



Geological & Geotechnical Consultants

Kendrick School

Phase 1 Desk Study & Phase 2 Report on Ground Investigation (May 2019)

Prepared for Darwin Group Ltd



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Darwin Group Ltd

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Phase 1 Desk Study & Phase 2 Report on Ground Investigation

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1.0 INTRODUCTION

Key GeoSolutions Ltd (KGS) have been commissioned by Darwin Group to undertake a ground investigation at Kendrick School, Reading in order to ascertain the potential ground conditions in relation to the proposed development.

The proposed development is located within Kendrick School grounds and is located on the existing tennis courts. The development will comprise a three storey teaching block. The proposed new teaching block is approximately 12m by 28m.

The investigation comprises a Desk Study including a preliminary risk assessment and a ground investigation for both geotechnical and contamination purposes. KGS have not been provided with the proposed load cell layout of the buildings.

The report comprises a desk study review of publically available information related to the site and the surrounding area, an Envirocheck report, provided by the Landmark Information Group (a copy of which can found in Appendix 1), has been used for this purpose and a preliminary risk assessment has been prepared for the site.

The Ground Investigation comprised three boreholes and two trial pits to define the ground conditions.

The comments given in this report and any opinions expressed are based in part on information made available by Darwin Group and other Third Parties. KGS has proceeded in good faith on the assumption that this information is accurate and accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied. There may be, however, conditions pertaining to the site which have not been disclosed by the investigation and which therefore could not be taken into account in this report. In particular, old foundations or underground services may be present that could affect the proposed development.

It should also be noted that the effects of ground and water borne contamination on the environment are constantly under review, and authoritative guidance values are potentially subject to change. The conclusions presented herein are based on the guidance available at the time this report was prepared, and no liability can be accepted for the retrospective effects of any changes or amendments to the legislation or guidance.

2.0 SITE OVERVIEW

2.1 Site Location and Description

The site of the proposed new development is located at National Grid Reference 471972mE, 173028mN and is shown on Figure 1.

The site is located to the east of the main Kendrick School Building, within the proposed footprint of the teaching block there are a number of tennis courts. The current surrounding landscaping is car parks and various school buildings, and the ground level of the site does not vary across the site. The access was via an access road to the south of the main school. The boundary to the site consist of current school buildings to the west and east, car parks to the north and south.

2.2 Land Use History

2.2.1 General

The Landmark Information Group (Landmark) was commissioned to provide an Envirocheck® Report. This report, including the Historical Ordnance Survey Maps, is presented in its entirety, in Appendix 1. The maps have been reviewed to determine historical on-site and off-site land use. Where appropriate these have been supplemented/correlated by other information from web-based sources.

2.2.2 Historical Land uses and features

The review focuses on the land use within the site boundary and the land immediately adjacent to the site. Additional comment on the land use further from the site is added if noteworthy from a geotechnical or land contamination context.

Site – A review of the historic maps shows that between 1877 and 1881 a building is observed within the proposed boundary of the new development this building after 1881 is no longer observed. The western site boundary has been a canteen since 1956 -2013 when the current building was built. The site has been surrounded by development from the 1877 map to present. The area along the northern boundary of the site was developed as a biscuit factory after the building on site was demolished and a small unnamed feature is observed along the southern boundary of the new proposed building. These features are observed on the 1882 map to 1973. Kendrick Girls School was first mapped between 1931-1934 within the school boundaries numerous buildings have been developed and subsequently demolished. Tennis courts have been established since 1962.

Surrounding Land –**0 – 250m**

Tin Works – Reading tin works lies c. 225m south west of the site, established by 1877 and remaining until 1962.

Brewery 1 – the royal albert brewery lies c 135m to the north of the site, was established by 1877 until 1970.

Lead Works – the lead and tin works lies c.205m to the north of the site, was established by 1877 and by 1968 the site had been cleared.

Saw Mill 1 – a saw mill lies c.247m to the north of the site, was established 1877 and by 1962 the site has been cleared.

250 - 500m

Brewery 2 – the Bridge Brewery lies c. 455m to the west of the site, was established by 1877 until 1979 by which time the site appears to have been redeveloped.

Foundry – a foundry lies c. 442m to the north west of the site, was established by 1877 until 1931 by which time the site has been redeveloped.

Gas Works – Gas works lies c. 399m north west of the site, was established by 1877 until 1931 when the gas works is no longer recorded.

Corn Mill – St Giles mill (corn) lies c. 365m west of the site, was established by 1877 until 1899 by which time it is recorded as being disused by 1912 the site has been redeveloped into a tramway power station .

Water Works – Water works lies c. 374m west of the site, was established by 1877 until 1912 by which time the adjacent site has been turned into a tramway power station.

Saw Mill – saw mill lies c 393m north of the site, was established by 1877 until 1962

Timber Yard 1 – Timber Yard lies c. 379m north of the site, was established by 1877 until 1962

Factory – A factory lies c. 480m north east of the site, was established by 1877 until 1976 after which the site appears to be redeveloped.

Hospital – Royal Berkshire Hospital lies c. 458m south east of the site, was established by 1877

500 – 1,000m

Brewery 3 – The Berkshire Brewery company site lies 670m east of the site, first shown on the 1877 and last mapped in 1899.

Sewage Works – first shown on the 1877 map located to approximately 652m to the northeast and remaining until 1968 when part of the site is developed into a museum.

Gas Works – a Gas works site lies 926m Northeast of the site, was established by 1877 until 1995 when the site appears to be undergoing redevelopment.

Canal – A Canal lies 652m north of the site, was established by 1877 until present and joins the Kennet River to the southwest.

Great Western Railway – The Great Western Railway lies 680m north of site, was established by 1877 until present.

Brewery 4 – Castle brewery lies 611m east of the site, was established by 1877 until 1931-1934 map.

Iron Works – Reading Iron Works lies 688m west of the site, was established by 1877 until 1901 - 1912 in which time it was re-developed to a Central Goods Depot (G.W.R)

Brick Works – Katesgrove Kilns Brick fields lies 555m south of the site, was established by 1877 until 1899 by which time the site had been redeveloped into residential houses.

Gravel Pit – A Gravel pit lies 980m south of site, was established by 1877 until 1883.

Reservoir 1 – Reading corporation water works Reservoir lies 727m south of the site, was established by 1877 until 1912-1913 when it is remapped as a recreation ground.

Reservoir 2 – a Reservoir lies 920m south of the site, was established by 1877 until 1938 when it ceases to be mapped as a reservoir.

2.2.3 Contemporary Surrounding Land Use

There are 30 No. contemporary trades are located within 250m of the proposed building site. The closest of which is inactive; the closest active entry is Waste disposal services located 109m southwest of the site, Berkshire Clearance Service, 49, South Street Reading. None of the operations require any Pollution Prevention and Control Permits.

The closest fuel station is located c.320m to the east of the site. BP Service Station, 69, London Road, Reading.

2.3 Geo-Environmental Setting

2.3.1 Geology

The site is covered by BGS 1: 50,000 Geological Sheet No. 268 (Reading) Solid & Drift Published 2000. This indicates the site to be underlain by the Lambeth Group (clays, silts and sands) of the Palaeocene to Eocene periods.

The geological map shows the site to be overlain by superficial strata, Taplow Gravel Member; these comprise sand and gravel, locally with lenses of silt, clay or peat.

2.3.2 Hydrogeology and Groundwater Vulnerability

The hydrogeology and groundwater vulnerability at the site has been assessed and is summarised in the following sections.

2.3.1 Classification of Aquifer

The bedrock strata, Lambeth Group is identified as Principal Aquifer, defined by the Environment Agency as:-

“These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.”

Both the bedrock strata, Lambeth Group, and superficial strata, Taplow Gravel Member, are identified as Secondary Aquifer - A, defined by the Environment Agency as:-

“These [Secondary Aquifers] include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. [Secondary A Aquifers have] permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.”

2.3.2 Soil Vulnerability

The soils beneath the site have not been classified but the classification of groundwater Vulnerability – Soluble Rock Risk is classified as Very Significant Risk – High Possibility.

2.3.3 Groundwater

The bedrock aquifer designated as Principal and Secondary A Aquifer.

