low. Assuming that appropriate health and safety measures will be adopted during construction, the preliminary risk is therefore considered **LOW.**
	Migration of gases on/off site and collecting in confined spaces on/off site.	Adjoining site users	Unlikely	The potential to generate significant volumes of ground gas beneath the site is considered low. Therefore, the potential risk to adjoining site users from on-site sources of ground gas are considered **LOW** subject to confirmation by an appropriate level of ground investigation and gas monitoring.
		Current/future site users	Low	Made Ground and any localised organic deposits could exist beneath the site, although the potential to generate significant volumes is considered low. Therefore, the potential risk to current and future site users is considered **LOW** although this will need to be confirmed by an appropriate level of ground investigation and monitoring.
The site is not in an area which is affected by naturally occurring radon gas.	Natural emissions from the ground collecting in confined spaces within buildings	Site end users	Unlikely	The site is not located in an area where radon protection measures are required. No further action is necessary regarding radon protection as the risk is **LOW**.
Chemicals which could prove aggressive to construction materials May be present on site.	Direct contact	Construction concrete, plastic water pipes.	Unlikely	Any risks to construction materials identified after site investigation and assessment will be mitigated as part of the structural design. The perceived risk is therefore considered **LOW**.

4.6 Under the proposed development scenario, potential pollution linkages are on the whole considered unlikely with associated preliminary risks being assessed as very low to low.

4.7 However, a precautionary approach is considered appropriate until such time as uncertainties in the conceptual model can be confirmed by ground investigation.

4.8 Such uncertainties related in the main to relatively low levels of contamination resulting from the site's historical use as allotment gardens and the potential for the presence of ground gas associated with any in-filling of the surrounding land.

4.9 In consideration of historical information the site was indicated to have been used as allotment gardens between 1946 and 1960 during which time it is considered that pesticides and herbicides were potentially in use. However, as the allotment gardens were in use by the general public and not on an agricultural / industrial scale, the use of such potential contaminants of concern would have been limited and localised in nature.

4.10 Nevertheless, the last recorded use of the site as allotment gardens was approximately 55 years ago and although the half-life of some of the more persistent substances can range between 15 and 30 years, it is considered that these would have sufficiently degraded within site soils to not be considered a significant risk.

4.11 In consideration of the age and location of the electricity substation, the potential presence of PCB's in near surface soils is considered unlikely and can be discounted.

5.0 SITE INVESTIGATION

Rationale

5.1 Intrusive investigations were undertaken primarily to provide geotechnical parameters for structural design purposes but also to verify the preliminary site conceptual model and confirm the anticipated low environmental risk.

5.2 Window sample probeholes (WS1 to WS3, WS5 and WS7) were undertaken to provide information on near surface deposits and to provide samples for chemical analysis, while minimising disruption of the existing site surfaces. WS4 and WS6 were not undertaken.

5.3 Cable tool percussion boreholes were undertaken to provide information on soil strength at greater depths and to determine the potential thickness of infill within the area of the infilled drain.

5.4 A general coverage of the site was considered appropriate primarily to provide parameters for foundation design. The investigation locations were also chosen so as not to impact on the existing sports pitches within the development boundaries.

5.5 Gas monitoring standpipes were installed in selected boreholes beneath the proposed building footprint for the measurement of ground gas and groundwater levels.

5.6 As no specific historical contaminative use was identified from the Conceptual Site Model, chemical analysis of a general suite of contaminants was undertaken on selected samples of soil. This was to confirm the anticipated low contamination risk and to establish the chemical suitability of soils for possible re-use within the development.

Intrusive Works

5.7 Ground Investigation work was undertaken by Geo-Ventures (UK) Ltd between 4th and 5th May 2016. This comprised the formation of 5no window sample probeholes to a maximum depth of 2.50 metres below ground level (mbgl) and 3no cable tool percussion boreholes to a maximum depth of 10.45mbgl.

5.8 The exploratory hole records are presented in Appendix 02 of this report whilst the exploratory hole locations are shown on sketch Drawing 7165G-SK-01 in Appendix 01.

Monitoring Standpipe

5.9 Monitoring wells for groundwater and ground gas measurements were installed in the 3no boreholes as indicated on the logs presented in Appendix 03.

Geotechnical and Chemical Testing

5.10 In-situ geotechnical testing was undertaken at regular intervals during the formation of the probeholes and boreholes in the form of Standard Penetration Tests (SPTs). The results for this testing are presented on the descriptive logs in Appendix 03.

5.11 Geotechnical soils testing was undertaken on selected samples for the following:

- Natural Moisture Content.
- Liquid and Plastic Limit.

5.12 The results of the geotechnical testing are presented in Appendix 04.

5.13 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 Polyaromatic Hydrocarbons (PAH).
- Asbestos Screen and Identification.
- 2:1 water/soil sulphate extract, pH.

5.14 The results of the chemical analysis are presented in Appendix 05.

Gas and Groundwater Monitoring

5.15 Gas and groundwater monitoring has been carried out on two occasions, to date, on 11th May and 19th May 2016.

5.16 The monitoring results to date are presented in Appendix 06.

6.0 GROUND CONDITIONS

Stratigraphy

6.1 Ground conditions encountered during the intrusive investigation generally confirm those identified in the published literature and in summary comprise Made Ground, underlain by cohesive London Clay to a maximum proven depth of 10.45mbgl. However, in the southern section of the site (namely BH3) the Made Ground was underlain by granular Superficial Deposits of Dollis Hill Gravel to a depth of 4.10mbgl where London Clay was encountered.

Made Ground

6.2 Made Ground was encountered within all exploratory holes from ground level to depths of between 2.60m and 4.80mbgl. The greatest thicknesses as encountered within BH1 and BH3 are considered to represent the line of the infilled drain.

6.3 The Made Ground generally comprised a surface horizon of topsoil to depths of between 0.20m and 0.30mbgl underlain by brown gravelly clay and brown variably sandy, clayey gravel. Gravel sized particles included brick, ash and locally slag and clinker.

6.4 The Window sample holes all terminated within the Made Ground at depths varying between 0.70m and 2.50mbgl due to the localised density of the strata.

6.5 SPT 'N' values of between 4 and in excess of 50 were recorded in the Made Ground. Due to the discrepancies between the values in the Window sample holes and the cable percussive holes, the higher values are not considered to be fully representative of the competence of the deposits and more likely associated with gravel and cobble sized fragments.

6.6 Natural moisture contents of 17% and 31% are recorded within the Made Ground with Liquid Limits of 44% and 72% together with corresponding Plasticity Indices of 23% and 42% (modified to 15% and 42%) indicating clay of intermediate to very high plasticity and low to high volume change potential.

Dollis Hill Gravel

6.7 Within BH3 the Made Ground was underlain by strata considered to represent Superficial Deposits of the Dollis Hill Gravel at a depth of 2.60mbgl and extending to a maximum depth of 4.10mbgl.

6.8 The stratum generally comprised yellow and grey, very clayey sand and gravel. Gravel sized particles are described as fine to medium and subrounded and presumed to be of mixed lithologies.

6.9 A single SPT 'N' value of 19 was recorded in the Dollis Hill Gravel Member indicating a medium dense state of compaction.

London Clay

6.10 Within BH1, BH2 and BH3 the Made Ground and / or Dollis Hill Gravel were underlain by London Clay at depths varying between 4.10m and 4.80mbgl and extending to a maximum proven depth of 10.45mbgl.

6.11 The London Clay generally comprised stiff, brown clay.

6.12 SPT 'N' values in the London Clay range between 14 and 22 indicating a locally firm but generally stiff consistency.

Visual/Olfactory Evidence of Contamination

6.13 No visual and/or olfactory evidence of significant ground contamination was identified within the exploratory holes during the investigation.

Groundwater

6.14 Groundwater was not encountered within any exploratory holes during their formation.

6.15 During the initial monitoring visits perched groundwater was recorded within BH1, BH2 and BH3 at depths of between 1.50m and 4.20mbgl.

6.16 It should be appreciated that the groundwater monitoring described above has 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

6.17 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.

7.0 GEOTECHNICAL APPRAISAL

Site Preparation and Earthworks

7.1 Site clearance will include the removal of all vegetation which should be undertaken in consultation with an ecological specialist.

7.2 It is anticipated that site-won Topsoil will be suitable for re-use as capping within landscaped areas subject to confirmatory chemical analyses.

7.3 Residual buried structures in the form of foundations are not anticipated. However, if any buried obstructions were to be encountered, these will need to be removed so that they do not form ground obstructions during proposed construction works. Consideration should be given to crushing and re-using such materials as bulk fill to resulting hollows, subject to suitability and compliance testing.

7.4 Services such as the possibly culverted drain may need to be diverted to facilitate construction and a CCTV and detailed service location survey is recommended in this respect. If in existence and once diverted, the redundant culvert should be either filled with grout or excavated, with the resulting excavations being backfilled with suitably compacted granular material.

7.5 Following removal of topsoil, site formation levels should be covered with a protective layer of suitable granular fill as soon as practically possible to prevent softening effects from inclement weather, which could lead to site trafficability problems. In this respect, this could consist of the piling mat which would be designed to an appropriate thickness to support the piling plant.

7.6 It is assumed that the current development configuration has been outlined in consideration of retained trees adjoining the site boundary with specific consideration of Root Protection Areas (RPA) as would need to be determined by the landscape architect.

7.7 Notwithstanding this, construction near retained trees and importantly within the RPA should be undertaken with due regard to guidance provided in BS5837:2012 'Trees in relation to design, demolition and construction – recommendations'.

7.8 It is not anticipated that significant earthworks, other than localised re-grading, will need to be undertaken in relation to the proposed development.

