



**Geo-Environmental**

**GROUND INVESTIGATION REPORT**

**for the site at**

**READING GOLF CLUB,**

**KIDMORE END ROAD,**

**READING, RG4 8SQ**

**on behalf of**

**VISTRY THAMES VALLEY**



|                                                                                                                                                                                              |                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Report:                                                                                                                                                                                      | GROUND INVESTIGATION REPORT                                                                                                                             |
| Site:                                                                                                                                                                                        | READING GOLF CLUB, KIDMORE END ROAD, READING, RG4 8SQ                                                                                                   |
| Client:                                                                                                                                                                                      | VISTRY THAMES VALLEY                                                                                                                                    |
| Date:                                                                                                                                                                                        | 11/12/2020                                                                                                                                              |
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## AMENDMENT RECORD

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| EXECUTIVE SUMMARY           |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Site Details                | Site Address            | Reading Golf Club, Kidmore End Road, Reading, RG4 8SQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                             | National Grid Reference | 471657, 176771                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                             | Site Area               | c. 12Ha                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                             | Form of Development     | Proposed to be developed for a residential end use with private gardens, areas of soft landscaping, car parks, access roads, storm water attenuation basins and associated infrastructure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Encountered Conditions      | Scope of works          | An intrusive investigation to clarify the ground and groundwater conditions and support the development of geotechnical and geo-environmental assessments of the site in relation to the proposed development including an investigation into the potential presence of solution features on site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                             | Ground Conditions       | The ground conditions encountered comprised Topsoil or Made Ground overlying sand, gravel and clay soils of the Black Park Gravel Member, clayey soils of Lambeth Group and Chalk of the Seaford Chalk Formation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                             | Groundwater             | <p>Water was encountered within four of the exploratory holes during the intrusive investigation at depths ranging from 2.70m bgl to 3.00m bgl. Monitoring wells were installed within WS01, WS03, WS07, WS12 and WS13.</p> <p>Return groundwater monitoring visits to date encountered water at depths of between 0.60m and 2.25m bgl within WS07, WS12 and WS13. WS01 and WS03 were reported as dry during all four monitoring visits.</p> <p>The water encountered during the intrusive investigation and subsequent monitoring is considered to be perched, or discontinuous water and thus whilst construction activities may need to include water control measures, the water is not considered a receptor of concern in the context of potential contamination.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Geotechnical Considerations | Foundations             | <p>For the purposes of foundation assessment, the site was divided into two zones, with Zone 1 located on the south-eastern limb of the site and Zone 2 located on the north-western limb of the site (see Figure 3).</p> <p>Based on the ground and groundwater conditions encountered within the exploratory holes in Zone 1, it is considered that conventional foundations could be suitable albeit with some deepening of foundations within the zone of influence of trees and hedgerows. Foundations should be taken below any Made Ground or disturbed ground, root zones, desiccated clay soils or the like and terminate wholly within the Black Park Gravel Member, or the Lambeth Group.</p> <p>On the basis of the ground and groundwater conditions encountered in the exploratory holes within Zone 2, it is considered that conventional shallow foundations may be suitable within some areas of Zone 2, albeit with inclusion of sufficient reinforcement to be capable of spanning a void of c. 2-3m diameter in plan, should it form in due course. Further investigation is likely to be required in this area to inform the foundation design and is likely to comprise further Dynamic Probing on a plot by plot basis to investigate the potential presence of possible solution features and inform design. Piled foundations are likely to be required for plots located within areas of high risk of solution features.</p> |



| EXECUTIVE SUMMARY           |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Geotechnical Considerations | Foundations (cont'd) | <p>A net allowable bearing capacity of 90kPa is recommended to account for the presence of firm clay at varying depths in some exploratory holes. Total settlement should remain within tolerable limits for this bearing capacity assuming that foundations terminate in a uniform soil type.</p> <p>Geotechnical laboratory testing has shown the more clayey soils of the Black Park Gravel Member and the Lambeth Group to be of high volume change potential. As such, a minimum founding depth of 1.0m bgl is recommended for conventional foundations on this site. Heave precautions may be required for foundations in excess of 1.5m deep.</p> <p>Foundation design should take account of lower strength soils at depth in some of the exploratory holes and this may result in shallow foundations being unsuitable due to overstressing or settlement issues.</p> <p>Foundations spanning multiple soils types should be avoided and the foundation deepened to terminate on a single soil type where possible.</p> <p>It is understood that an existing Thames Water sewer crosses beneath part of the site at c. 1.7m bgl. No foundations are likely be permitted over or within a set easement of this asset.</p> |
|                             | Floor Slabs          | Given the presence of shrinkable soils, it is recommended that suspended floor slabs are constructed throughout the site. Preliminary modelling indicates a minimum void height of 300mm due to the presence of high volume change potential soils.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                             | Excavations          | Shallow excavations within the Topsoil, and clay soils of the Black Park Gravel Member and the Lambeth Group are likely be stable in the short to medium term assuming the excavations remain dry. Excavations within the more sandy and gravelly Black Park Gravel Member are unlikely to be stable in the short term and some collapse was observed within trial pits during the intrusive investigation. Excavations taken below any water ingress are likely to collapse and will require shoring and dewatering to maintain stability.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                             | Buried Concrete      | Buried concrete should be designed to Class DS-1 (AC-1s).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                             | Buried Services      | Zone 2 has been identified as extending across areas of High and Medium risk for the presence of solution features and also known features have been identified on the north-western portion of Zone 2. It is recommended that simple butt jointed services are not used in this portion of the site due to the potential for leakages to occur at connections. A flexible pipework and connection should be included. If water were to leak from mains supply, storm or foul water systems the leak could induce reactivation of dormant solution features, creation of new dissolution features or saturate to overlying soils any of which could result in catastrophic collapse of the ground                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



| EXECUTIVE SUMMARY            |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | Storm water drainage          | <p>On the basis of the results of soakage testing, it is considered that the rate of infiltration is unlikely to be sufficient for conventional soakaways to function satisfactorily and thus storage and attenuation is likely to be required.</p> <p>The drainage strategy will need to minimise the risk of any infiltration solution exacerbating the status of existing solution features, causing dormant features to become active, or creation of new dissolution features. No infiltration device (basin/pond, swale, soakaway or the like) should be located within 20m of any structure due to the potential for infiltrating water to induce instability and ground collapse. In addition, wherever possible, drainage runs should be diverted away from the feature.</p>                                                                                  |
|                              | Storm water drainage (cont'd) | <p>Currently infiltration basins are shown in the high risk solution feature zone as well as in the vicinity of the known solution feature on site and these would not be acceptable unless measures were included to prevent infiltration, e.g. inclusion of a permanent liner and discharge elsewhere.</p> <p>It is understood that the existing Thames water sewer which crosses the site is located beneath or close to one of the proposed storm water basins. Consultation with Thames Water is recommended at the earliest opportunity to determine whether this is acceptable and what mitigation measures could be required.</p>                                                                                                                                                                                                                              |
|                              | Earthworks                    | Site won soils (clay, sand and gravel) and Chalk may be suitable for re-use as earthworks fill subject to testing in due course and may require treatment to bring them within acceptability limits for placement and compaction.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Environmental Considerations | Human Health                  | <p>As assessment of the soils has identified potential contamination within Made Ground soils underlying the tarmacadam car park. Further analysis of the soils underlying the car park is recommended to investigate the extent of the impacted Made Ground. Should an area of contamination be identified, remediation measures would be required. The actual scope of any remediation would depend on the end use for this area and it is possible that impacted soils might need to be removed from site. Waste Acceptance Criteria (WAC) analysis may be required to confirm the exact classification of the soils for removal.</p> <p>No contamination was identified in soil samples tested from the remainder of the site, i.e. excluding the car park area. As such, no requirement for remedial action has been identified on the remainder of the site.</p> |
|                              | Soft Landscaping              | The assessment did not show any exceedances on the site above the respective generic assessment criteria for a proposed residential land use and thus, no remedial action would be warranted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                              | Groundwater                   | It is considered that no risk mitigation measures are required with respect to groundwater.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                              | Ground Gas                    | Based on ground gas monitoring undertaken to date, no ground gas or vapour risks have been identified which would require remedial action. Ground gas monitoring is still underway on site and this assessment could be subject to change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                              | Radon Gas                     | No radon protection measures are required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                              | Built Environment             | On the basis of the analytical results, it is considered that PVC pipe may be required for potable water supply, together with backfilling trenches with clean, inert granular fill (shingle).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                              | Waste Disposal                | Soil analytical results were screened using CATWASTE and no soils categorised as potentially hazardous waste were identified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**EXECUTIVE SUMMARY**

In addition, all samples of soil submitted for asbestos screens were returned with no asbestos fibres identified.

**Further Action:**

- Further ground investigation will be required on both Zone 1 and Zone 2. In Zone 1, it is likely to comprise investigation to inform design to account for tree influence on clay soils and the like. In Zone 2, the further investigation will need to assess the potential presence of solution features and variable ground conditions beneath plots, provide information for pile design, assess chalk condition and target possible and/or known solution features. If abnormal conditions are encountered, Geotechnical/Geo-Environmental advice should be sought to determine a suitable source of action.
- Further investigation and infiltration testing will be required to inform the design of any SUDS elements such as revised locations of basins, swales, attenuation crates, permeable paving or the like.
- If earthworks are proposed then further testing would be required to inform an earthworks specification, with compliance testing undertaken during any such earthworks construction. In addition, an Earthworks Specification should be prepared which correlates with the earthworks strategy and construction strategy.
- A discovery strategy should be maintained during development such that any abnormal conditions (geotechnical or potential contamination) are identified and their potential impact on the proposed development assessed prior to determining any potential mitigation measures.

*This Executive Summary is intended to provide a brief summary of the main findings and conclusions of the investigation. For detailed information, the reader is referred to the main report ref. GE19428-GIR-DEC20*



## 1.0 INTRODUCTION

Geo-Environmental Services Limited, "Geo-Environmental", was instructed by Vistry Thames Valley, "the Client", to undertake a preliminary investigation of the geotechnical and geo-environmental factors pertaining to Reading Golf Club, Kidmore End Road, Reading, RG4 8SQ, herein referred to as 'the site' (National Grid Reference at centre: 471120, 176760). The site's location is presented in Figure 1.

## 1.2 Form of Development

It is understood that the site is proposed to be developed for a residential usage comprising a number houses, private gardens, access roads and associated infrastructure. In addition, it is likely that public areas of soft landscaping would be proposed.

At the time of writing, a provisional development has been formulated and issued to Geo-Environmental. However, it is considered likely that this layout will change in due course due to development constraints, planning/design requirements and to account for ground conditions and ground hazards.

## 1.3 Objectives

The data from the intrusive investigation was to form the basis of an interpretation with respect to foundation design, concrete specification, excavation stability and other pertinent construction issues and in order to clarify the site's status with regards to soil contamination and any requirement for remedial action in relation to the current land use, proposed redevelopment, adjacent land uses and the wider environment, in the context of likely planning requirements, immediate liabilities under the Environmental Protection Act 1990 and risks posed to Controlled Waters under the Water Resources Act from the current status of the site and in line with the proposed redevelopment.

## 1.4 Standards and References

Where practicable, the investigation was undertaken in accordance with the following documents and guidance:

- National Planning Policy Framework – March 2012;
- Planning Policy Statement 23 – Planning and Pollution Control;
- Model Procedures for the Management of Contaminated Land, CLR11, DEFRA and Environment Agency 2004 (withdrawn 2020);
- Land Contamination Risk Management, Environment Agency, October 2020;
- Environment Agency Guidance on Requirements for Land Contamination Reports, Version 1 dated July 2005;
- BS10175:2011+A2:2017 - Investigation of Potentially Contaminated Sites - Code of Practice, BSI 2017;
- BS5930:2015+A1:2020 - Code of Practice for Site Investigations, BSI 2020;
- EN ISO 14688 Geotechnical Investigation and Testing Part 1-2002 and Part 2-2004;
- BS1377: 1990 - Soils for Civil Engineering Purposes, BSI1990;
- NHBC Standards Chapter 4.1 Land Quality - Managing Ground Conditions;
- NHBC Standards Chapter 4.2 Building Near Trees;
- CIRIA C665 – Assessing risks posed by hazardous ground gases to buildings (2007);
- CIRIA C574 - Engineering in Chalk
- NHBC 10627-R01(04)- Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present (2007);
- BS8485:2015 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings;



- Department of Environment - Industry Profiles (1995 - 1996).

### 1.5 Conditions

This report does not purport to be a “Geotechnical Design Report” as defined in Clause 2.8 of Eurocode 7 (Geotechnical Design BS EN 1997-1:2004) and some of the data used to support this preliminary geotechnical assessment may not be fully compliant with that design code. It is considered possible that further detailed ground investigations could be required to facilitate the detailed geotechnical design process and should be carried out on a structure specific basis if necessary.

The data collected from the investigations have been used to provide an interpretation of the geotechnical and/or environmental conditions pertaining to the site. The recommendations and opinions expressed in this report are based on the data obtained. Geo-Environmental takes no responsibility for conditions that either have not been revealed in the available records, or that occur between or under points of physical investigation. Whilst every effort has been made to interpret the conditions, such information is only indicative and liability cannot be accepted for its accuracy.

It should be noted that in particular the concentrations and levels of mobile liquid and gaseous materials are likely to vary with time. The results obtained may therefore only be representative of the conditions at the time of sampling. This report should not be taken as any guarantee that a site is free of hazardous or potentially contaminative materials.

Information contained in this report is intended for the use of the Client and Geo-Environmental can take no responsibility for the use of this information by any party for uses other than that described in this report. Geo-Environmental makes no warranty or representation whatsoever express or implied with respect to the use of this information by any third party. Geo-Environmental does not indemnify the Client or any third parties against any dispute or claim arising from any finding or other result of this investigation report or any consequential losses.

This report remains the property of Geo-Environmental and the Client has no rights to, or reliance upon this document or supporting documents until such time as payment has been received in full for all invoices for works undertaken in connection with this report.

Assessment criteria or other parameters developed for the evaluation of contamination on this site are based on a number of assumptions regarding exposure and toxicology. Exposure to contaminants and levels of adverse effects may therefore vary. Whilst reasonable care and expertise has been employed in the development of such criteria, no liability is accepted in this respect. Other criteria or guidance on the development of assessment criteria may be published in the future and no liability is accepted in this respect.



## 2.0 SITE CONTEXT

### 2.1 Site Description

At the time of the intrusive investigation, late October 2020, the site comprised an approximately 'L' shaped parcel of land which was in use as an operational golf course and included a clubhouse, tarmac surfaced car park and several holes (comprising tee-off, fairway, rough, bunkers and greens). The ground surface was variable with flat and undulating ground surfaces and a number of depressions and mounded surface features, some of which may be attributed to golf course landscaping, but also some features understood to be associated with natural topography and sub-surface features, including possible solution features.

A number of mature to semi mature trees were located across the site and along the site boundaries. Tracts and stands of trees were also present separating the holes and fairways on the golf course.

The site was accessed by an open driveway off Kidmore End Road, east of the site. The golf course was accessed by a service track running along the north-eastern site boundary.

The site was bounded by residential land use to the east, south and west. Housing was also located to the north and east, i.e. the inner quadrant to the 'L' shape. The golf course continued to the north of the western limb of the subject site. The site boundaries to adjacent land (excluding the continuation of the golf course) comprised wooden fences, wire fences, trees and hedges.

### 2.2 Anticipated Geology

With reference to British Geological Survey (BGS) mapping, the geology of the site was anticipated to comprise a succession of Black Park Gravel (generally anticipated to comprise sand and gravel with possible sub-ordinate clay content), Lambeth Group (interbedded sand and clay) and Seaford Chalk Formation. In addition, given the developed nature of the site it was considered likely that a thickness of Made Ground could be present at locations within the site.

BS5930:2015 defines **Made Ground** as anthropogenic ground in which the material has been placed without engineering control and/or manufactured by man in some way, such as through crushing or washing, or arising from an industrial process. Great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material. In addition, on sites which have undergone several phases of historic development it is not uncommon for asbestos to be present within Made Ground soils.