The ground water flooding potential for the site is “Potential for Groundwater Flooding of Property situated Below Ground Level” with the land to the north of the site shown as having “Limited Potential for Groundwater Flooding to occur”. The site is also identified as being a High Vulnerability Secondary Aquifer.

2.3.4 Source Protection Zone

The site is not within a Source Protection Zone. The closest Source Protection Zone, located c.358m to the northeast of the site, is Zone III (Total Catchment) *“The total area needed to support the discharge from the protected groundwater source”*.

2.3.5 Groundwater Abstraction

No groundwater abstraction points are located within 250m of the proposed site. The nearest recorded groundwater abstraction point is located 455m southeast. This abstraction point is from a well at the Royal Berkshire Hospital and is operated by The Royal Berkshire Hospital, and is used for *“Hospitals: Drinking; Cooking; Sanitary; Washing; (small Garden)”*.

2.4 Other Significant Geo-environmental Information

2.4.1 Hydrology

The closest water feature to the site is Gunter’s Brook, which is located 227m to the north of the site.

The nearest area at risk of *“Extreme Flooding from Rivers or Sea without Defences”* has been identified 227m north of the site.

The site has *“Potential for Groundwater Flooding of Property Situated below Ground Level”*, and the northern boundary to the site has *“Limited Potential for Groundwater Flooding to Occur”*.

A pollution incidents to controlled waters has been recorded 246m North of the site; the incident was a Category 3 – Minor Incident where miscellaneous – unknown pollutant was reported on 10th July 1995.

2.4.2 Surface Water Abstraction

No surface water abstraction points are located within 250m of the proposed site. The nearest surface water abstraction point is located 381m west of the site. This abstraction point is from a single unknown point at St. Giles Stream at the Oracle Centre Reading, and is used for “Amenity: Lake and pond Through flow”.

2.4.3 Radon

With reference to Annex A and B of Radon: Protective Measures for New Dwellings (BR211, 2007), the site is located in a lower probability radon area, as less than 1% of homes are estimated to be at or above the action level. The information contained within the Envirocheck® Report (Appendix 1) also states that no radon protective measures are necessary in the construction of new dwellings or extensions.

It should be noted that in areas where protection measures are required, further review will be necessary from time to time as new data becomes available regardless the indicative risk as the risk can vary between neighbouring properties and even from room to room in same building.

Public Health for England (PHE) in 2014 produced a briefing on radon in schools and indicated that in radon affected areas schools should undertake radon measurements in the premises. Consequently, it is possible that the school has additional information on the actual radon risk and it is recommended enquiries are made with the school accordingly.

In the event there is a significant delay between reporting and construction it is therefore recommended that an updated BR 211 Radon Report is obtained.

2.4.4 BGS Estimated Soil Chemistry

The table below lists the BGS Estimated Soil Chemistry Values for arsenic, cadmium, chromium, lead and nickel; these are assumed to represent the background concentrations for the soil chemistry. According to BGS/DEFRA Technical Guidance Sheet (TGS) on normal levels of contaminants in English soils, Benzo(a)pyrene, Technical Guidance Sheet TGS04, July 2012 the background concentrations for Benzo(a)pyrene (BaP) are 3.6mg/kg for an Urban Domain and 0.5mg/kg for Principal Domain (for all areas outside an Urban Domain).

Table 1 - BGS Soil Chemistry

Arsenic	<i>Estimated Values (0m from site)</i>	<i><15 – 25 mg/kg</i>
Cadmium	<i>Estimated Values (0m from site)</i>	<i><1.8 mg/kg</i>
Chromium	<i>Estimated Values (0m from site)</i>	<i>60 – 90 mg/kg</i>
Lead	<i>Estimated Values (0m from site)</i>	<i><100 mg/kg</i>
Nickel	<i>Estimated Values (0m from site)</i>	<i>15 – 30 mg/kg</i>

2.4.5 Waste

Based on the Envirocheck report there are no waste related sites within 1000m of the site.

There are records of Potentially Infilled Land (non-water) and (Water) located within 100m of the site. The closest of these Potentially Infilled Land (non-Water) was taken from the 1995 mapping and is located 468m south of the site.

There are no records of premises actively using Hazardous Substances within 1000m.

There are no Registered Waste Transfer Sites located within 500m of the site.

There are no Licensed Waste Management Facilities located within 1000m of the site.

There are no records of Registered Waste Treatment Sites located within 1000m of the site.

There is two Notification of Installations Handling Hazardous Substances (NIHHS) or Planning Hazardous Substance Consents within 1000m of the site. British Gas TransCo, located 957m north east of the site at Reading Holder Station (4&5 Sites), Gas Works Road, Kennet Mouth, London

Road, Reading had a NIHHS which is currently not active. The Royal Berkshire Nhs Foundation Trust, located 546m southeast of the site also submitted a Planning Hazardous Substance Consents this has been withdrawn.

There is one Control of Major Accident Hazards Sites (COMAH), Explosive Sites or Planning Hazardous Substance Enforcements within 1000m of the site. Transco Plc located 956m north east of the site currently has an Active COMAH located at Kenavon Drive, Reading.

There are three records of Potentially Infilled Land (water) located within 500m of the site.

2.4.6 Ground Stability, Mineral Workings and Coal Mining

As would be expected based on the published geology the site is noted as being in an area '*that might not be affected by coal mining*'. The Envirocheck report does also indicate seven manmade mining cavities within 500m of the site, the closest being located 116m south of the site. The Envirocheck report also indicated one natural recorded cavity within 500m of the site, located 423m southwest of the site..

The Envirocheck report indicates that hazards associated with non-coal mining activity are unlikely on site.

There are no BGS recorded Mineral Sites within 500m of the site and 34 BGS recorded mineral sites within 10000m of the site. The closest of these sites is located 542m south of the site, Ivy Bridge Brick Field located at The Mount, Reading and has ceased operations worked the quaternary head deposits.

The Envirocheck® Report indicates the soils found on, or close to, site are classified as follows:

- Potential for collapsible ground –Very Low Hazard.
- Potential for compressible ground – No to Moderate Hazard.
- Potential for dissolution – Low to High Hazard.
- Potential for landslide – No to Very Low Hazard.
- Potential for running sand – No to Very Low Hazard.
- Potential for shrinking or swelling clay ground – No to Moderate Hazard.

2.4.7 Environmentally Sensitive Land Uses

None of the following sensitive land uses are located within 1000m of the site; Areas of Adopted Green Belt, Areas of Unadopted Green Belt, Ancient Woodlands, Areas of Outstanding Natural

Beauty, Forest Parks, National Nature Reserves, National Parks, Nitrate Sensitive Areas, Ramsar Sites, Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas, Ancient Woodland or World Heritage Sites.

A Nitrate Vulnerable Zone is located 670m north of the site

2.4.8 *Unexploded Ordnance*

A Preliminary Unexploded Ordnance (UXO) Risk Assessment for the site was not undertaken and one was not provided by Darwin Group.

2.4.9 *Walkover Survey*

A site walkover survey was carried out on 30th May 2019 by KeyGS. During the survey the site was found to consist Asphalt areas consisting of car park and tennis courts, and buildings along the western boundary of the site. No visible evidence of contamination, invasive weeds, presence of asbestos, PCBs, old tanks or chemicals were noted.

3.0 CONCEPTUAL MODEL AND PRELIMINARY RISK ASSESSMENT

3.1 Introduction

This section of the report comprises a qualitative assessment of the potential for contaminated land to be present at the site. The statutory definition for “contaminated land” being as follows:

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

- (a) significant harm is being caused or there is significant possibility of such harm being caused; or*
- (b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.”*

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

- (1) A qualitative assessment of the likelihood of plausible contaminant linkages, i.e. there must not only be a source of contamination, but a pathway and a receptor; and
- (2) A quantitative element which will seek to determine the degree of harm and the significance of such harm on a receptor.

The Statutory definition of contaminated land was introduced through Part 2A of the Environment Protection Act 1990 to specifically address the historical legacy of land contamination. Where a site is being submitted for redevelopment under the planning regime it should on completion be suitable for use and should not be capable of being determined Contaminated Land under Part 2A of the Environment Protection Act 1990.