Slopes and Retaining Walls

7.9 Changes in elevation between the site and land to the south and south-west are currently accommodated by steep grassed and vegetated slopes.

7.10 Any re-grading and/or loading of these slopes as a result of construction activities will need to ensure their stability in both short and long-term situations, taking account of local ground and groundwater conditions. In this respect, slopes with angles of no more than 1 vertical in 3 horizontal (i.e. about 18 degrees) should be stable in both short and long term conditions although this will need to be confirmed by further development specific site investigation.

7.11 Should steeper slopes be necessary, more detailed slope stability analysis is recommended to determine the stability in the long and short term.

7.12 Any new retaining structures required for redevelopment at the site should be appropriately designed and constructed, with due consideration to ground and groundwater conditions and to stability in both the short and long term conditions.

Foundations

7.13 Made Ground, which extends to depths of between 2.60m and 4.80mbgl is considered unsuitable for the direct support of structural loads from new buildings as it is variable in nature and locally loosely compacted, resulting in the potential for unacceptable total and differential settlements.

7.14 The depths to the shallowest competent bearing stratum are such that the use of traditional shallow spread foundations may be rendered impractical and uneconomical due to the need for substantial support and possible dewatering measures.

7.15 Due to the locally high and very high plasticity of the clayey Made Ground, ground improvement using vibro-stone columns, is not considered to be an appropriate solution, as the ground could still be subject to the continued risk of shrink and heave effects, especially within close proximity to the trees.

7.16 Therefore, the new structure may need to be supported on a piled foundation solution, with piles being taken down through the Made Ground and granular Dollis Hill Gravel and into the underlying London Clay.

7.17 Pile design should assume no side support (skin friction) for the pile sections surrounded by Made Ground or Alluvial Deposits associated with the former drain. 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.

7.18 However, for preliminary considerations, the use of pre-cast or cast in-situ driven concrete piles may be considered suitable. This option would have the advantage of minimising waste soil arisings although potential noise and vibration effects would need to be considered.

7.19 Such environmental effects would be minimised by the use of a bored pile solution, although ensuring appropriate construction of such piles through potential saturated granular soils could render this option impractical and uneconomical.

Floor Slabs

7.20 In consideration of the thickness of Made Ground and the potential high to very high shrinkage potential, new floor slabs should be suspended.

Excavations and Groundwater

7.21 Excavations at the site should be feasible using an appropriate scale of hydraulic plant. All excavations at the site will require adequate lateral support, or battering back to a safe angle, to ensure their stability.

7.22 An allowance should be made for encountering locally saturated granular strata which may cause stability issues, particularly where excavations are kept open for any appreciable time. Excavations will therefore need to be appropriately supported due to the locally granular nature of the Made Ground.

Pavement Design

7.23 In consideration of the ground conditions and the locally very high plasticity recorded within the Made Ground, it is recommended that new road pavement construction design should be based on a California Bearing Ratio value of no more than 2.5% in Made Ground.

7.24 The CBR would 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.

Concrete Design

7.25 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.

7.26 The London Clay is also considered to have the potential to contain pyrite.

7.27 Values of 2:1 water/soil extract for sulphate range from less than 100mg/l to 600mg/l. Values of pH range from 6.4 to 8.0 with the average of the lowest 20% being 6.9.

7.28 Values of Total Sulphate range between 0.01% and 0.40% across foundation depths, with the Total Potential Sulphate ranging between 0.03% and 1.2% providing a characteristic TPS value of 1.1%.

7.29 On the basis of these results, the typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site is DS-3 and AC-3 respectively.

Drainage and Soakaways

7.30 In consideration of the thickness and mainly cohesive nature of the Made Ground and potential for perched groundwater, soakaways are not considered a feasible drainage option for the site, subject to confirmation by appropriate testing at drainage design stage.

8.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

General

8.1 A review of the desk study information has concluded that, due to the absence of historic contaminative land use, the potential for a significant pollution linkage to be present at the site is low with corresponding low risk to human health and the environment.

8.2 Furthermore, no visual or olfactory evidence of significant ground contamination has been recorded from the intrusive investigations.

8.3 Notwithstanding this, it has been considered prudent to adopt a precautionary principal and undertake chemical analysis of the sub-surface soils to establish in more detail the human health risk status of the site.

Human Health

8.4 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 CLR11, Model Procedures for the Management of Land Contamination, 2004.GQRA).

8.5 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.

8.6 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.

8.7 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.

8.8 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.

8.9 More recently, LQM/CIEH have published a revised 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.

8.10 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).

8.11 In light of the proposed end use which does not specifically classify within any of the above categories, adoption of screening levels for "Residential without homegrown produce" are considered appropriate as a conservative initial approach in this assessment.

8.12 A table of relevant Screening Levels protective of human health is provided in Appendix 07.

Soil Test Results

8.13 9no samples of Made Ground were analysed for a suite of Metals, Semi-Metals and PAH's. The majority of concentrations measured were below the stringent SL's for "Residential without homegrown produce" end-use with the following exceptions:

Contaminant	Number of Samples Exceeding SL	SL (mg/kg)	Recorded Concentrations (mg/kg)	Strata
Lead	4	310	360 to 640	Made Ground
Benzo(a)anthracene	1	11	32	
Benzo(a)pyrene	4	3.2	3.8 and 23	
Benzo(b)fluoranthene	4	3.9	6.4 and 43	
Dibenzo(ah)anthracene	4	0.31	0.40 and 2.40	

8.14 1no sample of Made Ground was also found to contain Chrysotile (White) Asbestos fibres, namely BH2 at 0.30mbgl.

Conclusions

8.15 Chemical analysis has indicated that the Made Ground contains sporadic elevated concentrations of lead when compared against SL's for "Residential without homegrown produce". Also, sporadic concentrations of PAH's in 4no samples of Made Ground exceed the SL's within the central and north-eastern sections of the site.

8.16 Also, asbestos fibres have been detected within 1no sample of Made Ground, namely BH2 at 0.30mbgl.

8.17 In consideration of the inhomogeneous nature of Made Ground, it cannot be discounted that other contaminants, including Asbestos Containing Materials (ACM) and fibres could be present in other areas of the site.

8.18 However, where surfaced with buildings and hardstanding, there will be no mechanism for a direct contact pollution linkage. Therefore the risk to the end-user and to the general public will be negligible in such areas.

8.19 However, asbestos fibres could become airborne during site enabling and ground works thus presenting a potentially significant risk to construction workers and the general public, particularly during dry weather conditions.

8.20 Such operations should therefore be undertaken under a watching brief by an asbestos specialist with any ACM so encountered being segregated for removal to landfill. Such operations may also need to incorporate specific control measures such as dust suppression, perimeter air monitoring and appropriate Personal Protective Equipment (PPE).

8.21 The nature of the contaminants encountered is such that they are not considered to be volatile and hence be a potential risk to human health through inhalation of indoor or outdoor air. No specific requirements are therefore recommended in this respect.

8.22 It cannot be discounted that further unidentified ground contamination could be exposed during groundworks operations especially relating to asbestos fibres / ACMs.

8.23 It is anticipated that the designated productive garden space for production of potential edible species would be formed within raised planters with uncontaminated imported Topsoil / subsoil of a minimum 600mm in thickness.

8.24 As a direct contact pollution linkage is also plausible in proposed soft play/ landscaped areas, 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 300mm clean cover over the existing Made Ground.

8.25 Such works, including confirmation of the clean cover thickness, will need to be subject of a site specific Remediation Strategy which will include procedures for appropriate validation.

8.26 It is therefore recommended that a 'watching brief' is undertaken by an environmental specialist, who will advise on any suitable remediation measures during the site enabling works and will liaise with the local authority at the appropriate time to gain approval of the remedial works validation.

8.27 Notwithstanding the above, if/where significant changes to the proposed end use are anticipated, the GQRA would need to be re-assessed in-line with the most appropriate land use scenario.

9.0 GROUND GAS RISK ASSESSMENT

Methodology

9.1 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:

- Guidance on Investigations For Ground Gas - Permanent Gases and Volatile Organic Compounds (VOCs) British Standard Institution (BS8576: 2013);
- Code of practice for the Characterisation and remediation from Ground Gas in Affected Developments. British Standard Institution (BS 8485: 2015); and
- Assessing Risks posed by Hazardous Ground Gases to Buildings CIRIA (C665, 2007).

9.2 The assessment presented herein is primarily based on the BS8485 document.

9.3 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.

9.4 Based on the measured flow rates and hazardous gas concentrations, individual "hazardous gas flow rates" (Qhg) can be derived for each monitoring point, from which the "site characteristic hazardous gas flow rate" (Qhgs), and then the "Characteristic Situation" (CS) can be determined.

9.5 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

9.6 The proposed development therefore is indicated to comprise the construction of Type B buildings which include managed private or commercial / public properties with small to medium rooms.

Ground Gas Conceptual Model

9.7 The site is not in an area recorded as being affected by naturally occurring radon gas.

9.8 The site is not within influencing distance of any operational, non-operational or historical landfills.

9.9 However, the site is indicated to have historically been up-filled, including the line of a former drain. A number of ponds and gravel pits were present on historical plans some 200m north and east of the site which appeared to have been infilled by 1914.

9.10 The underlying geology does not include shallow coal seams which could have the potential to release hazardous ground gas.

9.11 No deposits of organic / degradable soils were encountered during the site investigation.

9.12 In consideration of the above, the preliminary risk to the development from ground gas has been assessed as low. However, it has been considered prudent to undertake ground gas monitoring, primarily for methane and carbon dioxide, with associated flow rates, on 2no occasions to date, on 11th May and 19th May 2016.