The **Black Park Gravel** is part of the **Thames Valley Formation** and generally comprises sand and gravel, with possible lenses of silt, clay or peat. The deposits are characterised as horizontally stratified, matrix-supported gravel with thin tabular cross-bedded sand channels.

The **Lambeth Group** comprises a mixture of stiff to hard red, blue/grey and brown mottled clays with basal beds of sand and gravel which vary greatly both laterally and vertically. Locally, these sediments are cemented with calcium carbonate, iron oxides and silica to form materials with relatively high strength. The Lambeth Group sits unconformably over the Chalk, i.e. the junction comprises a geological weathering/erosion boundary and the Lambeth Group soils close to the boundary are often green due to the presence of the mineral glauconite.

The **Seaford Chalk Formation** is part of the **White Chalk Subgroup** and comprises white chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large.

Geological hazards were identified on the wider golf course and comprised 4No. sinkholes and 43No. solution pipes. In addition, a further 33No. natural cavities were identified within 1km of the site. Whilst the hazard mapping did not indicate any of the solution features (sinkholes and solution pipes) to be within the extent of the proposed



development site, several were located close to the east, north and west, and hazard mapping also indicated a higher risk zone for solution features where the Black Park Gravel and/or Lambeth Group thinned out over the Chalk, such that a higher risk zone crossed the north-western portion of the site, see Section 2.3 for further information.

### 2.3 Third Party Information

The following documents have been provided for review and to assist in formulating a scope of works for a preliminary investigation. It should be noted that further investigation is likely to be required to support design in due course.

- Phase 1 Contamination Risk Assessment, prepared by Ground and Environmental Services Limited, ref. 12112 dated February 2019.
- Geophysical Survey Report, prepared by Magnitude Surveys, ref. MSSU661 dated May 2020.
- Flood Risk Assessment and Sustainable Drainage Systems (SuDS) Strategy, prepared by Stantec, ref 67058R1Rev1 dated 02/06/2020.
- Indicative Site Layout, prepared by Paul Hewitt, ref. 2036/PL.04 Rev. N dated July 2020.

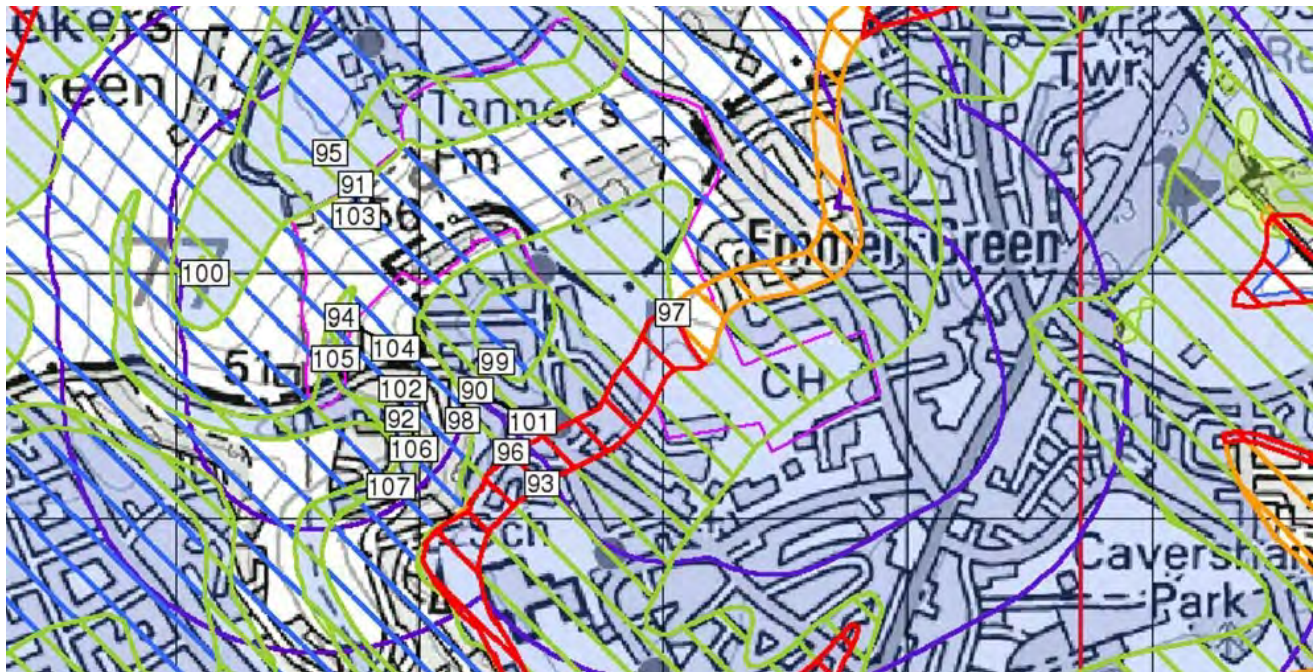
All of these documents were prepared for Fairfax Properties, the landowner, and thus it is assumed that Vistry Thames Valley would have formal reliance on these documents in due course. The factual correctness of third party information is assumed and no liability is accepted for errors or omissions in such information, or subsequent errors where assessment is based on this third party information.

Comments are presented in relation to these documents and where relevant, the Geophysical survey and Indicative Site Layout have been referred to under the review of the Phase 1 Contamination assessment and/or the Flood Risk Assessment.

#### *Phase 1 Contamination Risk Assessment*

This report identified the ground conditions underlying to site to comprise a mixture of Black Park Gravel (generally anticipated to comprise sand and gravel with possible sub-ordinate clay content) and Lambeth Group (interbedded sand and clay) and Seaford Chalk.

Geological hazards were identified on the wider golf course and comprised 4No. sinkholes and 43No. solution pipes. In addition, a further 33No. natural cavities were identified within 1km of the site. Whilst the hazard mapping did not indicate any of the solution features (sinkholes and solution pipes) to be within the extent of the proposed development site, several were located close to the east, north and west, and hazard mapping also indicated a higher risk zone for solution features where the Black Park Gravel and/or Lambeth Group thinned out over the Chalk, such that a higher risk zone crossed the north-western portion of the site.



Extract from Phase 1 Report showing ground stability risk associated with chalk dissolution  
(red hatching is high risk, orange- medium risk, green – low risk; yellow line is approximate site boundary)

The geophysical survey, whilst principally undertaken for archaeological purposes, also identified numerous anomalies within the site. Many of these were recorded as 'ferrous spikes' and thus may be metal fragments in the soil mass, but some anomalies could represent natural hazards and this should be considered further.

The assessment identified a risk of solution features being present beneath the site and set out proposals for an initial investigation to assess ground conditions further. In addition, the assessment recommended incorporation of reinforcement in conventional foundations (assuming they are a suitable option), and siting soakaways at a minimum offset of 20m from any structure. This latter point should be extended to attenuation basins which are designed to drain to the ground and thus have a similar potential to induce collapse of existing sub-surface features and potentially initiate new features. The Indicative Site Layout shows attenuation basins close to or straddling the high-risk solution feature zone (see extract map above).

The report identified potential contamination sources including the grounds keepers sheds/yard (not within the development site), a former chalk quarry (not within the development site), landfill which included deposition of domestic and trade wastes (off-site) and Made Ground (considered as a ground gas source but also a possible source of soil contamination). Whilst most of these potential sources were outside of the proposed development site, it is possible that they might impact the development site, e.g. gas from the off-site landfill, and thus should be considered as part of any investigation and further assessment. In addition to these sources, tarmac and hardstanding areas may be underlain by Made Ground soils and/or aggregates which have the potential to be contaminated by Asbestos.

#### *Flood Risk Assessment (FRA)*

The FRA sets out an initial drainage strategy whereby storm water is proposed to be discharged to the ground via a series of attenuation basins. Infiltration rates were estimated from small scale testing in boreholes, or based on reference to published values. Further testing in accordance with BRE DG365 will be required.

As noted above, the current drainage strategy and development layout show attenuation basins close to, or straddling zones where there is a high risk of solution features and associated ground stability hazards, as well as siting basins adjacent to or close to housing. A minimum offset of 20m should be used when refining the



development layout and the basin areas will need to be investigated to assess the potential for and actual presence and condition of solution features and implications this may have for infiltration.



### 3.0 PRELIMINARY RISK ASSESSMENT SUMMARY

#### 3.1 Contamination Risk Assessment

The Contamination Risk Assessment identified plausible potential pollutant linkages that exist in relation to the proposed redevelopment of the site. The preliminary risk rating for each potential linkage was classified as moderate, low to moderate or low in relation to potential contaminated ground, liquid contaminant sources such as diesel, petrol and oils, asbestos and a landfill orchard located just off site to the north of the site.

The potential pollutant linkages established within the third party Contamination Risk Assessment including the grounds keepers sheds/yard, a former chalk quarry and a landfill which included deposition of domestic and trade wastes (off-site) were not located within the development site but it was considered possible that they might impact the development site, e.g. gas from the off-site landfill, and thus should be considered as part of any investigation and further assessment. In addition to these sources, tarmac and hardstanding areas may be underlain by Made Ground soils and/or aggregates which have the potential to be contaminated by Asbestos.

In order to progress the assessment in line with best practice guidance and to provide further characterisation of the site, it was recommended that an intrusive investigation and associated testing was to be undertaken to confirm the findings of the Contamination Risk Assessment report and to provide a robust risk assessment for the site and proposed development. As such it was recommended that a geochemical and geotechnical investigation be carried out on the site to include analysis of soil samples for the range of potential contaminants identified within the Contamination Risk Assessment and to undertake a period of ground gas monitoring.

#### 3.2 Geotechnical Condition

The following factors that might impact the geotechnical condition of the site were identified as part of the desk study:

- The possible presence of solution features (dormant and/or active) which if encountered may affect the foundation design and construction.
- The possible presence of loose/voided ground overlying or partially infilling solution features and implications for long term stability and performance of roads, foundations, drainage and amenity value.
- The possible presence of Made Ground (e.g. varying depth and/or composition) which if encountered may affect the foundation design and construction.
- The presence of laterally and vertically variable strata and the impact these could have on further construction.
- The suitability of shallow soils as a bearing stratum for conventional foundations.
- Consideration of the volume change potential of any cohesive soils and the affect this could have on foundations.
- The possible presence of aggressive ground conditions (sulphates) which may affect the foundation design and construction.
- The possible presence of perched and shallow groundwater beneath the site.
- The presence of any trees on the site, which may have a significant impact on foundation design and construction if/where shrinkable soils are present.

#### 3.3 Investigation Strategy

The positioning of exploratory holes was determined on site to provide general site coverage as no particular areas of concern had been identified by the desk study. Table 3.1 sets out the investigation strategy adopted.

| Area of Concern           | Investigation                                                                             | Positions |
|---------------------------|-------------------------------------------------------------------------------------------|-----------|
| General ground conditions | Exploratory holes located across the site, coupled with sampling and laboratory analysis. | All       |



| Area of Concern                               | Investigation                                                                                                                                                                                                          | Positions                                          |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Potential contamination of near surface soils | Exploratory holes located to provide coverage of the site, coupled with sampling and laboratory analysis.                                                                                                              | All                                                |
| Potential risk of solution features           | Exploratory holes located to target the north-western limb of site, including area of higher hazard rating identified from the desk study and possible anomalies identified from third party geophysical survey plans. | TP01 – TP07, WS01 – WS10, WS14 and SHDP01 – SHDP10 |
| Area of tarmac car park/hardstanding          | Coring and shallow pitting to confirm tarmac thickness and assess composition of underlying shallow strata, coupled with analysis of selected soil samples to inform a preliminary contamination assessment.           | C1 – C8                                            |
| Gas and groundwater monitoring                | Standpipes installed to accommodate gas and groundwater monitoring.                                                                                                                                                    | WS01, WS03, WS07, WS12 and WS13                    |

**Table 3.1 Summary of the investigation strategy**

Soil samples were collected and placed into amber jars and cool boxes on site for transit to the office, where they were stored under chilled conditions (<4°C) prior to final transportation in cool boxes to the laboratory by their in-house courier. Both the geotechnical and contamination testing were undertaken by UKAS accredited laboratories. Contamination testing of soil samples was also undertaken in accordance with accredited MCERTS protocols. Samples were stored in temperature-controlled conditions from sampling until receipt at the laboratory from which time sample preparation and storage was determined by testing requirements and in line with laboratory's protocols.

### 3.3 Scope of Works

The investigation strategy comprised construction of exploratory holes across the site to assess ground and groundwater conditions and to support the geotechnical and geo-environmental assessment. The investigation included:

- Coring through existing tarmac access road and car park surfacing to determine the tarmac thickness and assess the materials on which the tarmac has been laid. Sampling of soils below tarmac for geochemical testing.
- Construction of 8No. trial pits to provisional depths of 3m bgl. 3-4No. trial pits were to be used for trial pit soakage testing and the remaining pits were to be used to target geophysical anomalies which might represent sub-surface hazards such as solution features.
- Undertake trial pit soakage tests within 4No. trial pits in general accordance with BRE Digest 365.
- Undertake Dynamic Cone Penetrometer tests at intervals along the anticipated main estate road alignment to assess the in-situ CBR profile of the upper metre of ground.
- Construction of 14No. dynamic sampler boreholes to depths of up to 5m bgl, depending on drilling conditions, using a self-propelled track mounted rig.
- Super heavy dynamic probing at 10No. locations to depths of up to 8m bgl to inform the geotechnical assessment.
- Installation of a combined ground gas and groundwater monitoring well within 5No. boreholes to facilitate return monitoring. The wells were completed with a lockable cover fitted flush with adjacent ground.
- Ground gas monitoring (spot monitoring) of well installations on 6 occasions over a 2-3 month period. Wherever possible, the monitoring would target periods of low or rapidly falling atmospheric pressure.
- Geotechnical laboratory testing to support the geotechnical assessment for foundations, ground floor construction, pavement design and buried concrete design.
- Geochemical laboratory testing for a suite of commonly occurring brownfield contaminants.
- Waste categorisation testing in soil samples to aid the assessment of likely waste classification of surplus soils.
- Provision of a Ground Investigation Report on completion of testing and monitoring.



## 4.0 ENCOUNTERED CONDITIONS

A factual record of the conditions encountered during the physical investigation of the site is presented in the following sections. For further details of the ground conditions, reference should be made to the exploratory hole logs and in situ testing presented in Appendix A, the geotechnical testing results in Appendix B, geochemical testing results in Appendix C and gas monitoring results presented in Appendix D.

The physical ground investigation works were undertaken from the 26<sup>th</sup> to the 30<sup>th</sup> October 2020, with gas and groundwater monitoring ongoing at the time of writing.

Unless stated otherwise, all depths are reported as metres below ground level (m bgl).