The proposed development will comprise a three storey teaching block. The construction is assumed to comprise a steel frame with suspended floors, and the teaching block is to be a three storey building. It is anticipated that in keeping with the other buildings in this area of the school the new school building will be surrounded by a mixture of soft and hard landscaping.

Considering the proposed end use of the site and the findings from the desk study presented in the preceding sections a Conceptual Site Model (CSM) has been derived identifying plausible contaminant linkages and a preliminary risk assessment undertaken as set out below to determine whether plausible significant contaminant linkages are present. This CSM is further reviewed in Chapter 6 as part of the assessment of the results from the preliminary ground investigation undertaken as part of this commission.

3.2 Sources of Contamination

The possible on site sources of contamination include the demolition of the previous buildings that have been present within the boundary of the proposed new building site and the subsequent construction of the current school buildings and tennis courts as well as the adjacent historical biscuit factory.

Off site sources of contamination include the biscuit factory which was located along the northern boundary of the proposed site.

3.3 Potential Contaminants of Concern

From the specific land uses mentioned above possible contaminants of concern could include: asbestos, metals, sulphates, cyanide, sulphide, phenols, petroleum hydrocarbons, Volatile Organic Compounds (VOC), Polychlorinated Biphenyl (PCB) and Polyaromatic Hydrocarbons (PAH). However, should made ground have been imported to site there is a risk of a broader range of contaminants being present.

3.4 Pathways for Migration

The pathways for migration of potential contaminants will be limited in parts by the presence of hard cover when the redevelopment is completed. However, during construction any existing cover will be removed, if made ground is present then there is the potential for direct contact, ingestion, inhalation, and for some water ingress to occur allowing leaching and migration along preferential pathways.

There is also the potential for pathways to be created along new infrastructure including utility trenches and pipework as well as foundations. The development will also result in direct contact between contaminants and construction materials.

According to information on flooding, the site is in an area potentially susceptible to groundwater flooding which may result in changes in gas migration pathways and leaching of contaminants through groundwater rising through the underlying geology.

3.5 Potential Receptors

The potential receptors include, site users, maintenance workers, construction workers, Principal and Secondary Aquifer, surface waters, buildings and buried structures and services.

3.6 Assessment of Plausible Contaminant linkages

A risk assessment of the identified plausible contaminant linkages has been undertaken for the site in line with current legislation described above. (The assessment takes into consideration the sources of possible contamination risk and the presence of any plausible pathways or receptors as outlined in the Environmental Protection Act 1990 (Part 2A)). The risk assessment has been undertaken on the understanding that the site is to be developed as a three storey teaching block (a three storey school building). As such, some assumptions have been made with respect to the following assessment as set out immediately below. The geo-environmental risk assessment should be reviewed in the event that the proposed end use is significantly altered from that described in Section 3.1 above.

It has been assumed that appropriate health and safety practices will be adopted during site clearance, preparation, earthworks and construction, and appropriate environmental protection / mitigation measures will be employed. It is also assumed that the proposed development will not introduce contaminative substances into the ground. In keeping with the other buildings in this area of the school it is anticipated that the building will be surrounded by a mixture of soft and hard landscaping.

Table 2 presents a qualitative assessment of the significance of the plausible contaminant linkages identified, those that are likely to only occur during construction are highlighted in italics. The classifications of consequence (severity) are taken from R&D Publication 66 (NHBC and Environment Agency, 2008). Whilst this is for housing the classifications have been applied to a broad range of development scenarios. It should be noted that as this PRA is based on desk study information, it has been assumed where there is no definite evidence of whether contamination is present or not or the significance of this contamination, that generally a “medium” consequence category has been selected except for the secondary aquifers where due to their limited resource value a “mild” consequence has been selected. As already stated the PRA is reviewed as part of the assessment of results from the preliminary ground investigation in Chapter 6. The scope of the investigation is set out in Chapters 4 and 5.

Table 2 - Plausible Contaminant linkages and Qualitative Preliminary Risk Assessment – Proposed Development (Based on desk study information)

Source	Pathway	Receptor	Consequence	Probability	Risk
<i>Hazards to Human Health</i>					
Soil Contamination – Made Ground	Direct Contact / Ingestion / Inhalation	Site Users/ Maintenance Workers	Medium	Low Likelihood	Moderate / Low Risk

<i>Soil Contamination – Made Ground</i>	<i>Direct Contact / Ingestion / Inhalation</i>	<i>Construction workers¹</i>	<i>Medium</i>	<i>Low Likelihood</i>	<i>Moderate / Low Risk</i>
Soil Contamination – Made Ground	Permeation to potable water supplies	Site Users	Medium	Unlikely	Low Risk
Hazards to the Water Environment					
<i>Potential Leachable contamination – Made Ground</i>	<i>Water ingress and vertical flow into groundwater during construction</i>	<i>Groundwater Principal and Secondary Aquifer</i>	<i>Medium</i>	<i>Likely</i>	<i>Moderate Risk</i>
Potential Leachable contamination within Made Ground	Groundwater Flooding	Groundwater Principal and Secondary Aquifers	Medium	Unlikely	Low Risk
Offsite - Potential leachable contaminants from adjacent historic activities	Migration through permeable strata	Groundwater Principal and Secondary Aquifers	Medium	Low Likelihood	Moderate / Low Risk
Hazards to Building Fabric, Structures and Services					
Soil contamination within the Made Ground (if present)	Direct Contact	Buried structures (concrete)	Medium	Low Likelihood	Moderate/ Low risk
Sulphates within near surface soils	Direct Contact	Buried structures (concrete)	Medium	Low Likelihood	Moderate/ Low risk

Notes:

1. Due to health and safety requirements risks to workers should be removed by use of appropriate work methods and use of PPE. Information on the risks must be provided in advance of works in accordance with CDM 2015. Residual information on risks shall also be retained on-site in the Health and Safety File to ensure future maintenance workers understand the risks and can mitigate accordingly.
2. Plausible contaminant linkages that are likely to only occur during construction are highlighted in italics.

In summary, as can be seen from the PRA above, there is generally a perceived low to moderate risk of on-site contamination affecting the development, nearby surface water and the underlying groundwater.

4.0 GROUND INVESTIGATION

The site work was carried out on the 30th May 2019 and generally in accordance with the guidelines laid down in BS EN 1997-2:2007.

Three window sample holes (WS01 to WS03) and two trial pits (TP0A to TP0B) were sunk in the vicinity of the proposed new buildings and development areas to investigate the ground conditions and provide samples for chemical and physical analyses. All exploratory holes were located based on the proposed location of the new school buildings and development areas.

The approximate locations of the boreholes and trial pits are shown on Figure 2. The depths and descriptions of the soils encountered are given in the borehole and trial pit records (Appendix 2).

Standard Penetration Tests (SPTs) were taken at various depths during drilling of the boreholes; the depths and results of the SPTs are provided on the borehole logs (Appendix 2).

Soakaway tests were carried out in Trial Pit TP0A, due to time constraints with the water bowser a soakaway test was not able to be carried out on TP0B (Appendix 3)

Samples taken for contamination purposes were recovered in labelled 250g amber jars, 60g amber jars and 1kg plastic tubs (marked as "Jars" on the borehole logs). The samples were then stored in cool boxes prior to being delivered to ChemTech Environmental Limited in Durham. Samples were scheduled using Sample Custody forms provided by ChemTech Environmental.

Gas standpipes were installed in WS01, WS02 and WS03, details of installations are on the borehole logs (see Appendix 2). The remaining trial pits were backfilled with arising's on completion.

5.0 LABORATORY TESTING

Samples were selected and scheduled for chemical analysis by KGS: the analysis was carried out by ChemTech Environmental Laboratories, a UKAS accredited laboratory with MCERTs accreditation for the majority of test scheduled. The range of chemical analyses was based on the known previous land use history of the site and include asbestos screen, total cyanide, sulphide, phenols, polyaromatic hydrocarbons (PAH), soil organic matter (SOM), Volatile Organic Compounds (VOC), Polychlorinated Biphenyl (PCB), Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG) banded aliphatics and aromatics hydrocarbons, waste acceptance Criteria (WAC) (complete & leachate suite), and metals (Arsenic, Barium, Beryllium, Boron water soluble, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc).