Results and Recommendations

9.13 The results to date indicate concentrations of methane ranging from below detectable limits to 4.2% by volume in air (v/v) with carbon dioxide concentrations generally ranging from 1.5% to 2.0% v/v. No detectable ground gas flows have been recorded during the initial monitoring visits.

9.14 The results give a maximum composite Qhg value of <0.0042l/hr and indicate the site to classify as Characteristic Situation (CS) 1 – Very Low Gas Risk' in accordance with BS8485:2015, with no specific gas protection measures required.

9.15 However concentrations of methane greater than 1% v/v have been recorded. It may therefore be prudent to adopt a precautionary approach at this stage and classify the site as Characteristic Gas Situation (CS) 2 – 'Low Gas Risk' in accordance with BS8485:2015. This would require new structures to incorporate ground gas protection measures to provide a score of 3.5 in accordance with Table 4 of BS8485:2015.

9.16 One example of a combination of measures which could be used to achieve the required score would be:

- Passive sub-floor dispersal and ventilation (for example by adoption of a suspended floor);
- Gas resistant membranes (lapped and taped and taken over cavity walls) in the floor slab construction;
- All joints penetrating the membrane to be sealed with a proprietary system.

9.17 However, these recommendations will be subject to the completion of the ground gas monitoring and updated risk assessment and confirmation with the local Authority Building Control/Contaminated Land Officer prior to construction.

10.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS

Excavated Soils

10.1 Groundworks undertaken during the development will produce excavated soil which will require appropriate site management. Principally, and in line with the sustainable development agenda, any soils arising from site excavations should firstly be considered for re-use where possible by incorporation into the development.

10.2 Waste arisings comprising uncontaminated natural soil would be suitable, subject to confirmatory analysis, for re-use as bulk fill or as sub-soil within any planned garden and soft play areas.

10.3 Where soils are surplus to requirements, they will need to be removed from site through appropriate waste management.

10.4 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.

10.5 For guidance and based on the current information, it is likely that the majority of Made Ground would be classified as Non-hazardous with natural deposits classified as Inert for landfill disposal.

10.6 However, where excavated Made Ground, following inspection, is found to include significant Asbestos Containing Materials and/or fibres that cannot be segregated, it may classify as Hazardous, subject to further quantification testing.

10.7 However, it is envisaged that the groundworks contractor, in consultation with the landfill operator, will need to undertake further classification testing of bulk waste soil in line with current guidance, so that it can be appropriately categorised for disposal purposes at a suitably licensed landfill.

Imported Fill

10.8 Imported fill will be subject to specific quality requirements. Allowance should be made for testing imported fill materials prior to emplacement to ensure suitability.

Water Supply Pipes

10.9 The local water supply body will need to be consulted with regards the selection of suitable water supply pipe materials for the development.

10.10 It cannot be discounted at this stage that specific materials and measures to protect the water supply from ground contamination would be required. This will need to be confirmed once the development proposals have been finalised.

APPENDIX 01

Drawings

RESIDUAL RISK REGISTER

Refer to bluesky architects hazard identification sheets in addition to the hazards/risks normally associated with the type of works indicated on this drawing. Note the following;

1. ??.
2. ??.

ARLINGTON ROAD

SUMMIT WAY

ADULT FOOTBALL 100.6x64m

TECH AREA

TECH AREA

Pond

Productive Gardens space
Space to be developed by school

Fire tender access route

18no.+ PTW Parking

Service Access

Key
2m High – Weld mesh fence
1.2m high – Timber fence to form barrier protection from Japanese Knotweed.

Existing grass

Hard Social

Proposed School Building

Hard games courts PE

1 Court MUGA

Habitat space

Existing Trees

Soft Social

Secure Reception Play

Arrival Plaza

Drop off area

Existing trees

Existing tree

New gates & weld mesh fence

Pedestrian access/Parent drop off

rev date drawn by comments

client
Ashmole Academy / EFA

project
Ashmole Primary School

drawing
Pitch Layouts Adjacent Proposed Site

drawing number
10065-04-P651

scale
1:500

revision

drawn by

date
March 2016

cad reference

bluesky architects

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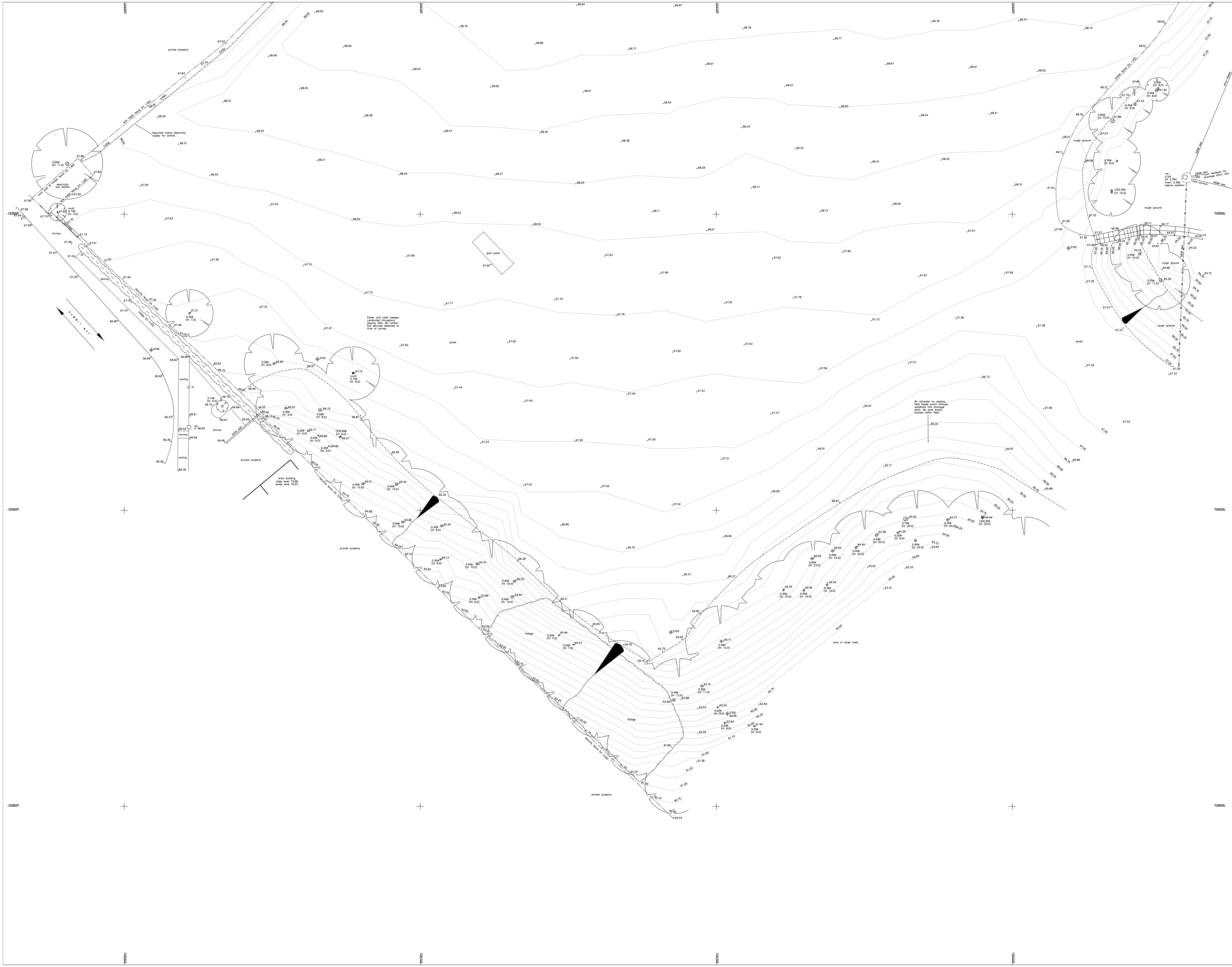

NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

GRID COORDINATES ARE ORDNANCE SURVEY NATIONAL GRID DERIVED FROM GPS TRANSFORMATION. GPS COORDINATES AND LEVELS SET AT ST01 (NO SCALE FACTOR APPLIED)

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:200

SERVICE COVERS INDICATED WHERE VISIBLE. PIPE INVERTS / DETAILS SURVEYED FROM SURFACE INSPECTION ONLY. GENERALLY DAMAGED COVERS AND COVERS WITHIN HIGHWAYS WILL NOT BE LIFTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

OVERHEAD CABLES ARE INDICATED USING REMOTE SURVEY METHODS AND ARE SUBJECT TO SEASONAL VARIATION, AND SHOULD BE TREATED AS APPROXIMATE.

SERVICE COVERS LOCATED UNDER PARKED VEHICLES/MOBILE STRUCTURES MAYBE OMITTED.

BURIED SERVICE COVERS WILL NOT BE INDICATED.