### 4.1 Soils

The ground conditions encountered within the exploratory holes were broadly consistent with those anticipated, i.e. a succession of Topsoil or Made Ground, over sand, gravel and clay of Black Park Gravel, clay and sand strata of the Lambeth Group and Chalk encountered at depth in a number of exploratory holes. A generalised summary of the encountered conditions is presented in Table 4.1.

| Top (m bgl) | Base (m bgl)                              | Geology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Positions                                      |
|-------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 0.00        | 0.20 – 0.50                               | <b>Topsoil:</b> Dark brown SILT with varying proportions of gravel, rootlets and roots (1-50mm); Brown fine SAND with varying proportions of gravel, rootlets and roots (1-20mm).                                                                                                                                                                                                                                                                                                                                         | All except WS05, WS07, WS09, WS14, C1-C8.      |
| 0.00        | 0.20 – 0.40                               | <b>Made Ground:</b> Dark brown CLAY with varying proportions of brick fragments, sand, gravel and rootlets; Brown SAND/SILT with varying proportions of clay, gravel, brick, clinker, rootlets and roots; Tarmacadam and Type 1 Subbase (C1-C8), Greyish brown/yellowish brown SAND and GRAVEL with brick fragments, concrete rubble and tarmacadam fragments (C1, C7); Dark brown gravelly SILT/SAND with a mild organic malodour and brick fragments (C2, C3)                                                           | WS05, WS07, WS09, WS14                         |
| 0.20 – 0.40 | 1.20 (base of hole) – 5.00 (base of hole) | <b>Black Park Gravel:</b> Brown/dark brown/orangish brown/yellowish brown fine to medium SAND with varying proportions of gravel, cobbles, boulders, rootlets and roots; Orangish brown SAND and GRAVEL with varying proportions of clay, cobbles, boulders, black flecking, rootlets and roots; Soft to stiff orangish brown/pale grey CLAY with varying proportions of sand, gravel, roots and rootlets and rotting roots and rootlets; Orangish brown/brown GRAVEL with varying proportions of clay, sand and cobbles. | All                                            |
| 0.80 – 2.90 | 2.50 (base of hole) – 5.00 (base of hole) | <b>Lambeth Group:</b> Stiff to very stiff thinly bedded (WS06) bluish grey/orangish brown/yellowish brown/greenish grey/reddish brown CLAY with varying proportions of silt, sand, black flecking, sand lenses (1-2mm thick) and rotting roots and rootlets; Orangish brown and grey fine to medium SAND with varying proportions of gravel.                                                                                                                                                                              | TP04, TP05, TP07, TP08, WS04, WS06, WS07, WS14 |
| 1.80 - 1.90 | 2.50 (base of hole) - 3.70 (base of hole) | <b>Seaford Chalk Formation:</b> Recovered as off white to cream weathered CHALK composed of silty gravel sized clasts with flints of fine to coarse gravel size and brown clayey sandy chalk matrix. Where encountered in TP05 the chalk was estimated to be CIRIA Grade Dm/Dc, the method of drilling for WS03 and WS04 could destroy any structure and thus a CIRIA grading has not been estimated at this stage.                                                                                                       | TP05, WS03, WS04                               |

**Table 4.1 Summary of encountered ground conditions**

With the exception of brick, concrete rubble and tarmacadam fragments and a mild organic malodour within soils encountered beneath the tarmacadam car park (C1-C8), no visual or olfactory evidence of potential contamination was identified during the intrusive investigation.



As noted in Table 4.1, Chalk was only encountered within three of the exploratory holes, TP05, WS03 and WS04. With reference to the respective exploratory hole logs, the chalk was encountered from an elevation of 77.7m AOD in TP05 and 77.9m AOD in WS04, but from 76.6m AOD in WS03 and this suggests a non-uniform depth to the Chalk where it was encountered. This is further supported by the fact that the Black Park Gravel Member and Lambeth Group strata were encountered to elevations below where Chalk was encountered in these three exploratory holes. Therefore, extreme caution should be adopted wherever any estimate or interpolation of Chalk depth or level is attempted between exploratory hole positions and any such estimate or interpolation would require further investigation to verify/clarify conditions. It is anticipated that whilst the weathering profile for the upper surface of the Chalk is likely to be uneven, changes would be highly variable. If or where any solution features are present, changes in depth to the Chalk are likely to be sudden and can vary from bowl shaped surfaces such as associated with suffusion to vertical or near-vertical 'plunging' surface associated with conical to cylindrical solution features and solution pipes.

The ground conditions encountered in the exploratory holes did not provide clear evidence of the presence of solution features. However, such features are known to exist in the north-western corner of the site and a High and Medium hazard rating was identified across the north-western limb and thus the presence of solution features below or away from exploratory hole locations cannot be ruled out. More detailed investigation will be required in due course to inform design.

No investigation was undertaken as part of this phase of works in relation to the known/reported solution feature located in the north-western corner of the site. The extent, composition and any infill associated with this feature may require further investigation in due course.

Pocket penetrometer testing was undertaken on samples of clay soils recovered from the dynamic sampler boreholes. Figure 5 presents the pocket penetrometer results with depth and indicates that zones of lower results were recorded in the sandy clay in WS01 at 2.5m bgl; around the junction between clay and wet sandy clay at 3.0m bgl in WS08; and silty clay in WS13 at 2.0-4.0m bgl. In addition, possible high result outliers were evident in the clay in WS08 at 2.5m bgl and silty clay in WS09 at 2.5-3.0m bgl.

For more detailed descriptions at specific locations, reference should be made to the exploratory hole logs presented in Appendix A.

## 4.2 Groundwater

Water was encountered during the intrusive investigation works within four of the exploratory hole positions on site, details of which are presented in Table 4.2.

| Location | Depth of strike (m bgl) | Water rose to (m bgl) | Time elapsed (min) |
|----------|-------------------------|-----------------------|--------------------|
| TP07     | 2.70                    | 2.90                  | 20                 |
| TP08     | 2.90                    | 3.00                  | 20                 |
| WS06     | 3.00                    | 3.00                  | 20                 |
| WS13     | 3.00                    | 3.00                  | 20                 |

**Table 4.2 Water strikes within exploratory hole positions**

In addition to groundwater, some soil layers were recorded to have had a notable water content, i.e. visibly wet, details of which are outlined in Table 4.3. Each of these observations relate to soils inferred to comprise Black Park Gravel Member.



| Location | Water content  | Depth range (m bgl) | Geology             |
|----------|----------------|---------------------|---------------------|
| TP04     | 'slightly wet' | 0.40 – 0.90         | Gravelly sandy CLAY |
| TP08     | 'wet'          | 1.80 – 2.90         | SAND and GRAVEL     |
| WS06     | 'slightly wet' | 2.00 – 2.60         | Medium SAND         |
| WS08     | 'wet'          | 3.10 – 3.70         | Gravelly sandy CLAY |
| WS12     | 'slightly wet' | 2.60 – 4.00         | Gravelly SAND       |
| WS13     | 'wet'          | 3.60 – 4.00         | Sandy CLAY          |

Table 4.3 Details of visible water content in encountered soils

Combined ground gas and groundwater monitoring wells were installed within WS01, WS03, WS07, WS12 and WS13 on site. These locations were chosen to provide general coverage of the site. At the time of writing, three of six proposed return gas and groundwater monitoring visits to site have been completed. Details of water encountered within the monitoring wells are presented in Table 4.4.

| Hole ID | Depth to water (m bgl) |          |          |
|---------|------------------------|----------|----------|
|         | 06/11/20               | 17/11/20 | 01/12/20 |
| WS01    | Dry                    | Dry      | Dry      |
| WS03    | Dry                    | Dry      | Dry      |
| WS07    | 1.95                   | 0.75     | 1.65     |
| WS12    | 0.90                   | 0.75     | 1.20     |
| WS13    | 0.70                   | 0.60     | 2.25     |

Table 4.4 Groundwater monitoring results in wells to date

Given the varying ground conditions encountered across the exploratory holes on site, the absence of water within the majority of exploratory holes during the intrusive investigation and also within two of the five monitoring wells, it is considered likely that the water encountered on site is a perched or discontinuous body of water. Nonetheless the potential to encounter water during construction and possible requirement for mitigation/control measures to be required is considered likely. With reference to Table 4.3, several of the 'wet' records relate to granular soil layers which could be prone to running sand, slumping or the like if exposed in excavations.

It should also be noted that changes in groundwater levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a series of standpipes or piezometers installed with appropriate response zones.

### 4.3 Ground Gases and Vapours

The third-party Contamination Risk Assessment report identified potential contamination sources located outside the development site (the grounds keepers sheds/yard, a former chalk quarry and a landfill which included deposition of domestic and trade wastes). In addition, organic rich Made Ground if encountered was considered a potential source for ground gas. Whilst most of these potential sources were outside of the proposed development site, it was considered possible that they might impact the development site, e.g. gas from the off-site landfill.

At the time of writing three out of six proposed ground gas monitoring visits had been conducted on the subject site. The objective of the ground gas monitoring was to assess the potential risk identified from the third party Contamination Risk Assessment report and also to provide an indication of possible winter groundwater conditions which might have relevance to the emerging drainage strategy.

The spot monitoring undertaken to date has detected the presence of methane at concentrations of up to 1.3%. This methane reading occurred within WS01 during the first return monitoring visit on 06/11/20. Given that this reading was an initial reading from the gas monitor, with the readings dropping to and remaining at 0.0% within 10 seconds, it is considered likely that this was an anomalous reading. In addition, the ground conditions encountered in WS01 were not considered to indicate a putrescible or methanogenic content. Outside of this anomalous reading, the spot monitoring undertaken to date has not detected the presence of methane within WS01 or any of the other



monitoring wells. Thus, the reading of 1.3% will not be considered part of the dataset. Carbon dioxide has been detected at concentrations in the range of 0.0% to 4.6% and oxygen in the range of 11.4% to 20.5%. Borehole flows were measured at 0.0l/hr and VOCs up to 2.6ppm during the monitoring. Atmospheric pressure was recorded in the range of 1008mb to 1017mb during the visits undertaken.

The implications of the gas monitoring data are considered in Section 6 of this report.

Should any previously undetected source of hazardous ground gases be identified during construction, this should be reported to Geo-Environmental immediately in order that any necessary gas assessment and/or monitoring can be instigated.

#### 4.4 Obstructions

With the exception of refusal on naturally occurring hard layers within the soil (likely flint gravel, dense sands or stiff clays), no natural or artificial obstructions were encountered during the intrusive investigation works undertaken. The presence of natural and/or manmade obstructions elsewhere on site cannot be discounted and any ground works could encounter hard bands or rock layers.

#### 4.5 Chemical Analysis

In order to assess the general chemical quality of the strata encountered, samples of soils recovered from the exploratory holes were submitted for analysis for a range of potential contaminants selected on the basis of the findings of the third-party Contamination Risk Assessment study and supported by CLR publication CLR8 and Environment Agency R&D66 publication.

The testing rationale included sampling and analysis to provide a general coverage of the subject site. Testing was undertaken for a broad range of commonly occurring contaminants including metals, metalloids, inorganic compounds, phenols, speciated TPH, PAH and asbestos as identified from the information presented within the desk study for the site.

#### 4.6 Geotechnical Testing

10No. dynamic probe (DP) tests were undertaken, as a super heavy 'SHDP' method, at depths of up to 8m bgl across the site. DPs were conducted in order to investigate potential 'soft', loose or voided zones which could be indicative of suspected solution features across the site, as highlighted within a previous third party report.

Recordings of no (zero) blows per 100mm increment were recorded in a number of locations, details of which are outlined in Table 4.5. Given the presence of water seemingly sporadically across the site, it is considered possible that zones of lower penetration resistance encountered within the Black Park Gravel could represent soft clays and/or loose wet sands.

| Location | Depth of 'soft' zones recorded (m bgl) | Geology (estimated based on nearby exploratory holes) |
|----------|----------------------------------------|-------------------------------------------------------|
| SHDP03   | 0.20 – 0.30                            | Black Park Gravel                                     |
|          | 0.40 – 0.60                            | Black Park Gravel                                     |
|          | 0.70 – 0.80                            | Black Park Gravel                                     |
| SHDP04   | 1.20 – 1.30                            | Black Park Gravel                                     |
| SHDP09   | 0.10 – 0.30                            | Black Park Gravel                                     |
|          | 0.40 – 0.60                            | Black Park Gravel                                     |

**Table 4.5 Summary of 'soft' zones recorded within dynamic probes**

Given that the relative soft zones encountered were located within the Black Park Gravel soils and for limited depth ranges, it is considered unlikely that they represent solution features, i.e. for which zero or low blows over a greater depth range would be anticipated. These 'soft' depth zones were underlain by strata of the Black Park Gravel and/or Lambeth Group to the base of the adjacent exploratory holes and no clear evidence of possible solution features



was identified within these exploratory holes. Despite this, the relative soft zones were encountered within, or in the vicinity of an area mapped as medium-high risk areas for chalk dissolution hazards. Therefore, the presence of solution features within this zone and in proximity to these exploratory holes cannot be ruled out. Furthermore, these strata may be more susceptible to internal erosion or wash out of fine soil particles if water infiltrates through these soils and this could cause subsidence in these soils. The dynamic probe results should be considered alongside other evidence including areas of known solution hazards as presented within Figure 2 for the site.

Dynamic Probe test results across the site showed a general trend of increasing blow count/resistance with depth at the positions probed.

Soakage testing was undertaken at selected locations across the site and the results are presented in Appendix A and discussed in Section 5.5 of this report.

Geotechnical laboratory tests were undertaken on selected samples of the key strata encountered on this site. The results are summarised in Table 4.6.

| Parameter                                   |                 | Black Park Gravel Member                                                                            | Lambeth Group                                            | Seaford Chalk Formation            |
|---------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------|
| Natural Water content (%)                   |                 | 8 – 40                                                                                              | 19 – 34                                                  | 26 – 29                            |
| Liquid Limit (%)                            |                 | 23 – 74                                                                                             | 40 – 80                                                  | -                                  |
| Plastic Limit (%)                           |                 | 12 – 28                                                                                             | 21 – 29                                                  | -                                  |
| Plasticity Index Ip (%)                     |                 | 9 – 46                                                                                              | 19 – 58                                                  | -                                  |
| Modified Plasticity Index Ip' (%)           |                 | 4.4 – 46                                                                                            | 19 – 57                                                  | -                                  |
| Classification (A-Line Plot)                |                 | CL – CV                                                                                             | CI – CV                                                  | -                                  |
| Soil grading                                |                 | Silty CLAY; sandy silty CLAY; sandy silty gravelly CLAY, clayey gravelly SAND, clayey sandy GRAVEL. | CLAY; silty CLAY; sandy silty CLAY; gravelly silty CLAY. | 'Putty' CHALK with chalk fragments |
| Particle Size Distribution                  | Very coarse (%) | 0.0                                                                                                 | -                                                        | -                                  |
|                                             | Gravel (%)      | 6.0 – 49.7                                                                                          | -                                                        | -                                  |
|                                             | Sand (%)        | 32.3 – 69.9                                                                                         | -                                                        | -                                  |
|                                             | Fines (%)       | 18.0 – 24.1                                                                                         | -                                                        | -                                  |
| pH                                          |                 | 6.3 – 7.4                                                                                           | 6.8                                                      | -                                  |
| Water soluble sulphate (g/l)                |                 | <0.02                                                                                               | <0.02                                                    | -                                  |
| Total Sulphur (%)                           |                 | <0.01 – 0.01                                                                                        | 0.01                                                     | -                                  |
| Acid Soluble Sulphate (SO <sub>4</sub> , %) |                 | <0.02 – 0.03                                                                                        | <0.02                                                    | -                                  |
| Saturation Moisture Content (%)             |                 | -                                                                                                   | -                                                        | 26 – 28                            |
| Bulk Density (Mg/m <sup>3</sup> )           |                 | -                                                                                                   | -                                                        | 1.94 – 2.04                        |
| Dry Density (Mg/m <sup>3</sup> )            |                 | -                                                                                                   | -                                                        | 1.54 – 1.58                        |

**Table 4.6 Summary of geotechnical laboratory test results**

A plot of soil moisture content versus depth is presented on Figure 6. This shows some spread of results but indicates some moisture contents are on the low side of the main cluster as summarised in Table 4.7.

| Depth (m bgl) | Location                     | Soil description                                              |
|---------------|------------------------------|---------------------------------------------------------------|
| 0.5           | TP02                         | Sandy gravelly clay                                           |
| 1.0           | WS03<br>WS11<br>WS12<br>TP08 | Gravelly clay<br>Sand and gravel<br>Very sandy clay<br>Gravel |
| 2.0           | WS12                         | Very gravelly sandy clay                                      |



| Depth (m bgl) | Location | Soil description |
|---------------|----------|------------------|
|               | TP04     | Sandy clay       |
| 2.5           | WS09     | Very silty clay  |

**Table 4.7 Summary of low moisture contents**

Where lower moisture contents were reported in sand and/or gravel soils these are unlikely to have relevant to foundation design or performance. However, where low moisture contents are associated with clay soils, these could be indicators of possible desiccation and should be considered further as part of detailed foundation design. Where low moisture content in clay also correspond to high pocket penetrometer results, this may further indicate possible desiccation, e.g. WS09 at 2.5m bgl and this may require further investigation or deep foundations to account for desiccation. Moisture content is not a constant in any soil and is subject to seasonal trends, external influences such as drainage (natural and artificial) and tree influence.



## 5.0 ENGINEERING CONSIDERATIONS

Subsequent to intrusive investigation of the site and receipt of the laboratory test results, the following geotechnical assessments have been made.

### 5.1 Foundations

Given the risk of solution features on site, foundation recommendations are presented based on zones as outlined within Figure 3. Zone 1 comprises the south-east portion of the site and is located outside of any known or encountered evidence of solution features. Zone 2 is in the north, central and south-western area of the site, and includes an area of high and medium hazard rating in relation to solution features as mapped in the third party Phase 1 report, the area of known solution features and the area surrounding relative soft zones recorded within in-situ Dynamic Probe tests undertaken during the intrusive investigation.