Whilst every effort has been made to schedule tests suitable for the known previous land use, there is no guarantee that other contaminants are not present on site for which analyses have not been carried out or which were not sampled in the programme of exploratory holes.

Four representative samples of the made ground were selected for contamination testing and three for WAC testing, the results are given in Appendix 4.

6.0 DISCUSSIONS ON GROUND CONDITIONS AND RECOMMENDATIONS

6.1 Soil Conditions

The following strata were encountered during the investigation:-

- Made Ground, Clayey Sand.
- Clayey Gravelly Sand (Taplow Gravel Member)

All boreholes and Trial Pits were terminated in the Taplow Gravel Member.

- WS01 was terminated at a depth of 4.31m bgl. .
- WS02 was terminated at a depth of 3.38m bgl.
- WS03 was terminated at a depth of 3.37m bgl.
- TP0A was terminated at a depth of 2.00m bgl.
- TP0B was terminated at a depth of 1.50m bgl.

6.2 Visual and Olfactory Evidence of Contamination

Visual and olfactory evidence where present is recorded on the exploratory hole logs within the relevant soil descriptions.

6.3 Foundations

The Made Ground is not considered to be a suitable load bearing material; therefore, the foundations should be taken down to the underlying medium dense sand of the Taplow Gravel Member. For foundation design purposes it is suggested that an Allowable Bearing Pressure (ABP) of 125kN/m² be assumed. The foundations should be formed with a minimum foundation depth of 1.0m below existing ground level and below any Made Ground.

The provision of a foundation design is beyond the scope of the current report. No loadings have been provided and the provision of a foundation design is beyond the scope of the current report. Prior to casting the foundations, a competent person should inspect the formation level and confirm the suitability or otherwise of the founding strata. Any potential soft areas or other anomalies should be excavated further until ground with suitable strength is encountered; the excavation can be brought back up to the required formation level using adequately compacted granular material or plain concrete.

If ground conditions are worse than those encountered by the boreholes or if groundwater is encountered at higher levels, any foundation design would need to be reviewed by a geotechnical engineer.

6.4 Chemical Considerations

6.4.1 Laboratory Results

The laboratory testing detected in all samples the presence of most metals tested for, excluding, Hexavalent Chromium, the laboratory testing also revealed the presence of, sulphur, TPH's and PAH's. A complete set of test results is contained in Appendix 4.

Table 3: Summary of Test Results (excluding results less than detection level or less than threshold value, where applicable).

Determinand	Unit	S4UL for RwoHP 1,2	Concentration (mg/kg)			
			Min.	Max.	Mean	Standard Deviation
pH	pH Units	Na	7.8	8.2	7.98	0.206
Antimony	Mg/kg	n/a	0.479	1.724	1.09	0.689
Arsenic	mg/kg	40	8.828	17.652	12.387	4.125
Barium	mg/kg	n/a	29.282	185.778	86.718	72.492
Beryllium	mg/kg	1.7	1.215	1.215	1.215	0.608
Boron, water soluble	mg/kg	11000	0.6	0.6	0.6	0.346
Cadmium	mg/kg	85	0.345	0.551	0.448	0.272
Chromium	mg/kg	6	39.654	73.315	52.156	14.645
Copper	mg/kg	7100	8.281	38.898	23.477	15.311
Lead	mg/kg	310	21.157	1273.869	402.787	593.913
Nickel	mg/kg	180	10.539	22.109	15.803	5.168
Selenium	mg/kg	430	0.411	1.071	0.712	0.338
Vanadium	mg/kg	1200	24.149	31.08	26.975	2.937
Zinc	mg/kg	40000	34.453	469.913	165.581	206.499
Benzo(a)pyrene	µg/kg	3.2	0.331	0.553	0.442	0.271

Notes:

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2. Where S4UL value is affected by changes in soil organic matter concentrations the S4ULs relating to 1% SOM.
 3. Four samples from near surface were subjected to asbestos identification analysis and no asbestos was detected.
- Sol S4UL presented exceeds the solubility saturation limit, which is presented in brackets

Darwin Group's Construction Methodology involves a site level reduction of approximately 0.5m followed by the placement of a building. It is assumed that the buildings will have a suspended floor with the buildings supported by columns onto pad foundations.

6.4.2 Human health – end users

Elevated levels of lead and chromium have been identified in the made ground. In terms of long term human health the proposed development the buildings and the surrounding hardstanding of the tennis courts will remove the direct contact and ingestion pathways. There are two small areas of grassed areas shown on the Proposed Landscaping Plan (DGL drawing number 1400). These areas are currently part of the tennis courts, i.e. they are covered with asphalt. The asphalt and underlying made ground will need to be excavated to allow placement of topsoil. It is recommended that the made ground be removed to a depth of 450mm, a geotextile separator layer be placed and clean topsoil be placed. Records of the works should be maintained in order that sufficient proof of the completion of works is available to produce a validation report.

6.4.3 Human health - Construction Workers/Maintenance Workers

The near surface made ground shows evidence of low levels of contamination the short term risks to construction workers from potential unidentified contamination can be mitigated by adoption of normal standards of health, safety and hygiene adopted on construction sites. Vigilance should be maintained during groundworks in case different ground conditions are encountered other than expected.

6.4.4 Controlled Waters

Based on the PRA presented in chapter 3 whilst the risk from water ingress has been mitigated by the presence of hard cover on completion of the building construction. However there is a risk of in the short term of mobilisation contamination during construction if leachable contamination is present. The risk to controlled waters is considered unlikely due to the ground conditions encountered during the site investigation.

6.4.5 Potable Water Supply Pipes

Plastic pipes can be affected by the presence of contamination leading to stress cracking and or permeation. The route of the potable water supply is not currently known and further testing could

determine the risk actually along the route at the depth and location of the pipe. However if it is a relatively small diameter pipe and a relatively short run then the adoption of barrier pipe without further testing may be the more cost effective approach. Consultation with the local water supplier is recommended in order to confirm appropriate measures for mitigation.

6.4.6 Summary

The site was found to pose no significant long term risk to human health and controlled waters. In summary the site is suitable for the proposed development with the following mitigation:

- In the proposed soft landscape areas the made ground should be removed to a depth of 450mm. A geotextile separator layer should be placed and then filled with clean topsoil.
- Normal standards of health, safety and hygiene during construction

6.4.9 Classification of Arising's for disposal to landfill

From the waste acceptance criteria (WAC) testing (see Appendix 4 for WAC test results), the made ground meets the criteria for inert landfill WAC so would classify as inert waste. The results of the WAC tests should be made available to all interested parties.

The natural occurring soils should be classified as Listed Inert but care should be taken to ensure it is excavated separately and that it is free from impact from the overlying made ground.