TOPOGRAPHICAL SURVEY/UTILITY KEY :-

- (ht) – height
- ø – diameter
- ● – pea trap
- a/g – above ground
- a/r – assumed route
- av – air valve
- bb – belisha beacon
- bd – back drop
- boll – bollard
- bos – bottom of shaft
- bt – telecom
- c/b fence – closeboard fence
- c/box – control box
- catv – cable television
- cl – cover level
- con – conifer
- cr – cable riser
- cwc – combined water sewer
- d/chan – drainage channel
- dp – depth
- ejb – electric junction box
- elec – electric
- eot – end of trace
- ep – electric pole
- er – earth rod
- f/bed – flower bed
- fh – fire hydrant
- fl – floor level
- fs – fire switch
- fwc – foul water chamber
- fws – foul water sewer
- g – gully
- g/run – gully run
- gr – gas riser
- h/chestnut – horse chestnut
- h/thorn – hawthorn
- ic – inspection cover
- il – invert level
- ill – illuminated
- int – interceptor
- lp – lamp post
- mh – manhole cover
- mkr – marker
- o/h – over head
- ol – off let
- osa – off survey area
- OSBM – ordnance survey bench mark
- p & r fence – post & rail fence
- pd – pit depth
- ptg – pipe to ground
- re – rodding eye
- ret wall – retaining wall
- rs – road sign
- rwp – rain water pipe
- s/birch – silver birch
- s/p – safety paving
- sap – sapling
- sec fence – security fence
- sfc – soil filled chamber
- sl – spot light
- sp – soil pipe
- st – stop tap
- sv – stop valve
- svp – soil vent pipe
- sws – storm water sewer
- TBM – temporary bench mark
- tfr – taken from records
- tl – threshold level
- toc – top of cap
- top – top of pipe
- tot – top of tank
- tp – telecom pole
- ts – traffic signal
- t/s – to surface
- u/s – underside
- utl – unable to lift
- utr – unable to rod
- uts – unable to survey
- utt – unable to trace
- vp – vent pipe
- wfc – water filled chamber
- wl – water level
- wm – water meter
- wp – waste pipe
- wr – water riser

SURVEY CONTROL :-

STATION	EASTINGS	NORTHINGS	LEVEL
ST01	529183.591	194070.093	71.196
ST02	529209.481	193944.272	67.413
ST03	529142.332	193879.407	65.780
ST04	529082.637	193925.527	67.041
ST05	529151.870	193865.649	62.845
ST06	529054.562	193927.072	66.863

INDICATIVE NORTH

UTILITY SURVEY KEY :-

- HATCHED AREA
- BOREHOLE
- CPT
- TRIAL PIT
- HAND PIT
- WINDOW SAMPLE

- W — W — WATER PIPE
- FOUL SEWER
- STORM SEWER
- COMBINED SEWER
- D — D — DUCTS
- TV — TV — CABLE TELEVISION
- COM — COM — DATA CABLE
- TELECOM CABLE
- G — G — GAS PIPE
- U — U — UNIDENTIFIED SERVICE
- OTHER
- CCTV — CCTV — CCTV
- TL — TL — TRAFFIC LIGHT
- O — O — OFFSET FILL
- V — V — VENT
- F — F — FUEL PIPE
- GL — GL — GAUGE LINES
- P — P — PIPE
- AR — AR — ASSUMED ROUTE
- TFR — TFR — TAKEN FROM RECORDS
- ELECTRIC CABLE

DISCLAIMER :-

Electromagnetic techniques have been used in the location of underground services. The results are not infallible and trial excavations should be carried out to confirm service identification, positions and particularly depths, where these are critical. The completeness of the underground services information cannot be guaranteed.

This method of survey does not differentiate between live and dead services, and as such all services should be treated as live. This drawing may not include the location of all public services that may cross the site, therefore the relevant service drawings should be obtained from the appropriate utility company and used in conjunction with this drawing.

Private service pipes and cables in highways are not shown, but there presence should be anticipated.

Additional below ground structures or obstructions not shown on this drawing may be present. Reference should be made to historical plans and as-built drawings. Excavations in the vicinity of services should be carried out with due diligence ref: HSG47 document avoiding dangers from underground services

Please note that factors such as ground conditions, proximity of other utilities, material and method of construction have an influence on the quality of the data collected on site.

TSA Standards – "Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate."

UTILITY NOTES

UNABLE TO ROD SEWER PIPES POSITIONED UNDER THE PORTAKABINS. ROUTES ARE ASSUMED ONLY. POOR VISIBILITY FROM SURFACE INSPECTION FOR INTERCEPTOR. POSSIBLE ADDTIONAL INCOMING PIPES. ALL RAIN WATER ON PLAYING FIELDS HEADS SOUTH THROUGH WOODLAND INTO DRAINAGE DITCH. NO EVIDENCE OF LAND DRAINS WITHIN PLAYING FIELD.

ASSUMED COMMS CONNECTION BETWEEN PORTAKABINS LOCATED WHILST BEING DIRECTLY CLAMPED TO BUILDING ELECTRIC SUPPLIES.

ELECTRICITY CABLE RUNNING ADJACENT TO THE SCHOOL BOUNDARY FENCE TO THE WEST IS ASSUMED TO BE THE SCHOOLS MAIN INCOMING ELECTRICITY SUPPLY. VOLTAGE UNKNOWN.

POWER AND RADIO SWEEPS CONDUCTED THROUGHOUT PLAYING FIELDS. NO FURTHER LIVE SERVICES DETECTED AT TIME OF SURVEY.

0 2 4 8 12 16 20

Indigo Surveys Ltd

Client	D FEEHAN
Project	CECIL ROAD, LONDON, N14 5RJ
Title	TOPOGRAPHICAL AND UTILITY SURVEY
Date	JANUARY 2016
Scale	1:200@A0
Dwg No	24209 / 1
Surveyor	N.B/M.R
Checked	T.W.G/A.H.

Revisions

GENERAL NOTES

1. DO NOT SCALE FROM THIS DRAWING WORK TO FIGURED DIMENSIONS ONLY.
2. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS ALLOWED WITHOUT PRIOR PERMISSION IN WRITING.
3. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
4. THE CONTRACTOR SHALL INCORPORATE ALL THE REQUIREMENTS OF THE PRE-TENDER STAGE HEALTH & SAFETY PLAN.

KEY

- SITE BOUNDARY
- POSSIBLE INFILLED DRAIN (ASSUMED ROUTE FROM BASED ON HISTORICAL PLANS)
- BH1 — CABLE PERCUSSIVE BOREHOLE LOCATION
- WS1 — WINDOW SAMPLE LOCATION
- BH2 — CHRYSOTILE ASBESTOS FIBRES ENCOUNTERED IN THE MADE GROUND AT 0.30MBGL

Rev.	Amendment	Date	By	Chkd
P1	FIRST PRELIMINARY ISSUE.	FEB '14	OC	SS

Project
ASHMOLE ACADEMY

Client
BLUESKY DESIGN SERVICES

Title
EXPLORATORY HOLE LOCATION PLAN

Drawn	Checked	Date	Scale
SS	PD	10-06-16	1:200@A0

WML CONSULTING
Chartered Civil and Structural Engineers
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Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire SK8 6QL
Tel 0161 482 0600
Fax 0161 486 9210
e-mail info@wmlconsulting.com
www.wmlconsulting.com

Job No. 7165G | Drawing No. SK-01

APPENDIX 02

Photographs

Photograph 1
Site access form Summit Way adjacent to the electricity sub-station.

Photograph 2
View south-east along Summit Way.

Photograph 3
View north-west towards the access gate on Summit Way.

Photograph 4
South-western section of the site with the slope to Summit Close evident.

Photograph 5
View across sports pitches from the northern area of the site.

Photograph 6
View across sports pitches from the northern area of the site.

Photograph 7
Drain outfall to the south of the site at the base of the slope.

Photograph 8
The vegetated slope at the southern apex of the site.

Photograph 9
View across vegetated slope.

Photograph 10
View north-east towards existing school within the central section of the site.

Photograph 11
View north-east towards existing school along northern site boundary.

Photograph 12
Northern site boundary to the rear of Arlington Road.

APPENDIX 03

Exploratory Hole Records

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Number
Ashmole Academy	WS1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler				16-1376
	Location	**Dates** 05/05/2016	**Engineer** Wright Mottershaw Lydon Consulting Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.20) 0.20	Black clayey TOPSOIL with rootlets		
0.30	D				(0.60)	MADE GROUND : firm / stiff black soil / clay fill with occasional ash and pieces of broken brick		
0.60	D				0.80	MADE GROUND : very dense black sand, clay, ash, gravel and pieces of broken brick fill		
1.00-1.37	SPT(C) 59/220		12,16/16,18,25		(1.00)			
1.00-1.45	D							
1.50	D				1.80	Complete at 1.80m		

Remarks
No penetration on sampler barrel at 1.80m
Services inspection pit excavated by hand to 1.00m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Number
Ashmole Academy	WS2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler				16-1376
	Location	**Dates** 05/05/2016	**Engineer** Wright Mottershaw Lydon Consulting Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.20) 0.20	Brown TOPSOIL		
0.60	D				(0.70)	MADE GROUND : brown gravelly soil / clay fill and pieces of broken brick		
1.00-1.45 1.00-1.45	SPT(C) N=41 D		8,8/10,10,10,11		0.90	MADE GROUND : dense grey / yellow sand, clay, ash, slag, cinder and pieces of broken brick fill		
1.50	D				(1.60)			
2.00-2.45 2.00-2.45	SPT(C) N=78 D		11,12/18,20,20,20		2.50	Complete at 2.50m		

Remarks
Services inspection pit excavated by hand to 1.00m
No penetration on sampler barrel at 2.50m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Number
Ashmole Academy	WS3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler				16-1376
	Location	**Dates** 05/05/2016	**Engineer** Wright Mottershaw Lydon Consulting Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.20) 0.20	Black clayey TOPSOIL with rootlets		
0.30	D					MADE GROUND : dense / very dense black clay, soil, ash, cinder fill and pieces of broken brick		
1.00-1.45	SPT(C) N=60		8,22/11,11,11,11,27		(1.10)			
1.00-1.45	D							
1.20	D				1.30	Complete at 1.50m		

Remarks
No penetration on sampler barrel at 1.30m
Services inspection pit excavated by hand to 1.00m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Number
Ashmole Academy	WS5