#### *Zone 1*

On the basis of the ground and groundwater conditions encountered in the exploratory holes within Zone 1, it is considered that conventional shallow foundations may be suitable for the proposed development within Zone 1, albeit with some deepening of foundations within the zone of influence of trees and hedgerows.

It is considered that the soils of the Black Park Gravel Member and the Lambeth Group should be classified 'en-masse' as high volume change potential. In line with NHBC Standards Chapter 4.2 a minimum founding depth of 1.0m bgl is recommended. Heave protection should be installed for any foundations extending deeper than 1.5m bgl.

Foundations should pass through any desiccated soils, root zones, Topsoil, Made Ground, disturbed ground, loose ground, fill material, soft and weathered ground and terminate wholly within the firm or stiff clay, or sand and gravel of the Black Park Gravel Member or the Lambeth Group. Due consideration is required during plot specific foundation design in relation to the reported presence of lower strength soils at depth in some of the exploratory holes, e.g. WS13, as this could have an adverse impact on bearing capacity and subsequent settlement.

A net allowable bearing capacity of 90kPa is recommended for the firm to stiff clay and sand/gravel soils of the Black Park Gravel and stiff clay soils of the Lambeth Group. This value has been limited to account for the reported presence of firm clay in some exploratory holes and thus could be conservative where higher strength soils are present. Total settlement should remain within tolerable limits for this bearing capacity.

Where foundations are proposed to be constructed within the zone of influence of trees, it is possible that foundations would need to be deepened to account for the presence and influence of trees. It is possible that foundation bases would require to be stepped and as such, it is recommended that steps do not exceed 0.50m in height at any point and are at least 1.0m (lateral distance) away from any corner or node point on the foundations, unless otherwise specified by an approved plot specific detailed foundation design. Where this cannot be accommodated, the foundation should be formed at the greater depth. Where the depth of foundations requires deepening beyond 2.50m bgl on account of trees, the use of a piled foundation solution on site may be more appropriate. Further investigation would be required to inform the pile design and would be likely to require the construction of a number of boreholes to 25m bgl.

Foundations which are proposed in proximity to trees and hedgerows (remaining, removed or proposed) should be designed in accordance with NHBC Standards Chapter 4.2, and design approaches 4.2B and 4.2C, which incorporate the water demand of trees and the distance of the tree from the nearest portion of foundation.

It is recommended that foundation excavations be concreted or blinded as soon after excavation as possible. Where concreting could take place the following day it is recommended that excavations are not taken to full depth overnight and that the final 0.5m of cover is only removed immediately prior to concreting. Long, deep excavations should be avoided in order to mitigate the risk of trench side collapse prior to concrete pour.



The foundation designer should also take account of constructability of conventional foundations and additional measures which may be required to support excavations and/or control groundwater ingress into foundation excavations during construction.

### *Zone 2*

On the basis of the ground and groundwater conditions encountered in the exploratory holes within Zone 2, it is considered that conventional shallow foundations may be suitable within some areas of Zone 2. Further investigation will be required in this area to inform the foundation design. Further investigation is likely to comprise further Dynamic Probing to investigate indicators for, or the presence of possible solution features. Plots where conventional foundations might be possible will need probing and foundations should be designed to span a cavity of 2-3m diameter (sub-circular in plan beneath any part of the foundation). In addition, where conventional foundations are deemed suitable, deepening of foundations within the zone of influence of trees and hedgerows may be required.

Plots located within areas at high risk of solution features will require piled foundations. Higher risk plots will require piled foundations. Further investigation would be required to inform the pile design and would be likely to require the construction of a number of boreholes to depths of at least 25m bgl. In addition, probing may be required on some plots spanning the edge, or close to the higher risk zone boundaries which are approximations and not absolute or defined boundaries. It may also be necessary to construct boreholes using rotary drilling techniques to enable detailed logging of the Chalk (condition, strength, fractures and the like).

Irrespective of final foundation solution for any given plot, it is considered that the soils of the Black Park Gravel Member and the Lambeth Group should be classified 'en-masse' as high volume change potential. In line with NHBC Standards Chapter 4.2 a minimum founding depth of 1.0m bgl is recommended. Heave protection should be installed for any foundations extending deeper than 1.5m bgl.

Foundations should pass through any desiccated soils, root zones, Topsoil, Made Ground, disturbed ground, loose ground, fill material, soft and weathered ground and terminate wholly within the natural soils of the Black Park Gravel Member, Lambeth Group or Chalk. Founding across multiple strata should be avoided in Zone 2 and thus foundations should be deepened where feasible.

A net allowable bearing capacity of 90kPa is recommended for the firm to stiff clay and sand/gravel soils of the Black Park Gravel, stiff clay soils of the Lambeth Group and Chalk. This value has been limited to account for the reported presence of firm clay in some exploratory holes and thus could be conservative where higher strength soils are present. Total settlement should remain within tolerable limits for this bearing capacity.

Notwithstanding the above, the foundation designer should take account of the reported presence of lower strength soils at variable depths within some of the exploratory holes, as indicated in WS01, TP03, SHDP3, SHDP4 and SHDP9.

Where foundations are proposed to be constructed within the zone of influence of trees, it is possible that foundations would need to be deepened to account for the presence and influence of trees. It is possible that foundation bases would require to be stepped and as such, it is recommended that steps do not exceed 0.50m in height at any point and are at least 1.0m (lateral distance) away from any corner or node point on the foundations, unless otherwise specified by an approved plot specific detailed foundation design. Where this cannot be accommodated, the foundation should be formed at the greater depth. Where the depth of foundations requires deepening beyond 2.50m bgl on account of trees, the use of a piled foundation solution on site may be more appropriate. Further investigation would be required to inform the pile design and would be likely to require the construction of a number of boreholes to 25m bgl.

Foundations which are proposed in proximity to trees and hedgerows (remaining, removed or proposed) should be designed in accordance with NHBC Standards Chapter 4.2, and design approaches 4.2B and 4.2C, which incorporate



the water demand of trees and the distance of the tree from the nearest portion of foundation.

It is recommended that excavations for any conventional foundations be concreted or blinded as soon after excavation as possible. Where concreting could take place the following day it is recommended that excavations are not taken to full depth overnight and that the final 0.5m of cover is only removed immediately prior to concreting. Long, deep excavations should be avoided in order to mitigate the risk of trench side collapse prior to concrete pour.

The foundation designer should also take account of constructability of conventional foundations and additional measures which may be required to support excavations and/or control groundwater ingress into foundation excavations during construction.

## 5.2 Floor Slabs

Given the presence of shrinkable soils encountered at shallow depth across the site within the Black Park Gravel Member and the Lambeth Group, it is recommended that suspended floor slabs are constructed throughout the site. Preliminary modelling indicates a minimum void height of 300mm due to the presence of high volume change potential soils. Consideration should also be given to heave associated with the presence of any seasonal desiccation and ongoing influence of trees.

## 5.3 Excavations

Shallow excavations within the Topsoil and clay soils of the Black Park Gravel Member and Lambeth Group are likely be stable in the short to medium term above any water ingress. Excavations within the sands and gravels of the Black Park Gravel Member are likely to become unstable in the short term. Large scale excavations and those taken below any water ingress are likely to collapse and will require shoring and dewatering to maintain stability. Where Chalk is encountered in excavations, it may be possible for the excavation to remain stable at relatively steep angle, subject to Chalk condition, fracturing and the like, albeit that some overbreak and spalling should be expected. Excavations in structureless Chalk are unlikely to remain stable in the medium to long term.

Ground works should be designed in such a manner to avoid any requirement for construction or maintenance personnel to enter into or work within excavations. If such work cannot be avoided, then it should only be permitted once a safe system of work, supported by a robust risk assessment, has been determined and implemented.

## 5.4 Sulphates

The results of the water soluble sulphate and pH analyses of soil and groundwater samples indicate that buried concrete, i.e. shallow foundations within the Black Park Gravel Member or Lambeth Group, should be designed in accordance with Class DS-1 of BRE Special Digest 1, with an ACEC class of AC-1s. Whilst this might also be applicable to foundations cast into the Chalk, further testing to verify this would be recommended.

## 5.5 Soakaways

Soakage testing in accordance with BRE DG365 was attempted within four trial pits (TP01, TP02, TP04 and TP05). The results are presented in Table 5.1 below. Results sheets are presented in Appendix A.

| Trial pit | Infiltration rate (m/s) |                      |                      | Notes                                 |
|-----------|-------------------------|----------------------|----------------------|---------------------------------------|
|           | Test cycle 1            | Test cycle 2         | Test cycle 3         |                                       |
| TP01      | $1.1 \times 10^{-5}$    | $5.7 \times 10^{-6}$ | $7.4 \times 10^{-6}$ | -                                     |
| TP02      | $2.1 \times 10^{-6}$    | $1.9 \times 10^{-6}$ | $1.9 \times 10^{-6}$ | -                                     |
| TP04      | -                       | -                    | -                    | Testing aborted due to collapsing pit |
| TP05      | $4.7 \times 10^{-6}$    | $3.4 \times 10^{-5}$ | $3.2 \times 10^{-5}$ | Partial collapse during test          |

**Table 5.1 Summary of soakage test results**



On the basis of the results of soakage testing, it is considered that whilst infiltration of storm water into the ground may be achievable, the rate of infiltration is unlikely to be sufficient for conventional soakaways to function satisfactorily and thus storage and attenuation is likely to be required. It is understood that the emerging drainage strategy includes infiltration basins. Additional measures such as swales, reed beds and the like may also be required to provide sufficient filtration to protect underlying groundwater resources.

As mentioned above, the third party desk study identified the presence of solution features on the wider golf course, a high risk zone crossing through the subject site and also that there are active solution features within the subject site which require infilling by the site maintenance staff periodically. The drainage strategy will need to minimise the risk of any infiltration system exacerbating the status of existing solution features, causing dormant feature to become active, or creation of new dissolution features. Currently infiltration basins are shown in the high risk solution feature zone as well as in the vicinity of the known solution feature on site and these would not be acceptable unless measures were included to prevent infiltration, e.g. inclusion of a permanent liner and discharge elsewhere. In addition, it is understood that one basin might be located over an existing Thames Water sewer and this solution is unlikely to be acceptable. Consultation is recommended at the earliest opportunity with Thames Water to determine any limitations they may require.

In accordance with guidance in CIRIA C574 Engineering in Chalk, for all dissolution features, whether backfilled or infilled, and for denoholes, all possible steps should be taken to prevent the ingress of surface water that might destabilise any void and/or cause further dissolution. No infiltration device (pond, swale, soakaway or the like) should be located within 20m of any structure due to the potential for infiltrating water to induce instability and ground collapse. There might be scope to review this offset and zone the site, subject to the results of further testing. In addition, wherever possible, drainage runs should be diverted away from any known feature (known from investigation or discovered during development). If this is not feasible, it is preferable for drains to be sealed flexible jointed pipes or to be provided with concrete bedding and haunching.

Care will also be required during construction ensure that drainage connections are robust and resilient to slight movement, otherwise leakage from drains could result in washing out of shallow soils, activation of solution features and collapse back to ground surface.

## 5.6 Earthworks

It is anticipated that any development on this site could include the reprofiling of site levels to accommodate the proposed development.

On the basis of the ground conditions encountered, it is anticipated that site won clay soils might be suitable for retention and re-use as earthworks fill, subject to meeting likely acceptability requirements. At this stage, it is anticipated that the sand and gravel soils might comprises Class 1 granular fill for use as general bulk fill, clay soils could be classified as Class 2A wet cohesive soil and/or Class 2C stony cohesive soils for use as general bulk fill, i.e. not specialist fill to structures or the like, and any Chalk would comprise Class 3 fill. The suitability of clay fill is often governed by factors such as moisture content and shear strength. BS6031 Code of Practice for Earthworks states that a Moisture Condition Value (MCV) range of 8-12 is common for wet cohesive fill and 8-16 for stony cohesive fill such as may be generated from this site.

Many clay soils have moisture contents which are outside of the acceptability range for immediate use as earthworks fill, i.e. based on MCV, or optimum moisture content (OMC) as derived from compaction tests. As such, if site won clay soils are proposed to be re-used for earthworks fill on this site, further testing for classification, acceptability and compliance would be required in due course. In addition, treatment may be required to bring clay fill into the required acceptability range, e.g. setting aside to dry out, wetting if dry, additional of lime:cement to dry out or stabilise the fill, or the like.

Any earthworks should be undertaken in accordance with an earthworks specification and accompanying earthworks strategy prepared for the proposed development and to reflect the required end use of the earthworks



construction.



## 6.0 ENVIRONMENTAL RISK ASSESSMENT

At the time of the intrusive investigation the site comprised an active golf course. The third-party Contamination Risk Assessment has shown potential pollutant linkages on site including the grounds keepers' sheds/yard as well as a former chalk quarry and a landfill which included deposition of domestic and trade wastes (off-site) which were not located within the development site but it was considered possible that they might impact the development site, e.g. gas from the off-site landfill, and thus should be considered as part of any investigation and further assessment. In addition to these sources, tarmac and hardstanding areas may be underlain by Made Ground soils and/or aggregates which have the potential to be contaminated by Asbestos.

Exploratory hole locations were selected to investigate potential contamination from on-site and off-site sources as well as to provide general site coverage. Soil samples recovered from the exploratory holes were submitted for analysis of a suite of commonly occurring contaminants including metals, metalloids, inorganic compounds, speciated TPH, PAH and asbestos. Selected samples were also analysed for leachable concentrations.

### 6.1 Soil Contamination vs. End Users

The presence of a possible contaminant does not necessarily imply that a site or area is contaminated or that there is any unacceptable risk to human health. A Preliminary Quantitative Risk Assessment has been undertaken in order to evaluate any unacceptable risks posed to human health with respect to the proposed redevelopment. It should be noted that this assessment is protective of the chronic long-term effects of contaminants, which is also likely to be protective of any possible immediate acute effects.

Based on the findings of the desk study and a visual assessment of the soils encountered, in conjunction with the proposed end use, samples of Topsoil, Made Ground and natural soils, were submitted for general chemical contamination analysis. Additionally, three samples were submitted for leachate analysis.

A quantitative risk assessment has been undertaken by comparing the results of the laboratory chemical testing of shallow soils against Tier 1 screening criteria in the first instance. These criteria comprise the Atkins ATRISK soil screening values (SSVs), the Suitable for Use Levels (S4ULs) published by LQM (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3453. All rights reserved) and the Category 4 Screening Levels (C4SLs) published by DEFRA. Although the C4SLs were released for Part 2A use, the associated policy companion document for the C4SLs indicated that they may also be used for planning. Although the C4SLs represent a marginally higher risk level than the SSACs (low risk rather than minimal risk) it is considered that the risk levels remain very low. Therefore, the final C4SLs are considered to be suitable to assess soils under the planning regime.

Where exceedances of the Tier 1 screening criteria are identified Site Specific Assessment Criteria (SSAC) have been generated using the Contaminated Land Exposure Assessment (CLEA) model v1.07 published by the Environment Agency to undertake further assessment.

The assessment identified two exceedances on the site above the respective generic assessment criteria for a proposed residential land use with home grown produce as outlined in Table 6.1.

| Contaminant | GAC (mg/kg) | Measured Concentration (mg/kg) | Location | Depth (m bgl) | Soil Type   |
|-------------|-------------|--------------------------------|----------|---------------|-------------|
| Arsenic     | 37          | 59.3                           | C6       | 0.30          | Made Ground |
| Lead        | 200         | 220                            | WS10     | 0.20          | Topsoil     |

**Table 6.1 Exceedances Above the Respective Generic Assessment Criteria for a Proposed Residential Land Use with Home Grown Produce**

The exceedance in Arsenic from exploratory hole C6 was recorded in a sample of Made Ground. In total 5No samples



of Made Ground were submitted for analysis, two from beneath the tarmacadam car park, and three from the grassed areas of the golf course. Visual and olfactory evidence from the intrusive investigation suggests that the Made Ground material from the car park comprised a different material to the Made Ground encountered in the grassed areas of the golf course and thus should be assessed separately. For further details of the ground conditions at these locations, reference should be made to the exploratory hole logs and in situ testing presented in Appendix A.