7.0 CONCLUSIONS AND RECOMMENDATIONS

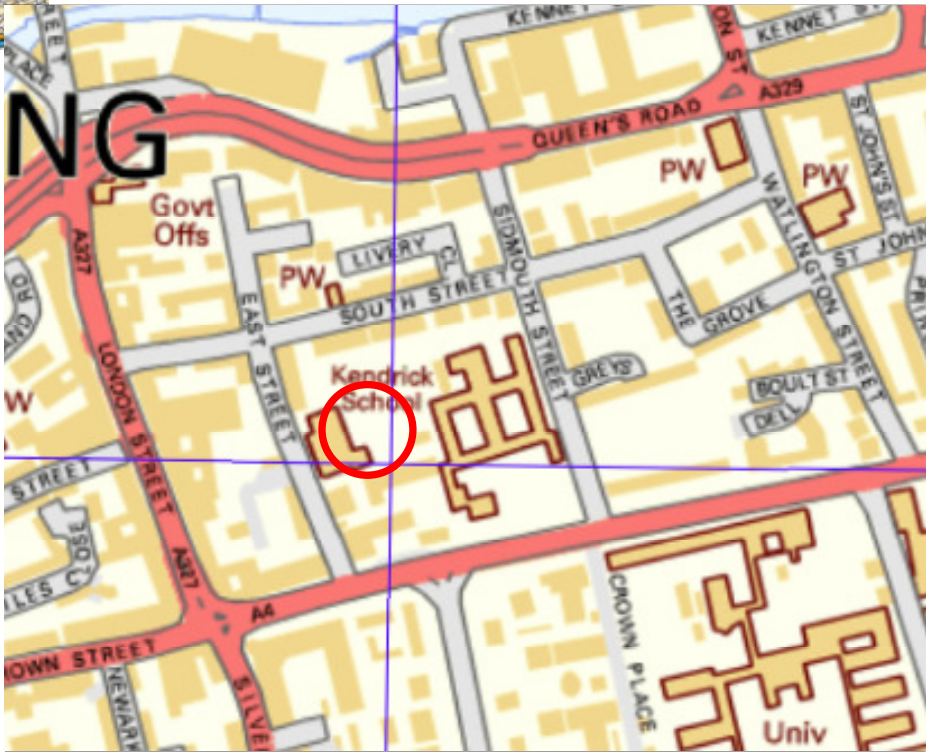
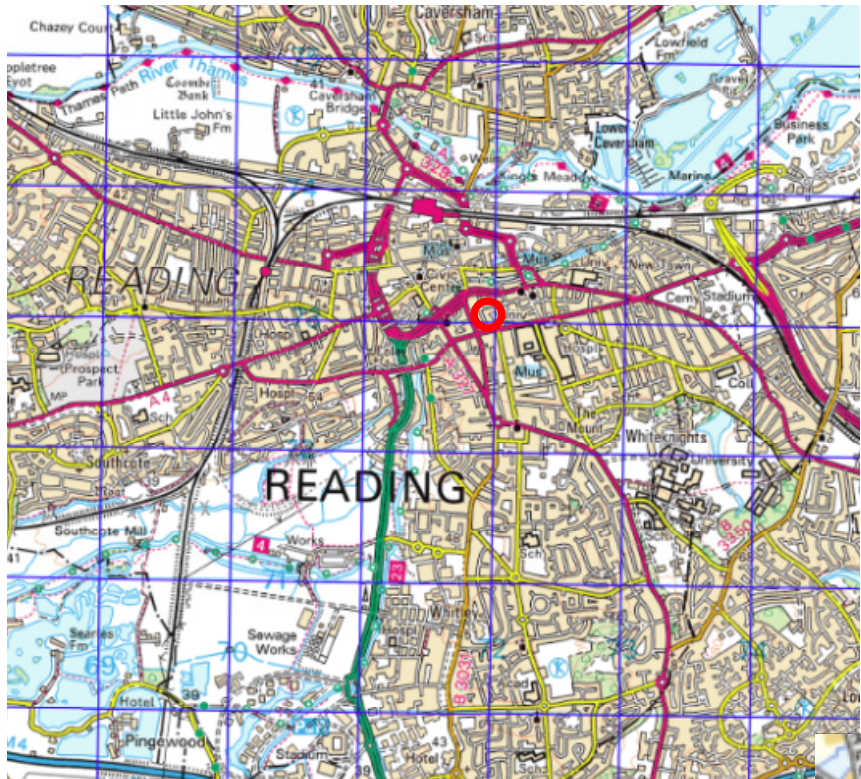
7.1 Conclusions

- It is proposed to build a new three storey teaching block at Kendrick School
- The site is underlain by up to 1m of made ground beneath which medium dense clayey sand was encountered.
- Offsite sources of contamination are potentially limited to the demolition of previous building on the site and the subsequent development the school buildings.
- The site was found to pose no significant long term risk to human health.
- In the proposed soft landscape areas the made ground should be removed to a depth of 450mm. A geotextile separator layer should be placed and then filled with clean topsoil.
- Normal standards of health, safety and hygiene adopted on construction sites should offer sufficient mitigation against contamination identified.

7.2 Recommendations

- If development is to include water supply pipes the water Supply Company is contacted to confirm that plastic pipes are suitable.
- Vigilance should be maintained during groundworks in case different ground conditions from those anticipated are encountered.

FIGURES



NOTES

1.



01	First Issue	RW	13/06/19
Rev.	Revision Detail	Drawn	Date

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CLIENT:

DarwinGroup
Construction Has Evolved

PROJECT:

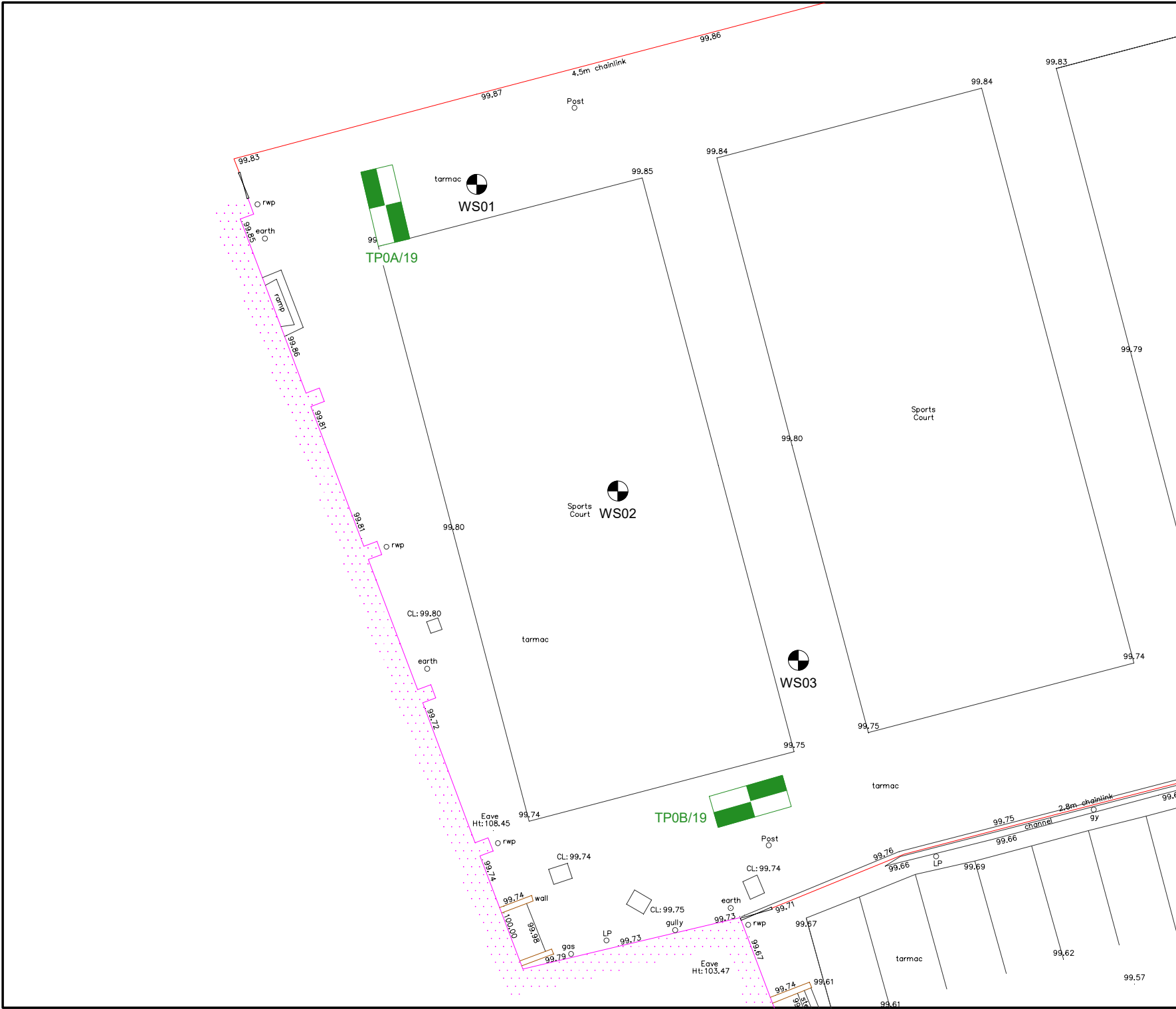
Kendrick School

TITLE:

Site Location Plan

Drawn: RW	Checked: BD	Date: Jun '19
Scale: NTS	Original Sheet Size: A4	Status: DRAFT

Drawing No.	Revision:
FIGURE 1	01



NOTES

1.