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler				16-1376
	Location	**Dates** 05/05/2016	**Engineer** Wright Mottershaw Lydon Consulting Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.20)	Black clayey TOPSOIL with rootlets		
0.30	D				0.20 (0.20)	MADE GROUND : firm / stiff black gravelly soil / clay fill and fragments of broken brick		
0.70	D				0.40 (0.50)	MADE GROUND : firm brown clay fill with fragments and pieces of broken brick		
1.00-1.45	SPT(C) N=51		4,6/10,12,13,16		0.90	MADE GROUND : dense / very dense black clayey gravel, ash and cinder fill with fragments of broken brick		
1.00-1.45	D				(1.60)			
2.00-2.45	SPT(C) N=63		10,8/15,15,16,17					
2.00-2.45	D				2.50	Complete at 2.50m		

Remarks
Services inspection pit excavated by hand to 1.00m
No penetration on sampler barrel at 2.50m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Number
Ashmole Academy	WS7

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler				16-1376

Location	Dates	Engineer	Sheet
	05/05/2016	Wright Mottershaw Lydon Consulting Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.20) 0.20	Black clayey TOPSOIL with rootlets		
0.30	D				(0.50)	MADE GROUND : firm / stiff yellow / brown clay fill with pieces of broken brick and gravel		
0.60	D				0.70	Complete at 1.60m		
1.00-1.45	SPT(C) N=87		4,8/17,20,25,25					
1.00-1.45	D							
1.50	D							

Remarks
No penetration on sampler barrel at 1.60m
Services inspection pit excavated by hand to 1.00m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m			16-1376

Location	Dates	Engineer	Sheet
	04/05/2016-05/05/2016	Wright Mottershaw Lydon Consulting Limited	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20	D						MADE GROUND : soft / firm to firm brown soil / clay fill with rootlets and fragments of broken brick and traces of ash and cinder			
1.00-1.45	SPT(C) N=5			1,1/1,1,1,2						
1.00	D									
1.20-1.65	D									
2.00-2.45	SPT(C) N=8			1,1/2,2,2,2						
2.00-2.45	D					(4.60)				
3.00-3.45	SPT N=10			2,2/2,2,3,3						
3.00-3.45	D									
4.00-4.45	SPT N=11			1,2/2,3,3,3						
4.00-4.45	D									
4.50	D					4.60	Stiff brown CLAY			
5.00-5.45	SPT N=15			2,3/3,4,4,4						
5.00-5.45	D									
6.00-6.45	SPT N=17			2,3/4,4,4,5						
6.00-6.45	D									
7.00-7.45	SPT N=16			3,3/4,4,4,4						
7.00-7.45	D					(5.85)				
8.00-8.45	SPT N=18			2,3/4,4,5,5						
8.00-8.45	D									
9.00-9.45	SPT N=19			3,4/4,5,5,5						
9.00-9.45	D									
10.00-10.45	SPT N=21			2,3/4,5,6,6						

Remarks
Services inspection pit excavated by hand to 1.00m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No.
16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m			16-1376

Location	Dates	Engineer	Sheet
	04/05/2016-05/05/2016	Wright Mottershaw Lydon Consulting Limited	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.45	D					10.45	Complete at 10.45m			

Remarks
Services inspection pit excavated by hand to 1.00m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No.
16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m			16-1376

Location	Dates	Engineer	Sheet
	05/05/2016	Wright Mottershaw Lydon Consulting Limited	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10	D					(0.30)	Brown clayey TOPSOIL with rootlets			
0.30	D					0.30	MADE GROUND : soft / firm brown gravelly soil / clay fill with occasional pieces of broken brick			
1.00-1.45	SPT(C) N=8			1,1/2,2,2,2						
1.00	D									
1.20-1.65	D									
2.00-2.45	SPT(C) N=8			1,2/2,2,2,2						
2.00-2.45	D									
						(4.50)				
3.00-3.45	SPT N=7			1,1/1,2,2,2						
3.00-3.45	D									
4.00-4.45	SPT N=9			1,1/2,2,2,3						
4.00-4.45	D									
4.80	D					4.80	Stiff brown CLAY			
5.00-5.45	SPT N=14			2,3/3,3,4,4						
5.00-5.45	D									
6.00-6.45	SPT N=17			2,3/4,4,4,5						
6.00-6.45	D									
7.00-7.45	SPT N=17			2,3/4,4,5,4						
7.00-7.45	D									
						(5.65)				
8.00-8.45	SPT N=17			2,4/4,4,4,5						
8.00-8.45	D									
9.00-9.45	SPT N=20			3,4/4,5,5,6						
9.00-9.45	D									
10.00-10.45	SPT N=22			3,4/5,5,6,6						

Remarks
Services inspection pit excavated by hand to 1.00m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m			16-1376
	Location	**Dates** 05/05/2016	**Engineer** Wright Mottershaw Lydon Consulting Limited	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.45	D					10.45	Complete at 10.45m			

Remarks

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m			16-1376

Location	Dates	Engineer	Sheet
	04/05/2016	Wright Mottershaw Lydon Consulting Limited	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10	D					(0.20)	MADE GROUND : brown / black gravel / soil / clay fill			
0.20	D					0.20	MADE GROUND : soft / firm and firm grey / black gravelly clay fill			
1.00-1.45	SPT(C) N=4			2,1/1,1,1,1						
1.00	D									
1.20-1.65	D					(2.40)				
2.00-2.45	SPT(C) N=13			2,3/3,3,3,4						
2.00-2.45	D									
2.60	D					2.60	Medium dense yellow / grey very clayey medium SAND and fine / medium sub-rounded GRAVEL			
3.00-3.45	SPT N=19			2,2/4,6,5,4						
3.00-3.45	D					(1.50)				
4.00-4.45	SPT N=15			1,2/3,3,4,5		4.10	Stiff brown CLAY			
4.00-4.45	D									
4.10	D									
5.00-5.45	SPT N=17			2,3/3,4,5,5						
5.00-5.45	D									
6.00-6.45	SPT N=16			2,3/3,4,4,5						
6.00-6.45	D									
7.00-7.45	SPT N=16			2,3/3,4,4,5						
7.00-7.45	D					(6.35)				
8.00-8.45	SPT N=18			3,3/4,4,5,5						
8.00-8.45	D									
9.00-9.45	SPT N=20			3,4/5,5,5,5						
9.00-9.45	D									
10.00-10.45	SPT N=21			2,4/5,5,5,6						

Remarks
Water added to borehole between 2.60m - 4.10m to assist drilling
Services inspection pit excavated by hand to 1.00m

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m			16-1376
	Location	**Dates** 04/05/2016	**Engineer** Wright Mottershaw Lydon Consulting Limited	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.45	D					10.45	Complete at 10.45m			

Remarks

Scale (approx)	Logged By
1:50	Dr J Crook

Figure No. 16-1376.WS1

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Standard Penetration Test Results

Site : Ashmole Academy

Client :

Engineer : Wright Mottershaw Lydon Consulting Limited

Job Number 16-1376

Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	1.00	1.15	1.45	CPT	1	1	1	1	1	2	N=5	
BH1	2.00	2.15	2.45	CPT	1	1	2	2	2	2	N=8	
BH1	3.00	3.15	3.45	SPT	2	2	2	2	3	3	N=10	
BH1	4.00	4.15	4.45	SPT	1	2	2	3	3	3	N=11	
BH1	5.00	5.15	5.45	SPT	2	3	3	4	4	4	N=15	
BH1	6.00	6.15	6.45	SPT	2	3	4	4	4	5	N=17	
BH1	7.00	7.15	7.45	SPT	3	3	4	4	4	4	N=16	
BH1	8.00	8.15	8.45	SPT	2	3	4	4	5	5	N=18	
BH1	9.00	9.15	9.45	SPT	3	4	4	5	5	5	N=19	
BH1	10.00	10.15	10.45	SPT	2	3	4	5	6	6	N=21	
BH2	1.00	1.15	1.45	CPT	1	1	2	2	2	2	N=8	
BH2	2.00	2.15	2.45	CPT	1	2	2	2	2	2	N=8	
BH2	3.00	3.15	3.45	SPT	1	1	1	2	2	2	N=7	
BH2	4.00	4.15	4.45	SPT	1	1	2	2	2	3	N=9	
BH2	5.00	5.15	5.45	SPT	2	3	3	3	4	4	N=14	
BH2	6.00	6.15	6.45	SPT	2	3	4	4	4	5	N=17	
BH2	7.00	7.15	7.45	SPT	2	3	4	4	5	4	N=17	
BH2	8.00	8.15	8.45	SPT	2	4	4	4	4	5	N=17	
BH2	9.00	9.15	9.45	SPT	3	4	4	5	5	6	N=20	
BH2	10.00	10.15	10.45	SPT	3	4	5	5	6	6	N=22	
BH3	1.00	1.15	1.45	CPT	2	1	1	1	1	1	N=4	
BH3	2.00	2.15	2.45	CPT	2	3	3	3	3	4	N=13	
BH3	3.00	3.15	3.45	SPT	2	2	4	6	5	4	N=19	
BH3	4.00	4.15	4.45	SPT	1	2	3	3	4	5	N=15	
BH3	5.00	5.15	5.45	SPT	2	3	3	4	5	5	N=17	
BH3	6.00	6.15	6.45	SPT	2	3	3	4	4	5	N=16	
BH3	7.00	7.15	7.45	SPT	2	3	3	4	4	5	N=16	
BH3	8.00	8.15	8.45	SPT	3	3	4	4	5	5	N=18	
BH3	9.00	9.15	9.45	SPT	3	4	5	5	5	5	N=20	
BH3	10.00	10.15	10.45	SPT	2	4	5	5	5	6	N=21	
WS1	1.00	1.15	1.37	CPT	12	16	16	18	25		59/220mm	Refusal
WS2	1.00	1.15	1.45	CPT	8	8	10	10	10	11	N=41	
WS2	2.00	2.15	2.45	CPT	11	12	18	20	20	20	N=78	Refusal
WS3	1.00	1.15	1.45	CPT	8	22	11	11	11	27	N=60	Refusal
WS5	1.00	1.15	1.45	CPT	4	6	10	12	13	16	N=51	Refusal
WS5	2.00	2.15	2.45	CPT	10	8	15	15	16	17	N=63	Refusal
WS7	1.00	1.15	1.45	CPT	4	8	17	20	25	25	N=87	Refusal