Limited testing was undertaken in the car park with two soil samples submitted for analysis. This was considered too small of a sample size for a statistical analysis. It is considered possible that the contamination encountered in the car park could be localised, therefore further analysis of the soils underlying the car park is recommended to investigate the extent of the impacted Made Ground. If the results of the further analysis indicate an area of contamination, this material may need to be removed from site. Waste Acceptance Criteria (WAC) analysis may be required to confirm the exact classification of the soils for removal (if removal is proposed).

Statistical analysis of the non-targeted Topsoil samples within the dataset has been undertaken in accordance with guidance contained in the CIEH/CL:AIRE report '*Comparing Soil Contamination Data with a Critical Concentration*' (May 2008). If the contamination status of the soils is considered in a planning context, the null hypothesis tested by the analysis is whether the true mean concentration is equal to or greater than the critical concentration for a given determinand, with the critical concentration being the relevant SSAC or GAC (the soil screening value) for that determinand in the context of the intended end use of the site. If the analysis shows that the true mean concentration is less than the critical concentration the null hypothesis can be rejected. The guidance recommends that for the null hypothesis to be rejected the analysis should show that there is a 95% (or higher) likelihood that the true mean concentration is below the critical concentration. Where this is the case the site is considered to be acceptable for the planned end use without further remediation.

The results of the statistical analysis for the Topsoil indicated that the null hypothesis could be rejected for all of the determinands tested and, although statistical outliers were identified, these were below their respective comparative values. The GAC exceedance of lead in WS10 at 0.2m bgl was shown to be part of the statistical dataset and the Upper Confidence Limit was below the critical concentration, and null hypothesis rejected.

In addition, twenty-five samples were submitted for asbestos screening and returned with no asbestos fibres identified.

Based on the above contamination assessment it is considered that remedial action may be required to protect end users of the proposed residential development on this site, albeit that testing to date indicates that remedial action may be required within the existing car park area. Further testing of soils from below the car park will be required to determine the extent of impacted Made Ground soils in this area and scope of any possible remedial action.

## 6.2 Soil Contamination vs. Adjacent land Users

Surrounding land uses were identified to comprise mainly residential with a school and youth centre to the south and golf course to the north. On the basis of the testing undertaken to date, it is considered that no significant risks to adjacent land users have been identified.

Notwithstanding the above, it is recommended that exposed soils are kept damp to avoid the release of soil particles to the air during development.

## 6.3 Soil Contamination vs. Soft Landscaping

British Standard BS3882:2015 *Specification for topsoil and requirements for use* provides assessment criteria for a number of potentially phytotoxic contaminants in terms of new planting.

The results of the chemical analysis for determinants known to pose a potential phytotoxic risk to plant growth are summarised in Table 6.2, together with the respective adopted Generic Assessment Criteria (GAC) for plant growth.



The compliance criteria set out in BS3882:2015 are pH dependent and thus the GAC used relate to the pH range measured on samples recovered from the site.

| Determinand | Phytotoxicity GAC (mg/kg) |            |         | GAC Exceedances |
|-------------|---------------------------|------------|---------|-----------------|
|             | pH <6.0                   | pH 6.0-7.0 | pH >7.0 |                 |
| Zinc        | 200                       | 200        | 300     | No              |
| Copper      | 100                       | 135        | 200     | No              |
| Nickel      | 60                        | 75         | 110     | No              |

**Table 6.2 Summary of Plant Phytotoxicity Assessment**

The phytotoxicity assessment did not identify any exceedance against the relevant phytotoxicity criteria. As such it is considered that no specific measures are required in this respect.

#### 6.4 Soil Contamination vs. Building Materials

The current guidance on selection of materials for water supply pipes to be laid in contaminated land is contained in UK Water Industry Research's (UKWIR) report reference 10/WM/03/21 (re-issued 2010). However, the guidance is not mandatory and there have been concerns raised by various industry technical associations regarding the document and the methodologies proposed. Although there are concerns regarding the document, in lieu of any further guidance in the first instance the results of this investigation have been compared with the proposed thresholds published in UKWIR Table 3.1. Based on a review of the tests results against UKWIR guidance, it is considered that standard water supply pipe might be suitable for potable water supply pipes the proposed development.

As a matter of good practice, and to maximise the protection to utilities, it is recommended that clean, granular backfill is used in service runs and that marker tapes are used for all buried services.

#### 6.5 Soil Contamination vs. Groundwater

The laboratory analysis of the soil samples taken during the intrusive investigation did not identify any potential sources of highly mobile contamination on the site. Furthermore, there was no visual or olfactory evidence of contamination on the near surface soils. Groundwater was encountered at depths ranging from 2.70m bgl to 3.00m bgl within the Black Park Gravel Member albeit that it was considered to be perched, or discontinuous water and thus not a receptor of concern.

#### 6.6 Ground Gases vs End Users

Spot monitoring was undertaken within wells installed within window sampler boreholes WS01, WS03, WS07, WS12 and WS13. These locations were selected to provide general coverage of the site. Three return 'spot' ground gas monitoring visits have been completed. The monitoring visits were undertaken between 6<sup>th</sup> November and 1<sup>st</sup> December 2020.

Based on the gas monitoring undertaken to date, it was considered that the site's gassing regime was representative Characteristic Situation 1 under British Standard guidance and NHBC Green based on both hazardous gas flow and limiting concentrations. Based on the monitoring undertaken to date, no gas protection measures would be required for the proposed development, albeit that monitoring is ongoing and thus the assessment could be subject to change.

Monitoring for volatile organic compounds (VOCs) using a photoionisation detector (PID) was also undertaken during the spot monitoring recording a maximum VOCs concentration of 2.6ppm. Based on the monitoring to date no specific action is required in terms of VOCs.

**6.7 Ground Gases vs Soft Landscaping**

In the absence of any plausible pollutant linkage for the proposed development areas, it is considered that no specific action is warranted in this respect.

**6.8 Ground Gases vs Adjacent Land Users**

In the absence of any plausible pollutant linkage for the proposed development areas, it is considered that no specific action is warranted in this respect.



## 7.0 WASTE DISPOSAL

The geochemical test results have been assessed for potential waste characterisation using the CatWasteSoil screening tool, which indicated that all samples would be characterised as non-hazardous waste. However, these soils would only be considered as waste following excavation and thus characterisation at this stage is for indicative purposes. Further sampling and testing (waste categorisation suite and Waste Acceptance Criteria) should be undertaken on soils which will require removal from site once these soils are identified. The CatWasteSoil results are included as Appendix D.

Natural soils at the site (Black Park Gravel Member, Lambeth Group and Seaford Chalk) are likely to be classified as Inert Waste (under the respective EWC codes for naturally occurring soils), suitable for disposal at an inert landfill facility.

Once any soils for disposal have been identified it is recommended that further testing of these specific soils be undertaken in order to confirm the above assessment.

In accordance with the CL:AIRE Definition of Waste Code of Practice (2011) materials are only considered waste if 'they are discarded, intended to be discarded or required to be discarded by the holder'.

The Code of Practice therefore allows soils to be reused on site where the following criteria are met:

- The soils are required to be used;
- The soils are suitable both in terms of chemical and geotechnical properties for the intended use;
- Only the required volume is used.

In order to comply with the Code of Practice, a Material Management Plan that confirms the above criteria are met has to be prepared. The material management plan must be reviewed by a 'Qualified Person' who then issues a declaration to the Environment Agency. Geo-Environmental can provide this service should it be required.

Where materials do not meet the required criteria, it may be possible to treat them under an environmental permit so that they may be re-used on site. In addition, where material is discarded as waste, it may still be possible to reuse the waste on site under a standard rules environmental permit or a U1 waste exemption. However, strict limits on the volumes that can be reused apply in these cases.

Under current legislation, where wastes are to be disposed of to landfill, they may, depending on their classification, require pre-treatment. Pre-treatment shall comprise a chemical, physical (including sorting), thermal or biological process. The pre-treatment is required to change the characteristics of the waste, reduce its volume, reduce its hazardous nature, and facilitate its handling and enhance its recovery.

Other materials disposed of from site as part of the demolition or remediation process may require disposal separately. All materials containing dangerous substances e.g. tar or bitumen, asbestos, mercury, hydrocarbons and PCBs are likely to be classified as Hazardous Waste and therefore susceptible to the relevant legislative controls.



## 8.0 DISCOVERY STRATEGY

Whilst an intrusive investigation has been undertaken on the site, it remains possible that unexpected soil conditions may be encountered during the process of construction.

### *Geotechnical*

Solution features are known to be present on the site and mapping indicates a high and medium hazard rating for solution features across part of the site. As such, it is possible that abnormal ground conditions, loose/voided ground, sudden changes or the like could be encountered during construction activities on the site. Therefore, a discovery strategy should be maintained in relation to potential geotechnical hazards. Any such discovery should be reported to the Geotechnical Engineer and wider design team, e.g. Structural Engineer and Civil Engineer, at the earliest opportunity such that the discovery can be investigated and possible remedial solutions be determined.

### *Contamination*

Should previously undiscovered contamination be encountered during construction, this should be reported to the site manager immediately in order that any necessary inspection may be made. Records should be kept, and samples submitted for analysis where conditions encountered are not as anticipated. The results of any such testing should be sent to the authorities for consultation.

A copy of the discovery strategy should be lodged on site, and provisions made to ensure that all workers are made aware of their responsibility to observe, report, and act on any potentially suspicious or contaminated materials they may encounter.

Depending on the type, nature and extent of any such 'discovery', it may be necessary to halt works in that location until such time as the assessment has been completed. This should be reviewed on a 'discovery' specific basis and in conjunction with regulatory consultation.

As a general guide, where such unexpected conditions are encountered the following approach is recommended:

- All discoveries are to be reported to the Site Manager immediately and works at that location are to halt until further notice;
- The Site Manager is to report any such discoveries to the Client and the Environmental Consultant;
- Following notification from the Site Manager, the Environmental Consultant shall discuss the discovery with the Local Authority and if considered necessary, arrange to meet an Officer on site to view the discovery;
- The Environmental Consultant shall attend the site to record the location, extent and nature of the discovery and implement an appropriate sampling and analysis regime, taking due account of the type and nature of the discovery, known and probable land uses in that area of the site;
- Where remedial action is required, regulatory consultation and approval will be sought;
- A record will be produced by the Environmental Consultant and held on site (with copies held by the Environmental Consultant, Client and Local Authority), detailing the discovery, assessment works undertaken, findings thereof, confirmation either of no action required or detailing the remedial action taken and validation thereof.

The process is shown in Chart 1 below.

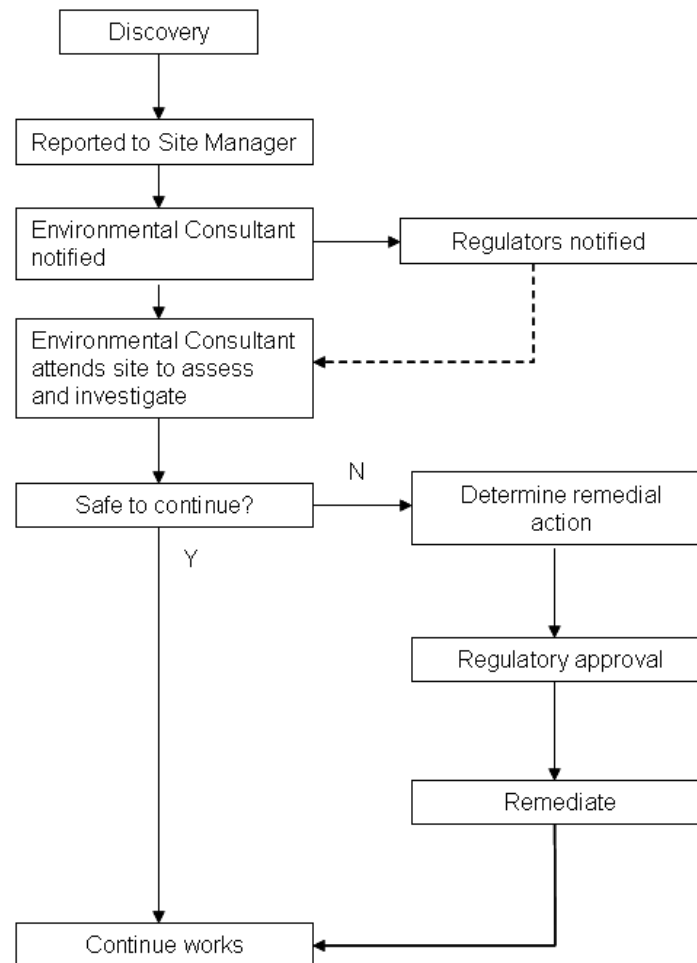
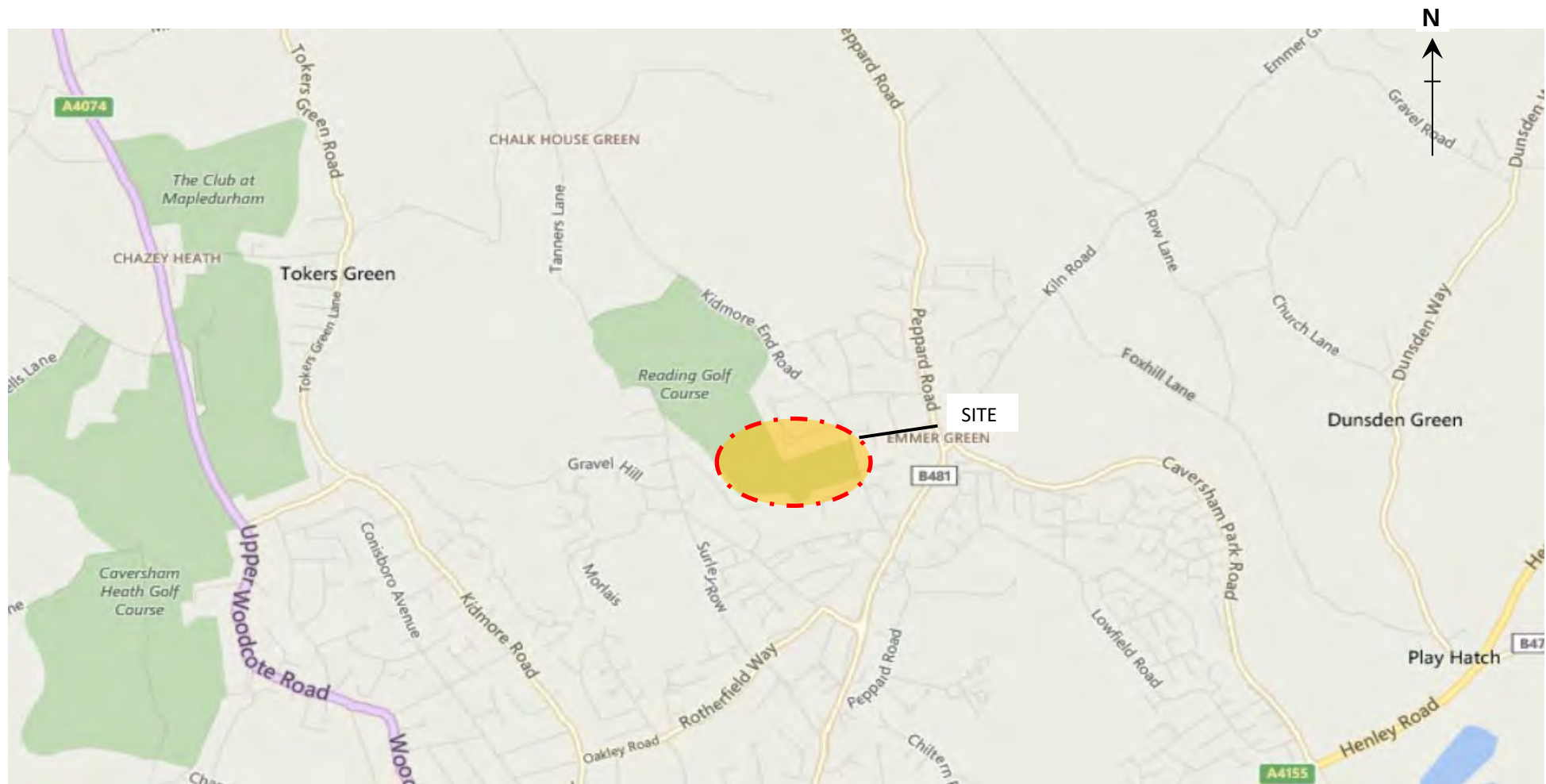