01 First Issue RW 31/05/19

Rev. Revision Detail Drawn Date

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CLIENT:

DarwinGroup
Construction Has Evolved

PROJECT:

Kendrick School

TITLE:

Borehole and Trial Pit Location Plan

Drawn: RW	Checked: BD	Date: May '19
Scale: 1:200	Original Sheet Size: A4	Status: DRAFT

Drawing No.	Revision:
FIGURE 2	01



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APPENDICES

APPENDIX 1

ENVIROCHECK REPORT

APPENDIX 2

BOREHOLE AND TRIAL PIT LOGS



PAGE 1 OF 1

PROJECT NAME Kendrick School

PROJECT LOCATION Reading

CO-ORDINATES 471966 mE, 173040 mN

GROUND ELEVATION 99.85 m **TRIAL PIT SIZE** 0.70*2.0

LOGGED BY Ruby Westnedge **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER		GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	
				0.10 Asphalt	99.75
				Brown slightly gravelly clayey SAND with brick and glass inclusions	
				0.60m to 0.80m - brick layer	
				0.80 Light brown very gravelly slightly clayey SAND	99.05
1					
2				2.00	97.85

Bottom of trial pit at 2.00 metres.

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

GENERAL BH / TP / WELL KENDRICK SCHOOL.GPJ GINT STD A4 ASTM LAB.GDT 18/6/19

CLIENT Darwin Group

PROJECT NAME Kendrick School

PROJECT NUMBER 19-187

PROJECT LOCATION Reading

DATE STARTED 30/5/19

COMPLETED 30/5/19

CO-ORDINATES 471981 mE, 173017 mN

EXCAVATION CONTRACTOR

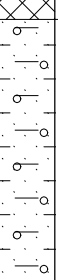
GROUND ELEVATION 99.75 m

TRIAL PIT SIZE 0.70*2.0

EXCAVATION METHOD	Excavator
--------------------------	-----------

LOGGED BY Ruby Westnedge

CHECKED BY BD

DEPTH (m)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS
			0.10 Asphalt
			Brown slightly gravelly clayey SAND with brick inclusions
			0.50 Brown very clayey slightly gravelly SAND
1			
			1.50
			98.25
			99.65
			99.25

Bottom of trial pit at 1.50 metres.

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

CLIENT <u>Darwin Group</u>	PROJECT NAME <u>Kendrick School</u>
PROJECT NUMBER <u>19-187</u>	PROJECT LOCATION <u>Reading</u>
DATE STARTED <u>30/5/19</u> COMPLETED <u>30/5/19</u>	CO-ORDINATES <u>471971 mE, 173040 mN</u>
DRILLING CONTRACTOR <u>GSS</u>	GROUND ELEVATION <u>99.85 m</u> HOLE SIZE <u>101</u>
DRILLING METHOD <u>Windowless Sampler</u>	LOGGED BY <u>Ruby Westnedge</u> CHECKED BY <u>BD</u>

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
0.10					Asphalt	99.75
					Black slightly gravelly very clayey SAND with inclusions of brick and occasional glass fragments	
1					0.80m - 1.00m - Brick cobble	
					1.00	98.85
	SPT	1-1-2-2 (6)			Medium dense dark brown slightly gravelly slightly clayey SAND	
2					1.80m becomes very gravelly	
	SPT	3-3-2-3 (11)			2.60m ; hole collapsed after drilling	
3					3.00m ; continuous SPT due to hole collapsing	
	SPT	5-4-4-5 (18)			3.41	96.44
	SPT	7-9-10-10 (36)				
4	SPT	14-14-15-7 (50)	7 for 35mm			

Refusal at 4.31 metres.
Bottom of borehole at 4.31 metres.

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test



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WELL NUMBER WS02

PAGE 1 OF 1

CLIENT Darwin Group **PROJECT NAME** Kendrick School
PROJECT NUMBER 19-187 **PROJECT LOCATION** Reading
DATE STARTED 30/5/19 **COMPLETED** 30/5/19 **CO-ORDINATES** 471976 mE, 173028 mN
DRILLING CONTRACTOR GSS **GROUND ELEVATION** 99.8 m **HOLE SIZE** 101
DRILLING METHOD Windowless Sampler **LOGGED BY** Ruby Westnedge **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
					0.10 Asphalt 99.70 Black slightly gravelly clayey SAND with inclusions of crushed brick and glass	
1					1.00 98.80 Medium dense brown slightly gravelly slightly clayey SAND	
	SPT	2-3-4-4 (13)				
2					1.80m; becomes very gravelly	
	SPT	3-3-2-4 (12)				
3						
	SPT	16-16-17-1 (50)	1 for 0mm		3.38 96.42 Refusal at 3.38 metres. Bottom of borehole at 3.38 metres.	

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

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WELL NUMBER WS03

PAGE 1 OF 1

CLIENT Darwin Group **PROJECT NAME** Kendrick School
PROJECT NUMBER 19-187 **PROJECT LOCATION** Reading
DATE STARTED 30/5/19 **COMPLETED** 30/5/19 **CO-ORDINATES** 471984 mE, 173022 mN
DRILLING CONTRACTOR GSS **GROUND ELEVATION** 99.75 m **HOLE SIZE** 101
DRILLING METHOD Windowless Sampler **LOGGED BY** Ruby Westnedge **CHECKED BY** BD

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (SPT N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION & REMARKS	WELL DIAGRAM
					0.10 Asphalt 99.65	
					0.30 Brown slightly gravelly clayey SAND with brick inclusions 99.45	
					Medium dense brown very clayey slightly gravelly SAND	
1						
	SPT	1-4-7-6 (18)				
2						
	SPT	3-2-2-2 (9)				
3						
	SPT	15-17-18 ()	18 for 70mm		2.00m; hole collapsed	
					3.37 Refusal at 3.37 metres. Bottom of borehole at 3.37 metres.	
					96.38	

NOTES

SAMPLE TYPE KEY U = Undisturbed D = Disturbed B = Bulk J = Jar VA = Shear Vane SPT = Standard Penetration Test

GENERAL BH / TP / WELL KENDRICK SCHOOL.GPJ GINT STD A4 ASTM LAB.GDT 18/6/19

APPENDIX 3
SOAKAWAY TEST RESULTS

**KEY | GS**

Tel: 01952 822960 info@keygs.com

SOIL INFILTRATION RATE TEST

(B.R.E. Digest 365, 1991, Soakaway Design)

Project:	Kendrick School
Project No:	19-187
Date:	30/05/2019

Trial Pit Number:	A
Length (m):	2.00
width (m):	0.70
Depth (m):	2.00
Groundwater Level:	

Remarks:	TEST 1		TEST 2		TEST 3	
	Time (min)	Depth to Water (m)	Time (min)	Depth to Water (m)	Time (min)	Depth to Water (m)
	0	1.43	0	1.4	0	1.46
	1	1.45	1	1.4	1	1.46
	2	1.48	2	1.41	2	1.47
	3	1.5	3	1.41	3	1.47
	4	1.53	4	1.42	4	1.48
	5	1.55	5	1.43	5	1.48
	10	1.56	10	1.5	10	1.51
	11	1.6	15	1.52	15	1.54
	15	1.64	20	1.58	20	1.55
	20	1.65	25	1.66	25	1.64
	23	1.68	30	1.7	30	1.67
	27	1.73	35	1.73	35	1.7
	30	1.74	40	1.78	95	1.9
	35	1.76	45	1.8		
	40	1.78	75	1.9		
	45	1.8				
	70	1.89				