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH1

Installation Type	Dimensions	Client	Job Number
Single Installation	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm		16-1376

Location	Ground Level (mOD)	Engineer	Sheet
		Wright Mottershaw Lydon Consulting Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
				0.10	Concrete
					Bentonite Seal
				1.00	
					Well Screen
				4.60	
					Bottom Fill
				10.45	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH2

Installation Type	Dimensions	Client	Job Number
Single Installation	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm		16-1376

Location	Ground Level (mOD)	Engineer	Sheet
		Wright Mottershaw Lydon Consulting Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
				0.10	Concrete
					Bentonite Seal
				1.00	
					Well Screen
				4.80	
					Bottom Fill
				10.45	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks

Geo-Ventures (UK) Limited
Geotechnical and Environmental Services

Site	Borehole Number
Ashmole Academy	BH3

Installation Type	Dimensions	Client	Job Number
Single Installation	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm		16-1376

Location	Ground Level (mOD)	Engineer	Sheet
		Wright Mottershaw Lydon Consulting Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
				0.10	Concrete
					Bentonite Seal
				1.00	
					Well Screen
				4.10	
					Bottom Fill
				10.45	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)
					5 min	10 min	15 min	20 min	

Groundwater Observations During Drilling

Date	Start of Shift					End of Shift				
	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A]			Remarks
	Time	Depth (m)	Level (mOD)	

Remarks

APPENDIX 04

Geotechnical Testing Results

LABORATORY REPORT

4043

Contract Number: PSL16/2267

Report Date: 24 May 2016

Client's Reference: 7165G

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

For the attention of: Sam Seddon

Contract Title: Ashmole Academy

Date Received: 19/5/2016
Date Commenced: 19/5/2016
Date Completed: 24/5/2016

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)

D Lambe (Senior Technician)
S Royle (Senior Technician)
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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH1			1.00		Brown very gravelly sandy CLAY.
BH2			1.00		Brown very gravelly slightly sandy CLAY.
BH3			1.00		Brown gravelly sandy CLAY.
WS1			0.30		Brown slightly gravelly slightly sandy CLAY.
WS3			1.00		Brown very sandy slightly clayey ashey GRAVEL.
WS5			0.70		Brown slightly gravelly CLAY.
WS7			0.30		Brown very gravelly sandy CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Checked / Approved		Date	24/05/16	Contract No:
Ashmole Academy				PSL16/2267
				Client Ref:
				7165G

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH1			1.00		17			48	23	25	60	Intermediate plasticity CI.
BH2			1.00		25			54	26	28	73	High plasticity CH.
BH3			1.00		21			44	21	23	79	Intermediate plasticity CI.
WS1			0.30		21			52	25	27	95	High plasticity CH.
WS3			1.00		22				NP			
WS5			0.70		31			72	30	42	100	Very high plasticity CV.
WS7			0.30		21			46	22	24	63	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

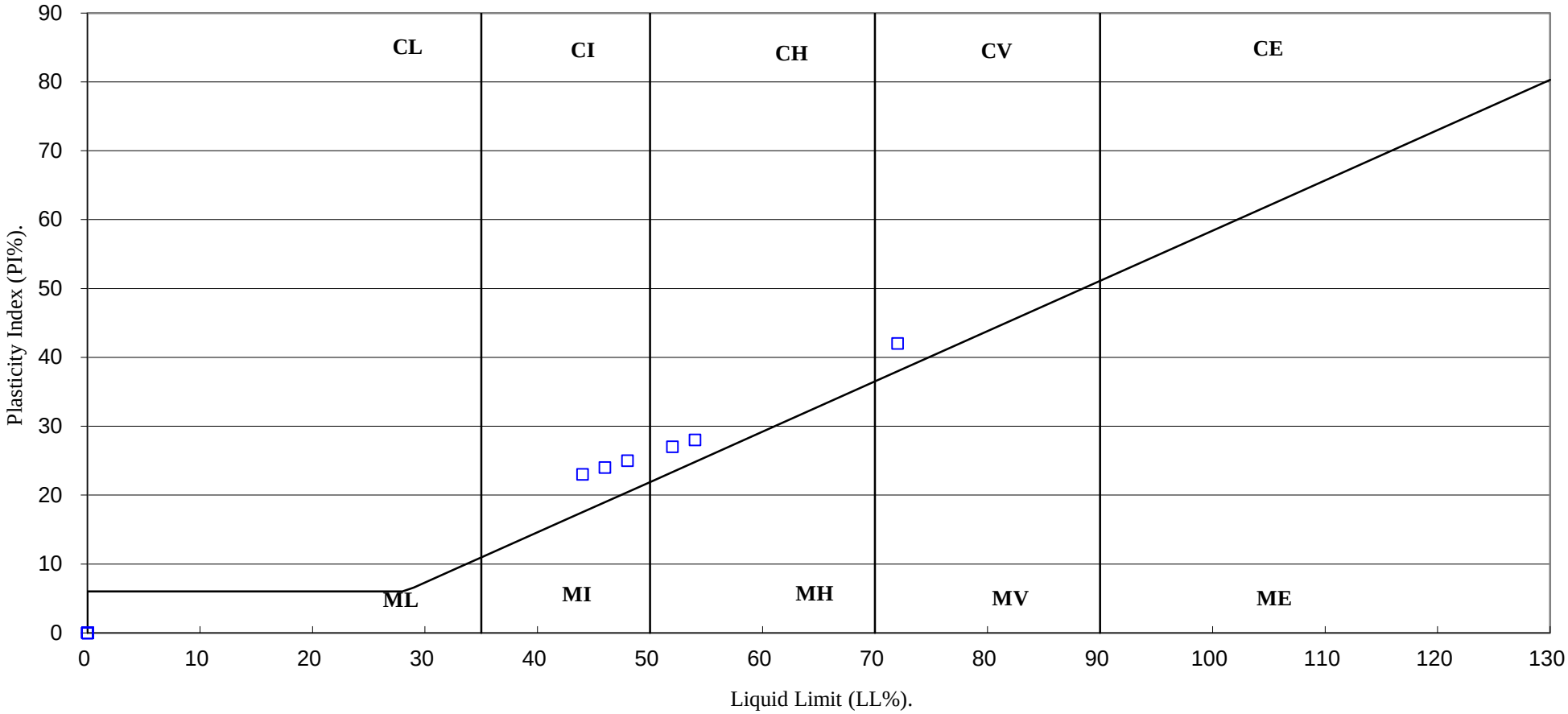
UKAS TESTING 4043

PSL Professional Soils Laboratory

Checked / Approved		Date	24/05/16	Contract No:
Ashmole Academy				PSL16/2267
				Client Ref:
				7165G

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Checked /Approved**		**Date**	**24/05/16**	**Contract No:**
		Ashmole Academy				**PSL16/2267**
						Client Ref:
						7165G

APPENDIX 05

Chemical Analytical Results

Scientific Analysis Laboratories Ltd
Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Report Number: 571580-1

Date of Report: 31-May-2016

Customer: WML Consulting Ltd
8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

Customer Contact: Ms Sam Seddon

Customer Job Reference: 1765G
Customer Purchase Order: 7165G
Customer Site Reference: Ashmole Academy
Date Job Received at SAL: 20-May-2016
Date Analysis Started: 23-May-2016
Date Analysis Completed: 31-May-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with Section 25 of the SAL Quality Manual

UKAS TESTING
1549

Report checked and authorised by :
Emma Spear
Project Manager

Issued by :
Emma Spear
Project Manager

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
WML Basic Suite

				SAL Reference	**571580 001**	**571580 002**	**571580 003**	**571580 004**	**571580 005**
				Customer Sample Reference	**BH1**	**BH1**	**BH1**	**BH1**	**BH2**
				Bottom Depth	**0.20**	**3.00**	**4.00**	**7.00**	**0.30**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	AR	1	mg/kg	**20**	**21**	-	-	**17**
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	-	-	<1
Cadmium	T6	AR	1	mg/kg	**1**	<1	-	-	<1
Chromium VI	T6	AR	1	mg/kg	<1	<1	-	-	<1
Copper	T6	AR	1	mg/kg	**150**	**81**	-	-	**100**
Lead	T6	AR	1	mg/kg	**590**	**640**	-	-	**410**
Mercury	T6	AR	1	mg/kg	<1	<1	-	-	<1
Nickel	T6	AR	1	mg/kg	**27**	**26**	-	-	**29**
Selenium	T6	AR	3	mg/kg	<3	<3	-	-	<3
Vanadium	T6	AR	1	mg/kg	**94**	**82**	-	-	**72**
Zinc	T6	AR	1	mg/kg	**320**	**310**	-	-	**250**
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1	-	-	<1
SO4(2:1)	T6	AR	100	mg/l	**110**	**370**	**400**	**320**	<100
Sulphur (total)	T6	AR	0.01	%	**0.33**	**0.40**	-	-	**0.14**
pH	T7	AR			**7.9**	**7.6**	**7.2**	**7.1**	**7.1**
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1	-	-	<1
Soil Organic Matter	T287	AR	0.1	%	**6.0**	**4.8**	-	-	**3.5**