Chart 1: Discovery Strategy Process

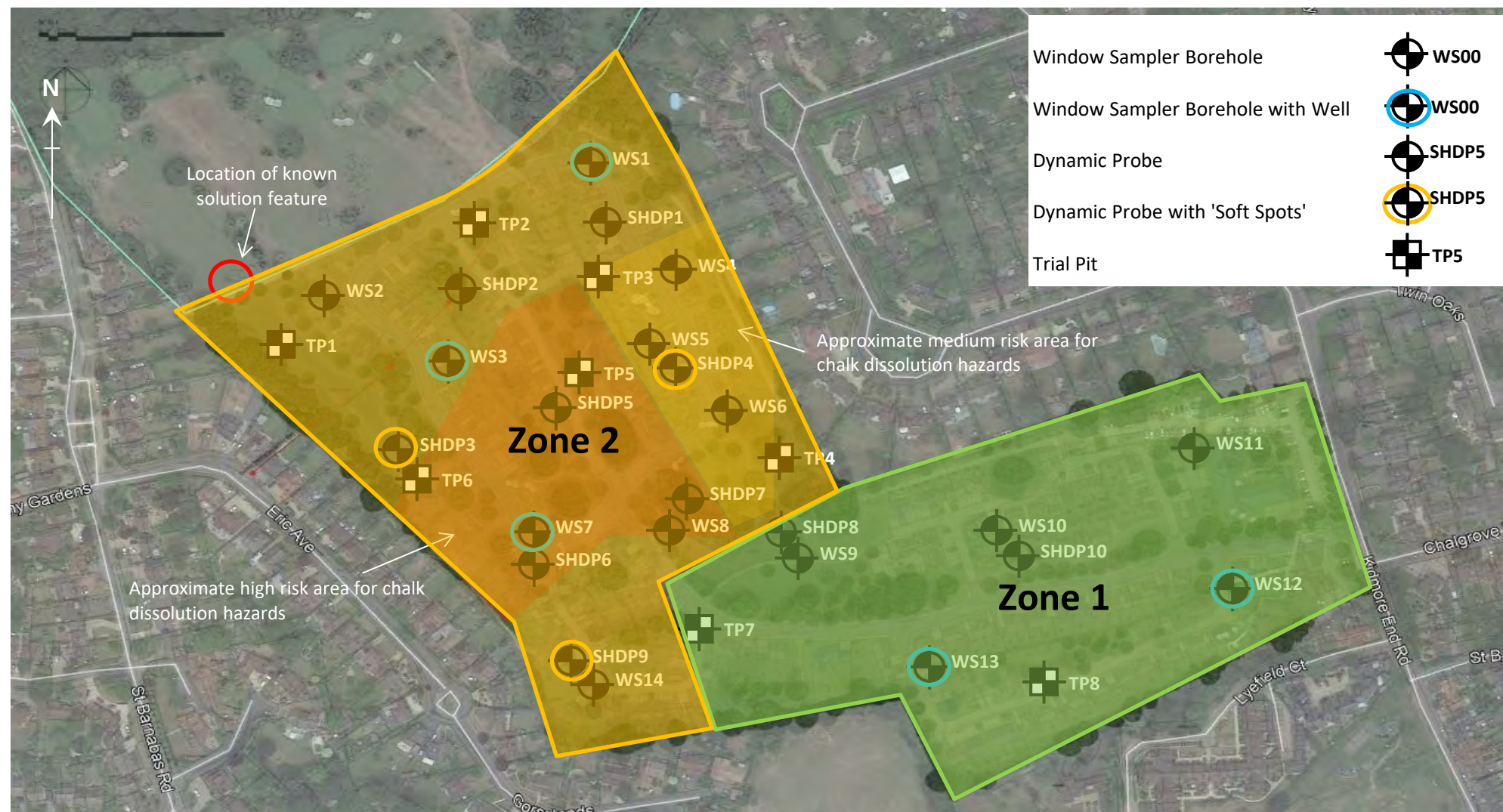
## FIGURES





|                 |                      |                  |              |                                                                                                                                                                    |                                                                                                                   |  |
|-----------------|----------------------|------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--|
| <b>Project:</b> | Reading Golf Course  |                  |              | <b>Title</b>                                                                                                                                                       | Site Location Plan                                                                                                |  |
| <b>Client:</b>  | Vistry Thames Valley |                  |              | <b>Geo-Environmental Services Ltd</b><br><br>Unit 7 Danworth Farm, Cuckfield Road<br><br>Hurstpierpoint, West Sussex BN6 9GL<br><br>+44(0)1273 832972 www.gesl.net | <br><b>Geo-Environmental</b> |  |
| <b>Ref No:</b>  | GE19428              | <b>Revision:</b> | 1.0          |                                                                                                                                                                    |                                                                                                                   |  |
| <b>Drawn:</b>   | LH                   | <b>Date:</b>     | 19/10/2020   |                                                                                                                                                                    |                                                                                                                   |  |
| <b>Figure:</b>  | 1                    | <b>Scale:</b>    | Not To Scale |                                                                                                                                                                    |                                                                                                                   |  |





|                 |                      |                  |              |                                                                                                                                                                    |                                                                                                                   |  |  |
|-----------------|----------------------|------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--|--|
| <b>Project:</b> | Reading Golf Course  |                  |              | <b>Title</b>                                                                                                                                                       | Foundation Zone Map                                                                                               |  |  |
| <b>Client:</b>  | Vistry Thames Valley |                  |              | <b>Geo-Environmental Services Ltd</b><br><br>Unit 7 Danworth Farm, Cuckfield Road<br><br>Hurstpierpoint, West Sussex BN6 9GL<br><br>+44(0)1273 832972 www.gesl.net | <br><b>Geo-Environmental</b> |  |  |
| <b>Ref No:</b>  | GE19428              | <b>Revision:</b> | 0            |                                                                                                                                                                    |                                                                                                                   |  |  |
| <b>Drawn:</b>   | KOD                  | <b>Date:</b>     | 05/11/2020   |                                                                                                                                                                    |                                                                                                                   |  |  |
| <b>Figure:</b>  | 3                    | <b>Scale:</b>    | Not To Scale |                                                                                                                                                                    |                                                                                                                   |  |  |



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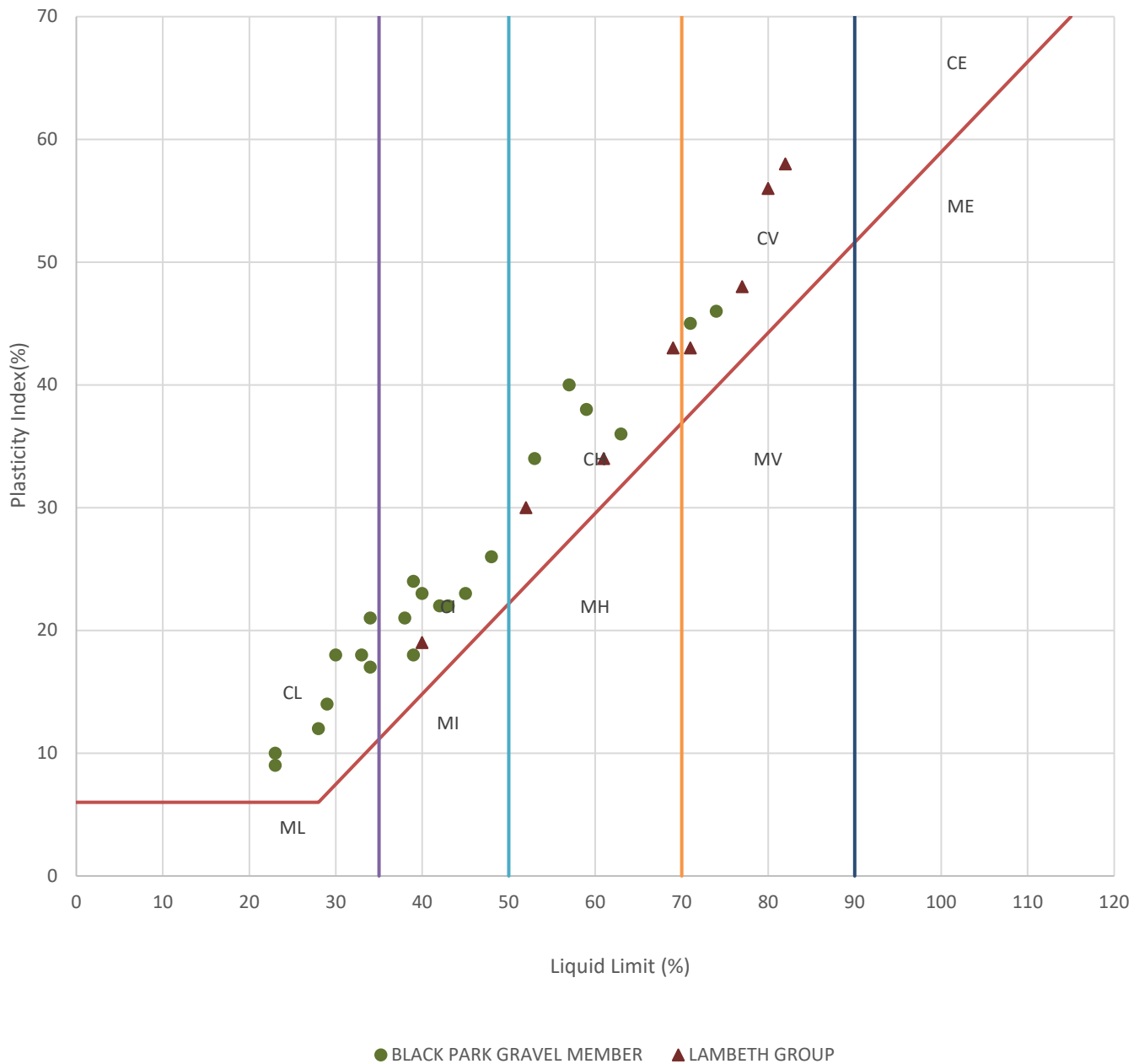
## Figure 4 A Line Plot

Project ID: **GE19428**

Project Title: **Reading Golf Club**

Client:

Location: **Reading**



Date Reported:

**09/12/2020**

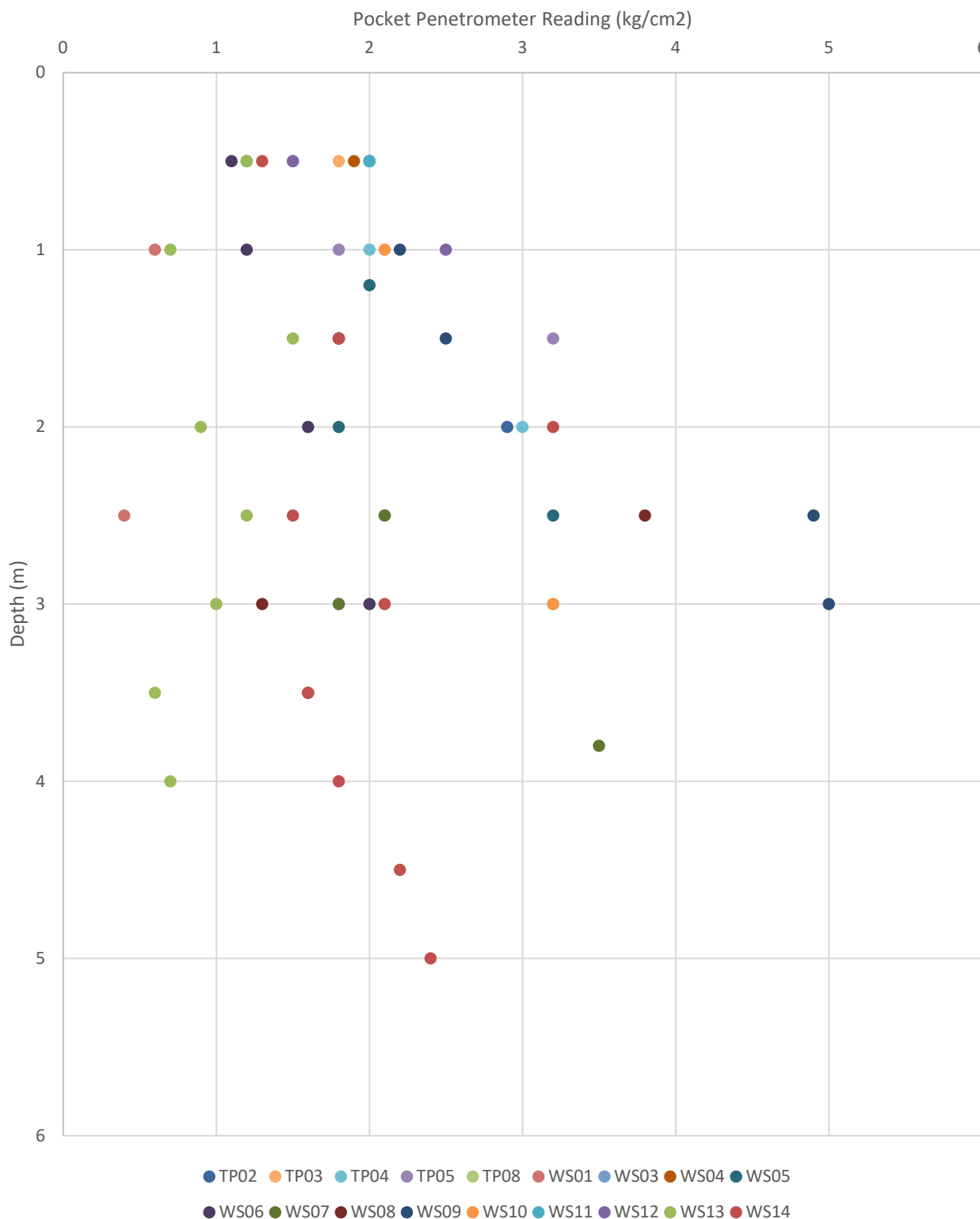
Data Status:



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# Figure 5 Pocket Penetrometer vs Depth Plot

|                                     |                                         |                       |
|-------------------------------------|-----------------------------------------|-----------------------|
| Project ID: <b>GE19428</b>          | Project Title: <b>Reading Golf Club</b> | Final Depth: <b>0</b> |
| Client: <b>Vistry Thames Valley</b> | Location: <b>Reading</b>                | Date Drilled:         |