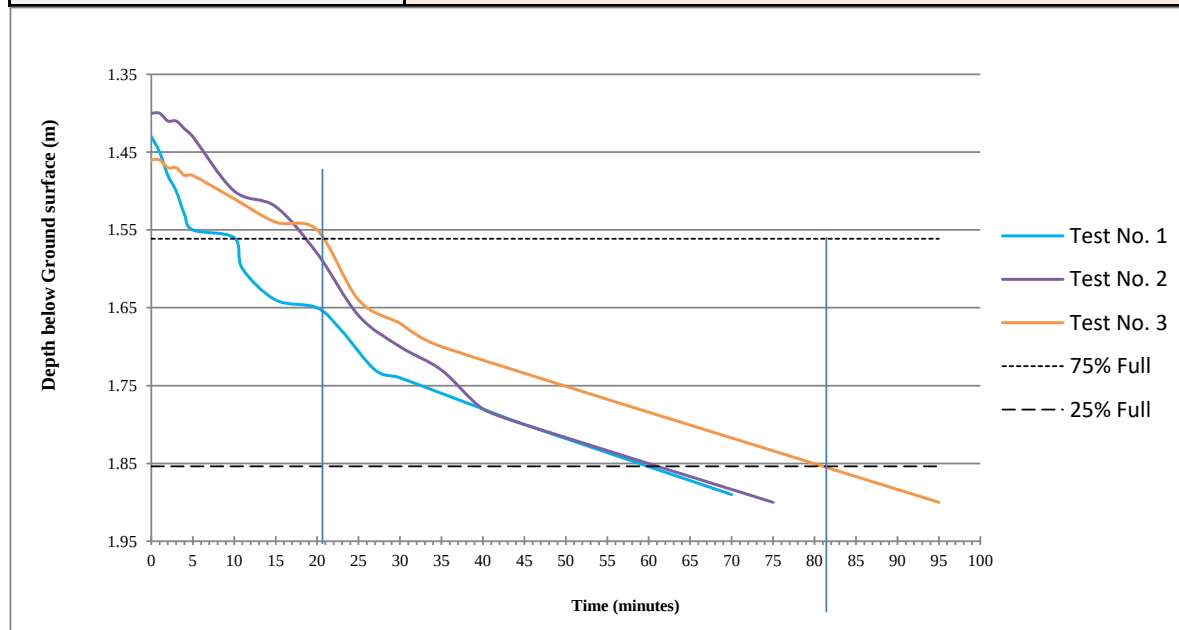
Effective Storage Depth	m	0.57	0.60	0.54
75% Effective Storage Depth	m	0.43	0.45	0.41
(i.e. depth below GL)	m	1.57	1.55	1.60
25% Effective Storage Depth	m	0.14	0.15	0.14
(i.e. depth below GL)	m	1.86	1.85	1.87
Effective Storage Depth 75%-25%	m	0.29	0.30	0.27

Time to fall to 75% effective depth	mins	10	18	21
Time to fall to 25% effective depth	mins	60	62	81

V (75%-25%)	m³	0.40	0.42	0.38
a (50%)	m²	2.94	3.02	2.86
t (75%-25%)	mins	50.00	44.00	60.00

Soil Infiltration Rate	m/s	4.53E-05	5.27E-05	3.67E-05
------------------------	-----	----------	----------	----------

DESIGN Soil Infiltration Rate	m/s	3.67E-05 m/s
--------------------------------------	------------	---------------------



APPENDIX 4
CHEMTECH ENVIRONMENTAL RESULTS



ANALYTICAL TEST REPORT

Contract no: 79132
Contract name: Kendrick School
Client reference: 19-187
Clients name: Key GeoSolutions
Clients address: Nova House
Audley Avenue Enterprise Park
Newport, Shropshire
TF10 7DW

Samples received: 03 June 2019

Analysis started: 03 June 2019

Analysis completed: 10 June 2019

Report issued: 10 June 2019

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:

John Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
79132-1	WS01	0.30-0.70	Sandy Clay with Gravel	-	-	12.9
79132-2	WS02	0.20-0.50	Clayey Sand with Gravel	-	-	17.8
79132-3	WS02	1.20-1.50	Sand with Gravel	-	-	7.0
79132-4	WS03	0.50-1.00	Sand with Gravel	-	-	9.7

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SOILS

Lab number Sample id Depth (m) Date sampled			79132-1 WS01 0.30-0.70 30/05/2019	79132-2 WS02 0.20-0.50 30/05/2019	79132-3 WS02 1.20-1.50 30/05/2019	79132-4 WS03 0.50-1.00 30/05/2019
Test	Method	Units				
Antimony (total)	CE127 ^U	mg/kg Sb	1.6	1.7	0.5	0.5
Arsenic (total)	CE127 ^M	mg/kg As	18	14	8.8	9.4
Barium (total)	CE127 ^M	mg/kg Ba	186	96	29	36
Beryllium (total)	CE127 ^U	mg/kg Be	1.2	<1	<1	<1
Boron (water soluble)	CE129	mg/kg B	0.6	0.6	<0.5	<0.51
Cadmium (total)	CE127 ^M	mg/kg Cd	0.6	0.3	<0.2	<0.2
Chromium (total)	CE127 ^M	mg/kg Cr	49	40	73	47
Copper (total)	CE127 ^M	mg/kg Cu	34	39	8.3	13
Lead (total)	CE127 ^M	mg/kg Pb	1274	288	21	28
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 ^M	mg/kg Mo	4.2	2.9	5.3	3.6
Nickel (total)	CE127 ^M	mg/kg Ni	22	18	13	11
Selenium (total)	CE127 ^M	mg/kg Se	1.1	0.9	0.4	0.4
Vanadium (total)	CE127 ^M	mg/kg V	31	27	24	26
Zinc (total)	CE127 ^M	mg/kg Zn	470	118	34	40
pH	CE004 ^M	units	7.8	7.8	8.1	8.2
Sulphide	CE079	mg/kg S ²⁻	<10	<10	<10	<10
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 ^M	% w/w C	3.4	2.2	0.2	0.4
Estimate of OMC (calculated from TOC)	CE072 ^M	% w/w	5.9	3.8	0.3	0.7
PAH						
Naphthalene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02
Acenaphthene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02
Fluorene	CE087 ^U	mg/kg	<0.02	<0.02	<0.02	<0.02
Phenanthrene	CE087 ^M	mg/kg	0.23	0.09	<0.02	<0.02
Anthracene	CE087 ^U	mg/kg	<0.02	<0.02	<0.02	<0.02
Fluoranthene	CE087 ^M	mg/kg	0.76	0.41	<0.02	<0.02
Pyrene	CE087 ^M	mg/kg	0.68	0.37	<0.02	<0.02
Benzo(a)anthracene	CE087 ^U	mg/kg	0.49	0.26	<0.02	<0.02
Chrysene	CE087 ^M	mg/kg	0.58	0.27	<0.03	<0.03
Benzo(b)fluoranthene	CE087 ^M	mg/kg	0.79	0.45	<0.02	<0.02
Benzo(k)fluoranthene	CE087 ^M	mg/kg	0.33	0.18	<0.03	<0.03
Benzo(a)pyrene	CE087 ^U	mg/kg	0.55	0.33	<0.02	<0.02
Indeno(123cd)pyrene	CE087 ^M	mg/kg	0.58	0.34	<0.02	<0.02
Dibenz(ah)anthracene	CE087 ^M	mg/kg	0.16	<0.02	<0.02	<0.02
Benzo(ghi)perylene	CE087 ^M	mg/kg	0.50	0.32	<0.02	<0.02
PAH (total of USEPA 16)	CE087	mg/kg	5.66	3.02	<0.34	<0.34

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SOILS

Lab number			79132-1	79132-2	79132-3	79132-4
Sample id			WS01	WS02	WS02	WS03
Depth (m)			0.30-0.70	0.20-0.50	1.20-1.50	0.50-1.00
Date sampled			30/05/2019	30/05/2019	30/05/2019	30/05/2019
Test	Method	Units				
BTEX & TPH						
MTBE	CE057 ^U	mg/kg	<0.02	<0.02	<0.02	<0.02
Benzene	CE057 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01
Toluene	CE057 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	CE057 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01
m & p-Xylene	CE057 ^U	mg/kg	<0.02	<0.02	<0.02	<0.02
o-Xylene	CE057 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	2	2	<1	<1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	2	2	<1	<1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	<4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	<4	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	7	13	<4	<4
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	<10	<10	<10
Subcontracted analysis						
Asbestos (qualitative)	\$	-	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Antimony (total)	Aqua regia digest, ICP-MS	Dry	U	0.2	mg/kg Sb
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Barium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ba
CE127	Beryllium (total)	Aqua regia digest, ICP-MS	Dry	U	1	mg/kg Be
CE129	Boron (water soluble)	Hot water extract, ICP-MS	Dry		0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Molybdenum (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Mo
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Vanadium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg V
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE079	Sulphide	Extraction, Continuous Flow Colorimetry	As received		10	mg/kg S ²⁻
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	As received		0.5	mg/kg PhOH
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE072	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry	M	0.1	% w/w
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE057	MTBE	Headspace GC-FID	As received	U	0.02	mg/kg
CE057	Benzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE057	Toluene	Headspace GC-FID	As received	U	0.01	mg/kg
CE057	Ethylbenzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE057	m & p-Xylene	Headspace GC-FID	As received	U	0.02	mg/kg
CE057	o-Xylene	Headspace GC-FID	As received	U	0.01	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
79132-1	WS01	0.30-0.70	N	
79132-2	WS02	0.20-0.50	N	
79132-3	WS02	1.20-1.50	N	
79132-4	WS03	0.50-1.00	N	

Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Kendrick School
Lab Number 79132-1
Sample ID WS01 0.30-0.70m
Date Sampled 30 May 2019
Date Received 3 June 2019
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.201
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 14.88
Dry Matter Content Ratio (DR) % 87.05
Leachant Volume (1) (L2) Litre 0.324
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.230
Eluate Volume (2) (VE2) Litre 1.250

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.4	7.9
Temperature (°C)	20	20
Conductivity (µS/cm)	170	85
Antimony (µg/l Sb)	5.0	2.3
Arsenic (µg/l As)	8.73	8.01
Barium (µg/l Ba)	15.3	9.5
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	<0.2	<0.2
Copper (µg/l Cu)	7.2	4.2
Lead (µg/l Pb)	2.8	10.2
Mercury (µg/l Hg)	0.042	0.025
Molybdenum (µg/l Mo)	5.2	1.9
Nickel (µg/l Ni)	1.1	0.6
Selenium (µg/l Se)	0.96	0.39
Zinc (µg/l Zn)	3	5
Chloride (mg/l Cl)	<1	1.8
Fluoride (mg/l F)	0.4	0.3
Sulphate (mg/l SO ₄)	<10	<10
Total Dissolved Solids (mg/l TDS)	130	65
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	<5	<5

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.010	0.026	0.06	0.7	5
0.017	0.081	0.5	2	25
0.031	0.103	20	100	300
<0.0002	<0.0007	0.04	1	5
<0.0004	<0.002	0.5	10	70
0.014	0.046	2	50	100
0.0056	0.093	0.5	10	50
0.00008	0.00028	0.01	0.2	2
0.010	0.024	0.5	10	30
0.002	0.007	0.4	10	40
0.002	0.005	0.1	0.5	7
0.005	0.045	4	50	200
<2	<17	800	15000	25000
0.8	3.4	10	150	500
<20	<100	1000	20000	50000
260	735	4000	60000	100000
<0.02	<0.1	1		
<10	<50	500	800	1000

Waste Analysis		Units	Result			
Total Organic Carbon		% w/w	3.4	3%	5%	6%
Loss on Ignition		% w/w	4.5			10%
BTEX		mg/kg	<0.06	6		
PCBs (7 congeners)		mg/kg	<0.045	1		
TPH (C10 - C40)		mg/kg	14	500		
PAH (total)		mg/kg	6.41	100		
pH		pH units	7.8		>6	
Acid Neutralisation Capacity (pH4)		mol/kg	0.15		To be evaluated	
Acid Neutralisation Capacity (pH7)		mol/kg	0.03		To be evaluated	

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Comments

Authorised by:

J. Campbell

Name:

John Campbell

Report date:

10 June 2019

Position:

Director

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Tel 01207 528578 Email customerservices@chemtech-env.co.uk
Vat Reg No. 772 5703 18 Registered in England number 4284013

Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Kendrick School
Lab Number 79132-2
Sample ID WS02 0.20-0.50m
Date Sampled 30 May 2019
Date Received 3 June 2019
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.213
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 21.64
Dry Matter Content Ratio (DR) % 82.21
Leachant Volume (1) (L2) Litre 0.312
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.240
Eluate Volume (2) (VE2) Litre 1.260

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.3	8.1
Temperature (°C)	20	20
Conductivity (µS/cm)	163	104
Antimony (µg/l Sb)	4.9	2.1
Arsenic (µg/l As)	10.67	8.29
Barium (µg/l Ba)	10.6	7.9
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	<0.2	<0.2
Copper (µg/l Cu)	7.3	5.2
Lead (µg/l Pb)	0.7	1.0
Mercury (µg/l Hg)	0.029	0.017
Molybdenum (µg/l Mo)	6.9	1.8
Nickel (µg/l Ni)	1.2	0.7
Selenium (µg/l Se)	0.98	0.30
Zinc (µg/l Zn)	<1	<1
Chloride (mg/l Cl)	<1	3.0
Fluoride (mg/l F)	0.1	0.2
Sulphate (mg/l SO ₄)	<10	<10
Total Dissolved Solids (mg/l TDS)	125	80
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	<5	<5

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.010	0.025	0.06	0.7	5
0.021	0.086	0.5	2	25
0.021	0.083	20	100	300
<0.0002	<0.0007	0.04	1	5
<0.0004	<0.002	0.5	10	70
0.015	0.055	2	50	100
0.0013	0.010	0.5	10	50
0.00006	0.00018	0.01	0.2	2
0.014	0.025	0.5	10	30
0.002	0.008	0.4	10	40
0.002	0.004	0.1	0.5	7
<0.002	<0.010	4	50	200
<2	<28	800	15000	25000
0.2	2.0	10	150	500
<20	<100	1000	20000	50000
250	862	4000	60000	100000
<0.02	<0.1	1		
<10	<50	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	2.2	3%	5%	6%
Loss on Ignition	% w/w	7.5			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	43	500		
PAH (total)	mg/kg	3.74	100		
pH	pH units	7.8		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.15		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.03		To be evaluated	

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Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Kendrick School
Lab Number 79132-4
Sample ID WS03 0.50-1.00m
Date Sampled 30 May 2019
Date Received 3 June 2019
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.194
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 10.71
Dry Matter Content Ratio (DR) % 90.33
Leachant Volume (1) (L2) Litre 0.331
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.280
Eluate Volume (2) (VE2) Litre 1.330

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.2	8.2
Temperature (°C)	20	20
Conductivity (µS/cm)	126	78
Antimony (µg/l Sb)	2.3	0.8
Arsenic (µg/l As)	6.12	3.28
Barium (µg/l Ba)	3.3	1.4
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	<0.2	<0.2
Copper (µg/l Cu)	4.8	2.3
Lead (µg/l Pb)	<0.2	<0.2
Mercury (µg/l Hg)	<0.008	<0.008
Molybdenum (µg/l Mo)	2.1	0.4
Nickel (µg/l Ni)	<0.5	<0.5
Selenium (µg/l Se)	0.49	<0.07
Zinc (µg/l Zn)	<1	<1
Chloride (mg/l Cl)	<1	1.8
Fluoride (mg/l F)	<0.1	<0.1
Sulphate (mg/l SO ₄)	<10	<10
Total Dissolved Solids (mg/l TDS)	95	60
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	<5	<5

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.005	0.010	0.06	0.7	5
0.012	0.037	0.5	2	25
0.007	0.017	20	100	300
<0.0002	<0.0007	0.04	1	5
<0.0004	<0.002	0.5	10	70
0.010	0.027	2	50	100
<0.0004	<0.002	0.5	10	50
<0.00002	<0.00008	0.01	0.2	2
0.004	0.007	0.5	10	30
<0.001	<0.005	0.4	10	40
0.001	<0.001	0.1	0.5	7
<0.002	<0.010	4	50	200
<2	<17	800	15000	25000
<0.2	<1	10	150	500
<20	<100	1000	20000	50000
190	656	4000	60000	100000
<0.02	<0.1	1		
<10	<50	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	0.4	3%	5%	6%
Loss on Ignition	% w/w	1.5			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	<10	500		
PAH (total)	mg/kg	<0.36	100		
pH	pH units	8.2		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.17		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.05		To be evaluated	

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