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
WML Basic Suite

				SAL Reference	**571580 006**	**571580 007**	**571580 008**	**571580 009**	**571580 010**
				Customer Sample Reference	**BH2**	**BH2**	**BH3**	**BH3**	**BH3**
				Bottom Depth	**4.80**	**10.00**	**0.20**	**3.00**	**9.00**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	AR	1	mg/kg	-	-	**16**	-	-
Boron (water-soluble)	T6	AR	1	mg/kg	-	-	<1	-	-
Cadmium	T6	AR	1	mg/kg	-	-	<1	-	-
Chromium VI	T6	AR	1	mg/kg	-	-	<1	-	-
Copper	T6	AR	1	mg/kg	-	-	**30**	-	-
Lead	T6	AR	1	mg/kg	-	-	**110**	-	-
Mercury	T6	AR	1	mg/kg	-	-	<1	-	-
Nickel	T6	AR	1	mg/kg	-	-	**28**	-	-
Selenium	T6	AR	3	mg/kg	-	-	<3	-	-
Vanadium	T6	AR	1	mg/kg	-	-	**85**	-	-
Zinc	T6	AR	1	mg/kg	-	-	**120**	-	-
Cyanide(Total)	T4	AR	1	mg/kg	-	-	<1	-	-
SO4(2:1)	T6	AR	100	mg/l	**130**	<100	<100	<100	**600**
Sulphur (total)	T6	AR	0.01	%	-	-	**0.02**	-	-
pH	T7	AR			**7.6**	**6.4**	**7.0**	**7.5**	**7.4**
Phenols(Mono)	T4	AR	1	mg/kg	-	-	<1	-	-
Soil Organic Matter	T287	AR	0.1	%	-	-	**1.9**	-	-

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
WML Basic Suite

				SAL Reference	**571580 011**	**571580 012**	**571580 013**	**571580 014**	**571580 015**
				Customer Sample Reference	**WS1**	**WS2**	**WS3**	**WS5**	**WS7**
				Bottom Depth	**0.60**	**0.60**	**0.30**	**0.30**	**0.10**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	AR	1	mg/kg	**18**	**20**	**15**	**20**	**13**
Boron (water-soluble)	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Copper	T6	AR	1	mg/kg	**63**	**34**	**70**	**70**	**31**
Lead	T6	AR	1	mg/kg	**360**	**150**	**230**	**280**	**150**
Mercury	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Nickel	T6	AR	1	mg/kg	**27**	**21**	**27**	**31**	**16**
Selenium	T6	AR	3	mg/kg	<3	<3	<3	<3	<3
Vanadium	T6	AR	1	mg/kg	**67**	**57**	**61**	**83**	**48**
Zinc	T6	AR	1	mg/kg	**270**	**150**	**140**	**230**	**110**
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1
SO4(2:1)	T6	AR	100	mg/l	<100	<100	<100	<100	<100
Sulphur (total)	T6	AR	0.01	%	**0.10**	**0.05**	**0.04**	**0.06**	**0.05**
pH	T7	AR			**7.9**	**8.0**	**7.8**	**7.8**	**7.2**
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1	<1	<1	<1
Soil Organic Matter	T287	AR	0.1	%	**3.1**	**3.7**	**3.8**	**5.6**	**5.0**

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
Asbestos ID

				SAL Reference	**571580 001**	**571580 002**	**571580 005**	**571580 008**	**571580 011**
				Customer Sample Reference	**BH1**	**BH1**	**BH2**	**BH3**	**WS1**
				Bottom Depth	**0.20**	**3.00**	**0.30**	**0.20**	**0.60**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Asbestos ID	T27	AR			N.D.	N.D.	Chrysotile Fibres Detected	N.D.	N.D.

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
Asbestos ID

				SAL Reference	**571580 012**	**571580 013**	**571580 014**	**571580 015**
				Customer Sample Reference	**WS2**	**WS3**	**WS5**	**WS7**
				Bottom Depth	**0.60**	**0.30**	**0.30**	**0.10**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Asbestos ID	T27	AR			N.D.	N.D.	N.D.	N.D.

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
pH and Sulphate

				SAL Reference	**571580 001**	**571580 002**	**571580 003**	**571580 004**	**571580 005**
				Customer Sample Reference	**BH1**	**BH1**	**BH1**	**BH1**	**BH2**
				Bottom Depth	**0.20**	**3.00**	**4.00**	**7.00**	**0.30**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
pH	T7	AR			**7.9**	**7.6**	**7.2**	**7.1**	**7.1**
SO4(Total)	T6	AR	0.01	%	-	-	**0.34**	**0.14**	-
SO4(2:1)	T6	AR	100	mg/l	**110**	**370**	**400**	**320**	<100

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
pH and Sulphate

				SAL Reference	**571580 006**	**571580 007**	**571580 008**	**571580 009**	**571580 010**
				Customer Sample Reference	**BH2**	**BH2**	**BH3**	**BH3**	**BH3**
				Bottom Depth	**4.80**	**10.00**	**0.20**	**3.00**	**9.00**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
pH	T7	AR			**7.6**	**6.4**	**7.0**	**7.5**	**7.4**
SO4(Total)	T6	AR	0.01	%	**0.06**	**1.0**	-	**0.02**	**0.21**
SO4(2:1)	T6	AR	100	mg/l	**130**	<100	<100	<100	**600**

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
pH and Sulphate

				SAL Reference	**571580 011**	**571580 012**	**571580 013**	**571580 014**	**571580 015**
				Customer Sample Reference	**WS1**	**WS2**	**WS3**	**WS5**	**WS7**
				Bottom Depth	**0.60**	**0.60**	**0.30**	**0.30**	**0.10**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
pH	T7	AR			**7.9**	**8.0**	**7.8**	**7.8**	**7.2**
SO4(2:1)	T6	AR	100	mg/l	<100	<100	<100	<100	<100

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
Total and Speciated USEPA16 PAH

				SAL Reference	**571580 001**	**571580 002**	**571580 005**	**571580 008**	**571580 011**
				Customer Sample Reference	**BH1**	**BH1**	**BH2**	**BH3**	**WS1**
				Bottom Depth	**0.20**	**3.00**	**0.30**	**0.20**	**0.60**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Naphthalene	T149	AR	0.01	mg/kg	**1.2**	**2.1**	**0.06**	**0.01**	**0.29**
Acenaphthylene	T149	AR	0.01	mg/kg	**0.21**	**0.25**	**0.04**	**0.02**	**0.51**
Acenaphthene	T149	AR	0.01	mg/kg	**2.1**	**3.9**	**0.05**	**0.01**	**3.1**
Fluorene	T149	AR	0.01	mg/kg	**2.1**	**3.9**	**0.04**	**0.01**	**2.9**
Phenanthrene	T149	AR	0.01	mg/kg	**8.8**	**17**	**0.43**	**0.12**	**35**
Anthracene	T149	AR	0.01	mg/kg	**3.2**	**5.4**	**0.15**	**0.04**	**14**
Fluoranthene	T149	AR	0.01	mg/kg	**8.6**	**18**	**0.86**	**0.42**	**62**
Pyrene	T149	AR	0.01	mg/kg	**6.7**	**14**	**0.70**	**0.37**	**52**
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	**4.5**	**6.8**	**0.46**	**0.24**	**32**
Chrysene	T149	AR	0.01	mg/kg	**3.7**	**6.0**	**0.41**	**0.21**	**25**
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	**6.4**	**10**	**0.79**	**0.44**	**43**
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	**3.8**	**5.4**	**0.44**	**0.22**	**23**
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	**2.0**	**3.2**	**0.33**	**0.17**	**13**
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	**0.40**	**0.56**	**0.05**	**0.03**	**2.4**
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	**2.0**	**3.2**	**0.33**	**0.17**	**13**
PAH(total)	T149	AR	0.01	mg/kg	**56**	**100**	**5.1**	**2.5**	**320**

SAL Reference: 571580
Project Site: Ashmole Academy
Customer Reference: 1765G

Soil Analysed as Soil
Total and Speciated USEPA16 PAH

				SAL Reference	**571580 012**	**571580 013**	**571580 014**	**571580 015**
				Customer Sample Reference	**WS2**	**WS3**	**WS5**	**WS7**
				Bottom Depth	**0.60**	**0.30**	**0.30**	**0.10**
				Date Sampled	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**	**11-MAY-2016**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Naphthalene	T149	AR	0.01	mg/kg	**0.03**	**0.13**	**0.05**	**0.02**
Acenaphthylene	T149	AR	0.01	mg/kg	**0.02**	**0.38**	**0.05**	**0.03**
Acenaphthene	T149	AR	0.01	mg/kg	**0.01**	**0.46**	**0.04**	**0.01**
Fluorene	T149	AR	0.01	mg/kg	**0.01**	**0.54**	**0.04**	**0.01**
Phenanthrene	T149	AR	0.01	mg/kg	**0.20**	**9.0**	**0.59**	**0.19**
Anthracene	T149	AR	0.01	mg/kg	**0.06**	**3.2**	**0.21**	**0.05**
Fluoranthene	T149	AR	0.01	mg/kg	**0.60**	**21**	**1.6**	**0.57**
Pyrene	T149	AR	0.01	mg/kg	**0.53**	**18**	**1.4**	**0.50**
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	**0.35**	**9.7**	**0.93**	**0.30**
Chrysene	T149	AR	0.01	mg/kg	**0.31**	**8.3**	**0.90**	**0.29**
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	**0.68**	**15**	**1.7**	**0.59**
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	**0.35**	**8.8**	**1.0**	**0.34**
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	**0.25**	**5.0**	**0.68**	**0.23**
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	**0.04**	**0.78**	**0.11**	**0.04**
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	**0.25**	**5.0**	**0.68**	**0.23**
PAH(total)	T149	AR	0.01	mg/kg	**3.7**	**110**	**10**	**3.4**

Index to symbols used in 571580-1

Value	Description
AR	As Received
N.D.	Not Detected
S	Analysis was subcontracted
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was sub-contracted to REC Asbestos.