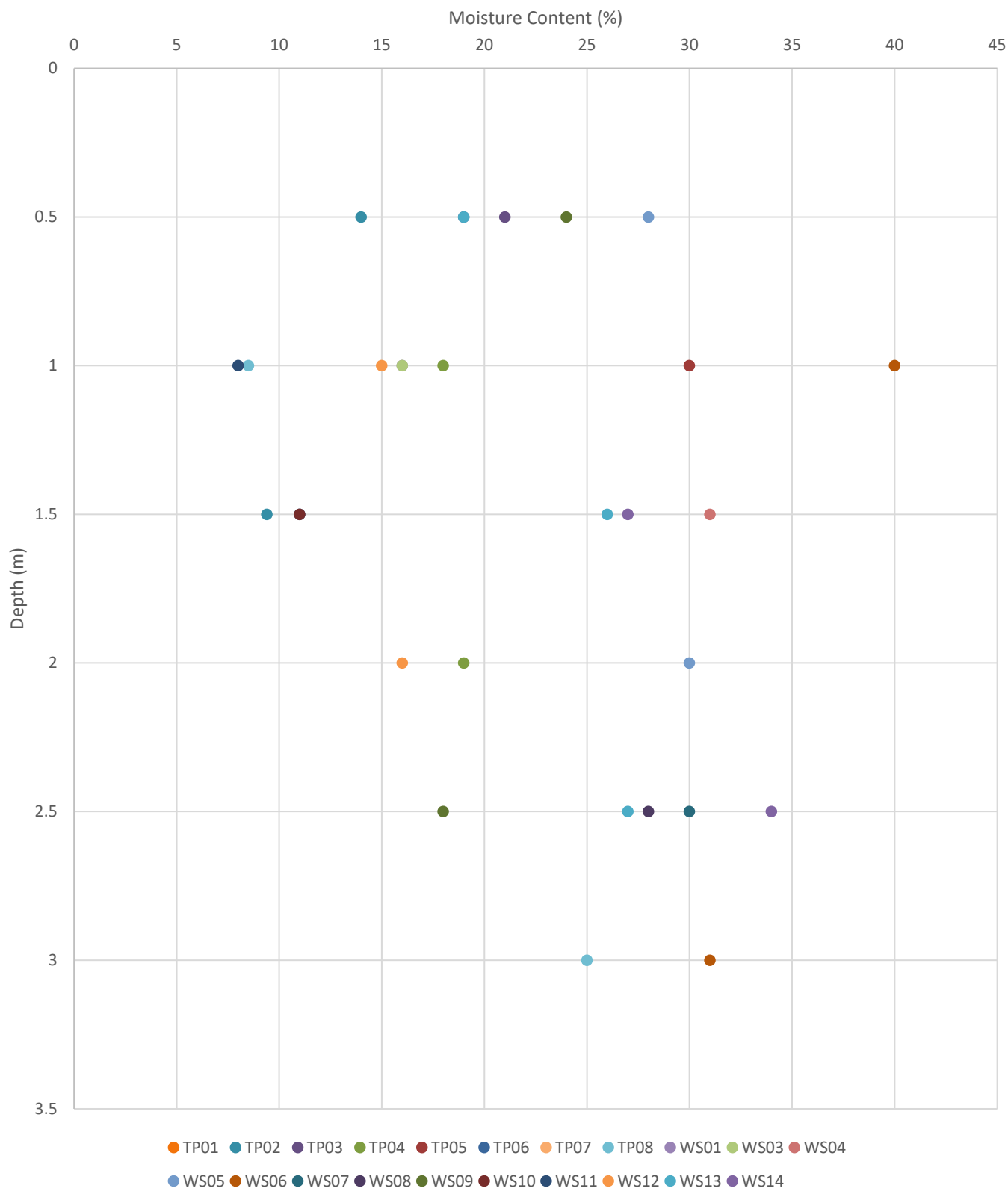




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# Figure 6 Moisture Content vs Depth Plot

|                                     |                                         |  |
|-------------------------------------|-----------------------------------------|--|
| Project ID: <b>GE19428</b>          | Project Title: <b>Reading Golf Club</b> |  |
| Client: <b>Vistry Thames Valley</b> | Location: <b>Reading</b>                |  |



Date Reported: **11/12/2020**

Data Status:

## **APPENDIX A**

### **Exploratory Hole Logs, In-situ Test Results and Soakage Test Results**





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

Geo-Environmental www.gesl.net

# Trial Pit Log

Trial Pit No

TP01

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471329.18 - 176920.87  
Level:

Date  
26/10/2020

Location: Reading

Dimensions (m): 1.90

Scale  
1:25

Client: Vistry Thames Valley

Depth  
3.10

0.60

Logged  
KOD

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend | Stratum Description                                                                                                                                                           |   |
|--------------|---------------------------|------|---------|-----------|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |        |                                                                                                                                                                               |   |
|              | 0.10                      | ES   |         | 0.20      |           |        | Grass overlying brown gravelly fine SAND with abundant rootlets and roots 1-20mm. TOPSOIL                                                                                     |   |
|              | 0.40                      | ES   |         |           |           |        | Brown gravelly fine to medium SAND with frequent rootlets and roots 1-5mm. BLACK PARK GRAVEL MEMBER                                                                           |   |
|              | 0.50                      | D    |         | 0.60      |           |        | Orangish brown slightly clayey gravelly SAND with frequent rootlets and roots 1-5mm. BLACK PARK GRAVEL MEMBER                                                                 |   |
|              | 1.00                      | D    |         | 1.10      |           |        | Orangish brown slightly cobbly SAND and GRAVEL with rootlets and roots 1-5mm. Sand is fine. Gravel and cobbles are fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER | 1 |
|              | 1.50                      | D    |         |           |           |        | Orangish brown and yellowish brown slightly gravelly fine SAND with some orange staining. BLACK PARK GRAVEL MEMBER                                                            |   |
|              | 2.00                      | D    |         | 2.30      |           |        | End of Pit at 3.10m                                                                                                                                                           | 2 |
|              | 2.50                      | D    |         |           |           |        |                                                                                                                                                                               |   |
|              | 3.00                      | D    |         | 3.10      |           |        |                                                                                                                                                                               | 3 |
|              |                           |      |         |           |           |        |                                                                                                                                                                               | 4 |
|              |                           |      |         |           |           |        |                                                                                                                                                                               | 5 |

| Water Strikes |                |
|---------------|----------------|
| Depth Strike  | Rose to (mlog) |
|               |                |

Remarks

Stability Localised spalling





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

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# Trial Pit Log

Trial Pit No  
TP02  
Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471486.20 - 176977.26  
Level: 77.02

Date  
26/10/2020

Location: Reading

Dimensions (m): 2.10  
Depth 3.00

Scale  
1:25

Logged  
KOD

Client: Vistry Thames Valley

| Water Strike | Samples & In Situ Testing |      |              | Depth (m) | Level (m) | Legend | Stratum Description                                                                                      |   |
|--------------|---------------------------|------|--------------|-----------|-----------|--------|----------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results      |           |           |        |                                                                                                          |   |
|              | 0.20                      | ES   |              | 0.30      | 76.72     |        | Grass overlying dark brown gravelly SILT with abundant rootlets and roots 1-30mm.<br>TOPSOIL             |   |
|              | 0.50                      | D    |              |           |           |        | Firm dark brown sandy gravelly CLAY with abundant rootlets and roots 1-30mm.<br>BLACK PARK GRAVEL MEMBER | 1 |
|              | 0.60                      | ES   |              |           |           |        |                                                                                                          |   |
|              | 1.00                      | D    |              | 1.20      | 75.82     |        |                                                                                                          |   |
|              | 1.50                      | D    |              |           |           |        | Soft to stiff orangish brown very gravelly sandy CLAY.<br>BLACK PARK GRAVEL MEMBER                       | 2 |
|              | 2.00                      | D    |              |           |           |        |                                                                                                          |   |
|              | 2.00                      | PP   | PP=2.9kg/cm2 | 2.30      | 74.72     |        |                                                                                                          |   |
|              | 2.50                      | D    |              |           |           |        | Orangish brown SAND and GRAVEL.<br>BLACK PARK GRAVEL MEMBER                                              |   |
|              | 3.00                      | D    |              | 3.00      | 74.02     |        | End of Pit at 3.00m                                                                                      | 3 |
|              |                           |      |              |           |           |        |                                                                                                          | 4 |
|              |                           |      |              |           |           |        |                                                                                                          | 5 |

| Water Strikes |              |
|---------------|--------------|
| Depth Strike  | Rises to (m) |
|               |              |

Remarks

Stability Localised spalling





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

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# Trial Pit Log

Trial Pit No

TP03

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471518.94 - 176941.22  
Level: 78.98

Date  
26/10/2020

Location: Reading

Dimensions (m): 1.80

Depth  
3.00

0.60

Scale  
1:25

Logged  
KOD

Client: Vistry Thames Valley

| Water Strike | Samples & In Situ Testing |      |              | Depth (m) | Level (m) | Legend | Stratum Description                                                                                                                                                                      |   |
|--------------|---------------------------|------|--------------|-----------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results      |           |           |        |                                                                                                                                                                                          |   |
|              | 0.20                      | ES   | PP=1.8kg/cm2 | 0.40      | 78.58     |        | Grass over dark brown slightly clayey gravelly fine SAND with abundant rootlets and roots 1-10mm. TOPSOIL                                                                                |   |
|              | 0.50                      | D    |              |           |           |        | Firm brown and orangish brown slightly gravelly sandy CLAY with frequent rootlets and roots 1-30mm. BLACK PARK GRAVEL MEMBER                                                             |   |
|              | 0.50                      | ES   |              | 0.80      | 78.18     |        | Orangish brown slightly gravelly fine to medium SAND with rootlets and roots 1-5mm. BLACK PARK GRAVEL MEMBER                                                                             | 1 |
|              | 0.50                      | PP   |              |           |           |        |                                                                                                                                                                                          |   |
|              | 1.00                      | D    |              | 1.30      | 77.68     |        | Orangish brown slightly clayey SAND and GRAVEL with cobbles and boulders and some rootlets. Sand is fine to medium. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER |   |
|              | 1.50                      | D    |              |           |           |        |                                                                                                                                                                                          |   |
|              | 2.00                      | D    |              | 2.20      | 76.78     |        | Orangish brown gravelly fine to medium SAND with occasional boulders of flint. Gravel is fine to medium sub angular flint. BLACK PARK GRAVEL MEMBER                                      | 2 |
|              | 2.50                      | D    |              | 2.70      | 76.28     |        | Soft orangish brown slightly gravelly sandy CLAY with some rotting roots and rootlets. BLACK PARK GRAVEL MEMBER                                                                          |   |
|              | 3.00                      | D    |              | 3.00      | 75.98     |        | End of Pit at 3.00m                                                                                                                                                                      | 3 |
|              |                           |      |              |           |           |        |                                                                                                                                                                                          | 4 |
|              |                           |      |              |           |           |        |                                                                                                                                                                                          | 5 |

|              |                        |
|--------------|------------------------|
| Depth Strike | Remarks                |
|              | Stability Sides stable |





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

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# Trial Pit Log

Trial Pit No  
TP04  
Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471619.07 - 176871.54  
Level: 80.84

Date  
26/10/2020

Location: Reading

Dimensions (m): 1.90

Depth  
3.00

0.60

Scale  
1:25

Logged  
KOD

Client: Vistry Thames Valley

| Water Strike | Samples & In Situ Testing |      |              | Depth (m) | Level (m) | Legend | Stratum Description |   |
|--------------|---------------------------|------|--------------|-----------|-----------|--------|---------------------|---|
|              | Depth                     | Type | Results      |           |           |        |                     |   |
|              | 0.20                      | ES   |              |           |           |        |                     |   |
|              | 0.50                      | D    |              | 0.40      | 80.44     |        |                     |   |
|              | 0.60                      | ES   |              |           |           |        |                     |   |
|              | 1.00                      | D    |              | 0.90      | 79.94     |        |                     | 1 |
|              | 1.00                      | PP   | PP=2kg/cm2   |           |           |        |                     |   |
|              | 1.50                      | D    |              |           |           |        |                     |   |
|              | 2.00                      | D    |              | 1.80      | 79.04     |        |                     | 2 |
|              | 2.00                      | PP   | PP=3kg/cm2   |           |           |        |                     |   |
|              | 2.50                      | PP   | PP=2.1kg/cm2 |           |           |        |                     |   |
|              | 3.00                      | PP   | PP=1.8kg/cm2 | 3.00      | 77.84     |        | End of Pit at 3.00m | 3 |
|              |                           |      |              |           |           |        |                     | 4 |
|              |                           |      |              |           |           |        |                     | 5 |

| Water Strikes |                  |
|---------------|------------------|
| Depth Strike  | Notes to (m) (g) |
|               |                  |

Remarks

Stability Sides stable





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

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# Trial Pit Log

Trial Pit No  
TP05  
Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471542.42 - 176869.54  
Level: 79.58

Date  
26/10/2020

Location: Reading

Dimensions (m): 2.10  
Depth 3.10

Scale  
1:25

Logged  
KOD

Client: Vistry Thames Valley

| Water Strike | Samples & In Situ Testing |      |              | Depth (m) | Level (m) | Legend | Stratum Description                                                                                                                                                                            |   |
|--------------|---------------------------|------|--------------|-----------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results      |           |           |        |                                                                                                                                                                                                |   |
|              | 0.30                      | ES   |              | 0.40      | 79.18     |        | Grass overlying dark brown gravelly fine SAND with abundant rootlets and roots 1-20mm. TOPSOIL                                                                                                 |   |
|              | 0.50                      | D    |              |           |           |        | Soft orangish brown and greyish brown slightly gravelly sandy CLAY with frequent rootlets and roots 1-20mm. BLACK PARK GRAVEL MEMBER                                                           |   |
|              | 0.50                      | ES   |              | 0.80      | 78.78     |        | Stiff pale bluish grey and orangish brown silty CLAY with rootlets and roots 1-10mm. LAMBETH GROUP                                                                                             | 1 |
|              | 1.00                      | D    | PP=1.8kg/cm2 |           |           |        |                                                                                                                                                                                                |   |
|              | 1.00                      | PP   |              | 1.40      | 78.18     |        | Stiff orangish brown and bluish grey sandy CLAY with sand lenses 1-2mm. LAMBETH GROUP                                                                                                          |   |
|              | 1.50                      | D    | PP=3.2kg/cm2 |           |           |        |                                                                                                                                                                                                |   |
|              | 1.50                      | PP   |              | 1.90      | 77.68     |        | Off white weathered CHALK composed of silty gravel with fine to coarse flint gravel and brown clayey sandy infill. Gravel is medium density white with black specking. SEAFORD CHALK FORMATION | 2 |
|              | 2.00                      | D    |              |           |           |        |                                                                                                                                                                                                |   |
|              | 2.50                      | D    |              |           |           |        |                                                                                                                                                                                                |   |
|              | 3.00                      | D    |              | 3.10      | 76.48     |        | End of Pit at 3.10m                                                                                                                                                                            | 3 |
|              |                           |      |              |           |           |        |                                                                                                                                                                                                | 4 |
|              |                           |      |              |           |           |        |                                                                                                                                                                                                | 5 |

| Water Strikes |                |
|---------------|----------------|
| Depth Strike  | Rose to (mlog) |
|               |                |

Remarks

Stability Localised spalling





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

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# Trial Pit Log

Trial Pit No

TP06

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471407.14 - 176844.68  
Level:

Date  
26/10/2020

Location: Reading

Dimensions (m): 1.70

Scale  
1:25

Client: Vistry Thames Valley

Depth  
3.00

0.60

Logged  
KOD

| Water Strike | Samples & In Situ Testing |         |         | Depth (m) | Level (m) | Legend | Stratum Description                                                                                                                            |   |
|--------------|---------------------------|---------|---------|-----------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type    | Results |           |           |        |                                                                                                                                                |   |
|              | 0.20                      | ES      |         | 0.35      |           |        | Grass overlying dark brown gravelly SILT with abundant rootlets and roots 1-30mm. TOPSOIL                                                      |   |
|              | 0.50<br>0.50              | D<br>ES |         |           |           |        | Stiff orangish brown slightly gravelly sandy CLAY with frequent rootlets. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER | 1 |
|              | 1.00                      | D       |         | 1.20      |           |        | Orangish brown slightly gravelly clayey fine SAND with some rootlets and rotting rootlets. BLACK PARK GRAVEL MEMBER                            |   |
|              | 1.50                      | D       |         |           |           |        | Very stiff orangish brown and grey mottled slightly gravelly sandy CLAY with frequent rotting roots and rootlets. BLACK PARK GRAVEL MEMBER     | 2 |
|              | 2.00                      | D       |         | 2.60      |           |        | Very stiff orangish brown and grey mottled slightly gravelly sandy CLAY with frequent rotting roots and rootlets. BLACK PARK GRAVEL MEMBER     |   |
|              | 2.50                      | D       |         |           |           |        | Very stiff orangish brown and grey mottled slightly gravelly sandy CLAY with frequent rotting roots and rootlets. BLACK PARK GRAVEL MEMBER     | 3 |
|              | 3.00                      | D       |         | 3.00      |           |        | End of Pit at 3.00m                                                                                                                            |   |

| Water Strikes |                  |
|---------------|------------------|
| Depth Strike  | Rises to (m/deg) |
|               |                  |

Remarks

Stability Sides stable





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

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# Trial Pit Log

Trial Pit No

TP07

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471593.08 - 176742.31  
Level: 82.25

Date  
27/10/2020

Location: Reading

Dimensions (m): 1.80

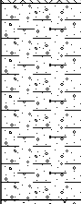
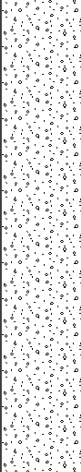
Depth  
3.00