Method Index

Value	Description
T4	Colorimetry
T6	ICP/OES
T27	PLM
T7	Probe
T287	Calc TOC/0.58
T149	GC/MS (SIR)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Arsenic	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Boron (water-soluble)	T6	AR	1	mg/kg	N	001-002,005,008,011-015
Cadmium	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Chromium VI	T6	AR	1	mg/kg	N	001-002,005,008,011-015
Copper	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Lead	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Mercury	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Nickel	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Selenium	T6	AR	3	mg/kg	U	001-002,005,008,011-015
Vanadium	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Zinc	T6	AR	1	mg/kg	U	001-002,005,008,011-015
Cyanide(Total)	T4	AR	1	mg/kg	U	001-002,005,008,011-015
SO4(2:1)	T6	AR	100	mg/l	N	001-015
Sulphur (total)	T6	AR	0.01	%	N	001-002,005,008,011-015
pH	T7	AR			U	001-015
Phenols(Mono)	T4	AR	1	mg/kg	U	001-002,005,008,011-015
Soil Organic Matter	T287	AR	0.1	%	N	001-002,005,008,011-015
Asbestos ID	T27	AR			SU	001-002,005,008,011-015
SO4(Total)	T6	AR	0.01	%	N	003-004,006-007,009-010
Naphthalene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Acenaphthylene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Acenaphthene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Fluorene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Phenanthrene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Anthracene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Fluoranthene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Pyrene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Chrysene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015
PAH(total)	T149	AR	0.01	mg/kg	U	001-002,005,008,011-015

APPENDIX 06

Gas Monitoring Results

Ground Gas Monitoring Record

Borehole	Gas Flow (l/hr)	Borehole Pressure (Pa)	Methane (% v/v)		Methane (%LEL*)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Nitrogen (%v/v)		Depth to water (m bgl)	Atmospheric Pressure (mB)	Comments
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
BH 1	0.0	0	4.2				1.8		8.4		85.5		2.41	999	
BH 2	0.0	0	3.4				1.5		8.5		86.5		4.19	999	
BH 3	0.0	0	0.0				1.8		19.2		78.9		1.55	999	

Notes:

Monitoring should be for not less than 3 Minutes. However, if high concentrations of gases initially recorded, monitoring should be for up to 10 mins.
* LEL = Explosive Limit = 5%v/v
ND - Not Detected

Relevant Information at times of monitoring

Monitored by:	S. Edwards	Contract: **Ashmole Academy**
Weather :	Rain	
Equipment used:	LMS Type G3 xi Gas Meter	Date: **11.05.2016**
Visible signs of vegetation stress:		
Boreholes sampled for laboratory analysis:		Job No.
Other comments / observations:		Sheet No. **1**

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Ground Gas Monitoring Record

Borehole	Gas Flow (l/hr)	Borehole Pressure (Pa)	Methane (% v/v)		Methane (%LEL*)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Nitrogen (%v/v)		Depth to water (m bgl)	Atmospheric Pressure (mB)	Comments
			Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady			
BH 1	0.0	0	4.1				2.0		8.8		85.0		2.38	1015	
BH 2	0.0	0	3.9				1.8		8.7		85.5		4.10	1015	
BH 3	0.0	0	0.0				1.9		19.1		78.9		1.50	1015	

Notes:

Monitoring should be for not less than 3 Minutes. However, if high concentrations of gases initially recorded, monitoring should be for up to 10 mins.
* LEL = Explosive Limit = 5%v/v
ND - Not Detected

Relevant Information at times of monitoring

Monitored by:	J. Crook	Contract: **Ashmole Academy**
Weather :	Dry	
Equipment used:	LMS Type G3 xi Gas Meter	Date: **19.05.2016**
Visible signs of vegetation stress:		
Boreholes sampled for laboratory analysis:		Job No.
Other comments / observations:		Sheet No. **2**

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APPENDIX 07

Site Specific Acceptance Criteria

Site Specific Assessment Criteria for Residential (without homegrown produce) based on 1% SOM

Contaminant	Criteria for Residential 6% SOM (mg/kg)
Metals	
Arsenic	40
Boron	11000
Cadmium	85
Chromium III	910
Chromium VI	6
Copper	7100
Lead*	310
Mercury	1.2
Nickel	180
Selenium	430
Vanadium	1200
Zinc	40000
Non – Metals	
Phenol	440^{dir} (460)
Polyaromatic Hydrocarbons (PAH) 1% SOM	
Benz[a]anthracene	11
Benzo[a]pyrene	3.2
Benzo[b]fluoranthene	3.9
Benzo[ghi]perylene	360
Benzo[k]fluoranthene	110
Chrysene	30
Dibenz[ah]anthracene	0.31
Fluoranthene	1500
Indeno[123-cd]pyrene	45
Naphthalene	2.3
Pyrene	3700

* 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.

Contaminant	Criteria for Residential End Use (mg/kg)
Volatile Organic Compounds – (VOCs) 1% SOM	
Benzene	0.38
Ethylbenzene	83
Toluene	880[vap](869)
Xylene	79
1,2-Dichloroethane	0.0092
1,1,1-Trichloroethane	9.0
Tetrachloroethane	3.9
Tetrachloroethene (PCE)	0.18
Tetrachloromethane	0.026
Trichloroethene (TCE)	0.017
Trichloromethane	1.2
Vinyl Chloride	0.00077
Semi-Volatile Organic Compounds (SVOCs) 1% SOM	
1,2-Dichlorobenzene	24
1,4-Dichlorobenzene	61
1,2,4-Trichlorobenzene	2.6
Hexachlorobenzene	4.1(0.2)[vap]
Total Petroleum Hydrocarbons – TPH	
Aliphatic C5-6	42
Aliphatic C6-8	100
Aliphatic C8-10	27
Aliphatic C10-12	130(48)[vap]
Aliphatic C12-16	1100(24)[sol]
Aliphatic C16-35	65,000(8.48)[sol]
Aliphatic C35 - 44	65,000(8.84)[sol]
Aromatic C5 – 7 (benzene)	370
Aromatic C7 – 8 (toluene)	860
Aromatic C8-10	47
Aromatic C10-12	250
Aromatic C12-16	1800
Aromatic C16-21	1900
Aromatic C21-35	1900
Aromatic C35 - 44	1900

* 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.

APPENDIX 08

Qualitative Risk Assessment Guidance

Qualitative Risk Assessment Guidance

The Preliminary Contamination Risk Assessment methodology within the Phase 1 Desk Study Report is undertaken with reference to the following CIRIA guidance.

- Contaminated Land Risk Assessment - A Guide to Good Practice CIRIA C552:2001.

In practical terms, risk evaluation is undertaken in order to ascertain if potential risks are considered to be acceptable via classification following factors.

- The magnitude of the potential **consequences** (severity) of the risk occurring.
- The magnitude of the **probability** (likelihood) of the risks occurring.

The potential consequences of contamination risks occurring at the Site should be classified in accordance with the following table which is adapted from Table 6.3 in the CIRIA guidance.

Table 1 Classification of Consequence

Classification	Definition
Severe	Short term (acute) risk to human health likely to result in 'significant harm' as defined by the *Environment Protection Act 1990*, Part IIA. Short term risk of (significant) pollution of sensitive water resource or ecosystem. Catastrophic damage to building/property. Short term risk to a particular ecosystem, or organism forming part of such an ecosystem.
Medium	Chronic damage to human health (significant harm). Pollution of sensitive water resources. A significant change in a particular ecosystem, or an organism forming part of such an ecosystem.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.
Minor	Harm, although not necessarily significant harm, which may results in a financial loss, or expenditure to resolve. Non-permanent, easily preventable effects to human health. Easily repairable damage to buildings, structures and services.

The probability or likelihood of a risk occurring is then classified in accordance with Table 6.4 in the CIRIA Guidance which is also reproduced in Table 2 below.

Table 2 Classification of Probability

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

These classifications are then compared to indicate the risk to each pollution linkage. For each likelihood scenario, it will be assumed that a pollution linkage exists between the source and any potential receptors. The classification is not applied if no active pollution linkage is perceived to exist.

Upon classification of both the consequences and probability, the two can be compared in Table 6.5 within the guidance, in order to produce a risk category rating. The risk categories range from 'Very High Risk' to 'Very Low Risk' and should be determined for each potential pollutant linkage as oppose to each receptor or hazard as indicated above.

The matrix table is reproduced in Table 3 below.

Table 3 Consequence Vs Probability Matrix

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

The outcome of the Consequence vs Probability matrix should be compared to the risk definitions and likely actions required in Table 4 (Table 6.6 in CIRIA C552).

The outcome will then determine the overall risk category for the site and should form the basis for any proposed investigation work and remedial actions to be determined. The assessment is based on a qualitative approach at the initial Phase 1 Desk Study, and should be updated following the results of any subsequent ground investigation results.

Table 4 Definitions of Classified Risks and Likely Required Actions

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