0.60

Scale  
1:25

Logged  
KOD

Client: Vistry Thames Valley

| Water Strike | Samples & In Situ Testing |         |         | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                        |   |
|--------------|---------------------------|---------|---------|-----------|-----------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type    | Results |           |           |                                                                                     |                                                                                                                            |   |
|              | 0.10                      | ES      |         |           |           |    | Grass overlying gravelly SILT with abundant rootlets and roots 1-15mm. Gravel is fine to medium sub angular flint. TOPSOIL |   |
|              | 0.50<br>0.50              | D<br>ES |         | 0.45      | 81.80     |    | Soft orangish brown gravelly sandy CLAY with frequent rootlets .<br>BLACK PARK GRAVEL MEMBER                               |   |
|              | 1.00                      | D       |         | 1.10      | 81.15     |   | Orangish brown clayey cobbly SAND and GRAVEL with some black flecking.<br>BLACK PARK GRAVEL MEMBER                         | 1 |
|              | 1.50                      | D       |         |           |           |                                                                                     |                                                                                                                            |   |
|              | 2.00                      | D       |         |           |           |                                                                                     |                                                                                                                            | 2 |
|              | 2.50                      | D       |         |           |           |                                                                                     |                                                                                                                            |   |
|              |                           |         |         | 2.70      | 79.55     |  | Firm bluish grey, orangish brown and reddish brown mottled silty CLAY with rotting roots and rootlets.<br>LAMBETH GROUP    |   |
|              | 3.00                      | D       |         | 3.00      | 79.25     |                                                                                     | End of Pit at 3.00m                                                                                                        | 3 |
|              |                           |         |         |           |           |                                                                                     |                                                                                                                            | 4 |
|              |                           |         |         |           |           |                                                                                     |                                                                                                                            | 5 |

| Depth Strike | Notes to (m) |
|--------------|--------------|
| 2.70         | 2.90         |

Remarks

Stability Sides unstable below water table





Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

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# Trial Pit Log

Trial Pit No

TP08

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471765.60 - 176709.14  
Level: 82.68

Date  
26/10/2020

Location: Reading

Dimensions (m): 2.00

Depth  
3.20

0.60

Scale  
1:25

Logged  
KOD

Client: Vistry Thames Valley

| Water Strike | Samples & In Situ Testing |      |              | Depth (m) | Level (m) | Legend | Stratum Description                                                                                                                            |   |
|--------------|---------------------------|------|--------------|-----------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results      |           |           |        |                                                                                                                                                |   |
|              | 0.30                      | ES   |              | 0.40      | 82.28     |        | Grass overlying dark brown very gravelly SILT with abundant rootlets and roots 1-50mm. Gravel is fine to coarse sub rounded flint. TOPSOIL     |   |
|              | 0.50                      | D    |              |           |           |        | Orangish brown very clayey sandy cobbly GRAVEL. Sand is fine to medium. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER   |   |
|              | 0.50                      | ES   |              |           |           |        |                                                                                                                                                |   |
|              | 1.00                      | D    |              |           |           |        |                                                                                                                                                | 1 |
|              | 1.50                      | D    |              |           |           |        |                                                                                                                                                |   |
|              | 1.80                      |      |              | 1.80      | 80.88     |        | Wet orangish brown SAND and GRAVEL. Sand is fine to medium. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER               | 2 |
|              | 2.00                      | D    |              |           |           |        |                                                                                                                                                |   |
|              | 2.50                      | D    |              |           |           |        |                                                                                                                                                |   |
|              | 2.90                      |      |              | 2.90      | 79.78     |        | Very stiff pale bluish grey, orangish brown and reddish brown mottled silty CLAY with black flecking and some sand lenses 1-2mm. LAMBETH GROUP | 3 |
|              | 3.00                      | D    |              |           |           |        |                                                                                                                                                |   |
|              | 3.00                      | PP   | PP=3.2kg/cm2 | 3.20      | 79.48     |        | End of Pit at 3.20m                                                                                                                            |   |
|              |                           |      |              |           |           |        |                                                                                                                                                | 4 |
|              |                           |      |              |           |           |        |                                                                                                                                                | 5 |

| Water Strikes |              |
|---------------|--------------|
| Depth Strike  | Rises to (m) |
| 2.90          | 3.10         |

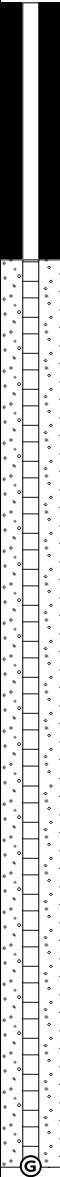
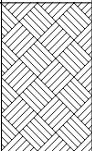
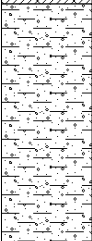
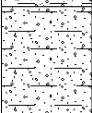
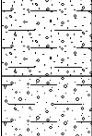
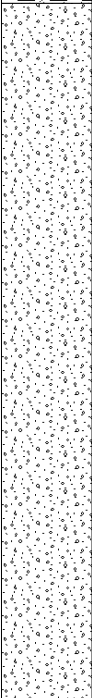
Remarks

Stability Localised spalling



|                                                                                                                                                     |  |                       |  |                            |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net |  | <h1>Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS01</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                     |  | Project No. GE19428   |  | Co-ords: 471513E - 177011N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                   |  | Level: 75.72          |  | Scale 1:25                 |  | Logged By KOD                               |  |
| Client: Vistry Thames Valley                                                                                                                        |  | Dates: 30/10/2020     |  |                            |  |                                             |  |

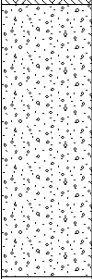
| Well                                                                               | Water Strikes | Sample and In Situ Testing |         |           | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                         |   |
|------------------------------------------------------------------------------------|---------------|----------------------------|---------|-----------|-----------|-----------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|                                                                                    |               | Depth (m)                  | Type    | Results   |           |           |                                                                                     |                                                                                                                                                             |   |
|  |               | 0.30                       | ES      |           | 0.50      | 75.22     |    | Grass overlying dark brown gravelly SILT with abundant rootlets.<br>TOPSOIL                                                                                 | 1 |
|                                                                                    |               | 0.60<br>0.70               | D<br>ES |           |           |           |    | Soft orangish brown slightly gravelly sandy CLAY with black flecking. Sand is fine. Gravel is fine to coarse sub angular flint.<br>BLACK PARK GRAVEL MEMBER |   |
|                                                                                    |               | 1.00<br>1.00               | D<br>PP | 0.6kg/cm2 | 1.30      | 74.42     |    | Firm orangish brown very gravelly sandy CLAY with black flecking. Sand is fine. Gravel is fine to coarse sub angular flint.<br>BLACK PARK GRAVEL MEMBER     |   |
|                                                                                    |               | 1.50                       | D       |           |           |           |   | Orangish brown slightly gravelly clayey fine SAND with black flecking.<br>BLACK PARK GRAVEL MEMBER                                                          |   |
|                                                                                    |               | 2.00                       | D       |           | 2.20      | 73.52     |  | Brown clayey sandy GRAVEL. Gravel is fine to coarse sub angular flint.<br>BLACK PARK GRAVEL MEMBER                                                          | 2 |
|                                                                                    |               | 2.50<br>2.50               | D<br>PP | 0.4kg/cm2 |           |           |  | Soft orangish brown sandy CLAY. Sand is fine.<br>BLACK PARK GRAVEL MEMBER                                                                                   |   |
|                                                                                    |               | 3.00                       | D       |           | 2.70      | 73.02     |  | Orangish brown SAND and GRAVEL with black flecking. Sand is fine to coarse. Gravel is fine to coarse sub angular flint.<br>BLACK PARK GRAVEL MEMBER         | 3 |
|                                                                                    |               | 3.50                       | D       |           |           |           |                                                                                     |                                                                                                                                                             |   |
|                                                                                    |               | 4.00                       | D       |           |           |           |                                                                                     |                                                                                                                                                             | 4 |
|                                                                                    |               | 4.50                       | D       |           |           |           |                                                                                     |                                                                                                                                                             |   |
|                                                                                    | 5.00          | D                          |         | 5.00      | 70.72     |           | End of Borehole at 5.00m                                                            | 5                                                                                                                                                           |   |

| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks                                                  |  |
|----------|-----------|----------------------|---------|-------------------|----------|----------------------------------------------------------|---------------------------------------------------------------------------------------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |                                                          |                                                                                       |
|          |           |                      |         |                   |          | Collapse of borehole at depth prior to well installation |                                                                                       |

|                                                                                                                                                                                       |  |                                                   |  |                            |  |                                             |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br><a href="http://www.gesl.net">www.gesl.net</a> |  | <h1 style="text-align: center;">Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS02</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                                                       |  | Project No. GE19428                               |  | Co-ords: 471357E - 176958N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                                                     |  |                                                   |  | Level: 79.91               |  | Scale 1:25                                  |  |
| Client: Vistry Thames Valley                                                                                                                                                          |  |                                                   |  | Dates: 29/10/2020          |  | Logged By KOD                               |  |

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                  |   |
|------|---------------|----------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                  | Type | Results |           |           |                                                                                   |                                                                                                                      |   |
|      |               | 0.20                       | ES   |         | 0.30      | 79.61     |  | Grass overlying dark brown gravelly SILT with abundant rootlets. TOPSOIL                                             | 1 |
|      |               | 0.40                       | ES   |         |           |           |                                                                                   |                                                                                                                      |   |
|      |               | 0.50                       | D    |         |           |           |                                                                                   |                                                                                                                      |   |
|      |               | 1.00                       | D    |         | 1.20      | 78.71     |  | Brown becoming orangish brown cobbly SAND and GRAVEL with some black ferruginous fragments. BLACK PARK GRAVEL MEMBER | 2 |
|      |               |                            |      |         |           |           |                                                                                   |                                                                                                                      |   |
|      |               |                            |      |         |           |           | End of Borehole at 1.20m                                                          |                                                                                                                      | 3 |
|      |               |                            |      |         |           |           |                                                                                   |                                                                                                                      | 4 |
|      |               |                            |      |         |           |           |                                                                                   |                                                                                                                      | 5 |

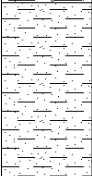
| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks                            |
|----------|-----------|----------------------|---------|-------------------|----------|------------------------------------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |                                    |
|          |           |                      |         |                   |          | Refusal on hard layer at 1.2m bgl. |





|                                                                                                                                                                                       |  |                                                   |  |                            |  |                                             |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br><a href="http://www.gesl.net">www.gesl.net</a> |  | <h1 style="text-align: center;">Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS04</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                                                       |  | Project No. GE19428                               |  | Co-ords: 471571E - 176958N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                                                     |  | Level: 79.73                                      |  | Scale 1:25                 |  | Logged By KOD                               |  |
| Client: Vistry Thames Valley                                                                                                                                                          |  | Dates: 30/10/2020                                 |  |                            |  |                                             |  |

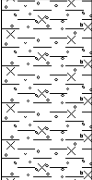
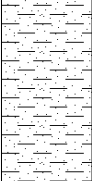
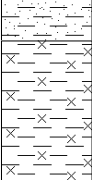
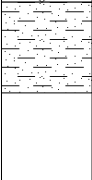
| Well                     | Water Strikes | Sample and In Situ Testing |      |           | Depth (m) | Level (m) | Legend                                                                                                                                                                                                                                    | Stratum Description |  |
|--------------------------|---------------|----------------------------|------|-----------|-----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--|
|                          |               | Depth (m)                  | Type | Results   |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 0.10                       | ES   | 1.9kg/cm2 | 0.30      | 79.43     |  Grass overlying dark brown clayey gravelly SILT with abundant rootlets. Gravel is fine to coarse sub angular flint.<br><b>TOPSOIL</b>                   | 1                   |  |
|                          |               | 0.40                       | ES   |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 0.50                       | D    |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 0.50                       | PP   |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 1.00                       | D    | 1.8kg/cm2 | 0.90      | 78.83     |  Orangish brown clayey sandy GRAVEL with black ferruginous fragments.<br><b>BLACK PARK GRAVEL MEMBER</b>                                                 | 2                   |  |
|                          |               | 1.20                       |      |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 1.50                       | D    |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 1.50                       | PP   |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 1.80                       |      |           | 1.80      | 77.93     |  Stiff orangish brown, bluish grey and greenish grey mottled sandy CLAY with some sand lenses 1-2mm and abundant black flecking.<br><b>LAMBETH GROUP</b> | 3                   |  |
|                          |               | 2.00                       | D    |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               | 2.50                       | D    |           |           |           |                                                                                                                                                                                                                                           |                     |  |
|                          |               |                            |      |           |           |           |                                                                                                                                                                                                                                           |                     |  |
| End of Borehole at 2.50m |               |                            |      |           |           |           |                                                                                                                                                                                                                                           | 4                   |  |
|                          |               |                            |      |           |           |           |                                                                                                                                                                                                                                           | 5                   |  |

| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks |
|----------|-----------|----------------------|---------|-------------------|----------|---------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |         |
|          |           |                      |         |                   |          |         |



|                                                                                                                                                     |  |                       |  |                            |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net |  | <h1>Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS05</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                     |  | Project No. GE19428   |  | Co-ords: 471555E - 176905N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                   |  |                       |  | Level: 79.98               |  | Scale 1:25                                  |  |
| Client: Vistry Thames Valley                                                                                                                        |  |                       |  | Dates: 30/10/2020          |  | Logged By KOD                               |  |

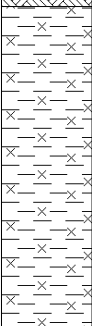
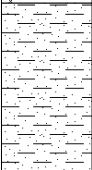
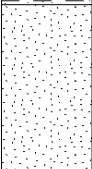
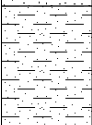
| Well                     | Water Strikes | Sample and In Situ Testing |         |           | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                                                     |   |
|--------------------------|---------------|----------------------------|---------|-----------|-----------|-----------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|                          |               | Depth (m)                  | Type    | Results   |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               | 0.10                       | ES      | 1.2kg/cm2 | 0.30      | 79.68     |    | Grass overlying dark brown slightly gravelly sandy CLAY with some brick fragments and frequent rootlets. MADE GROUND                                                                    | 1 |
|                          |               | 0.40                       | ES      |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               | 0.50<br>0.50               | D<br>PP |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               |                            |         | 2.0kg/cm2 | 0.90      | 79.08     |    | Firm orangish brown and grey mottled slightly gravelly silty CLAY with frequent rootlets and some orange staining. Gravel is fine to medium sub angular flint. BLACK PARK GRAVEL MEMBER |   |
|                          |               | 1.00                       | D       |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               | 1.20                       | PP      |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               | 1.50                       | D       | 1.8kg/cm2 | 1.70      | 78.28     |    | Stiff orangish brown and grey mottled very sandy CLAY. Sand is fine. BLACK PARK GRAVEL MEMBER                                                                                           |   |
|                          |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               | 2.00<br>2.00               | D<br>PP | 3.2kg/cm2 | 2.20      | 77.78     |   | Stiff grey and orangish brown mottled silty CLAY with orange staining. BLACK PARK GRAVEL MEMBER                                                                                         | 2 |
|                          |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               | 2.50<br>2.50               | D<br>PP |           | 2.50      | 77.48     |  | Very stiff orangish brown, greenish grey and yellowish brown mottled sandy CLAY with abundant black flecking. Sand is fine. BLACK PARK GRAVEL MEMBER                                    | 3 |
|                          |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
|                          |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         |   |
| End of Borehole at 2.50m |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         | 4 |
|                          |               |                            |         |           |           |           |                                                                                     |                                                                                                                                                                                         | 5 |

| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks        |
|----------|-----------|----------------------|---------|-------------------|----------|----------------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |                |
|          |           |                      |         |                   |          | Refusal at 2.5 |



|                                                                                                                                                     |  |                                                   |  |                            |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net |  | <h1 style="text-align: center;">Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS06</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                     |  | Project No. GE19428                               |  | Co-ords: 471586E - 176851N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                   |  |                                                   |  | Level: 80.40               |  | Scale 1:25                                  |  |
| Client: Vistry Thames Valley                                                                                                                        |  |                                                   |  | Dates: 30/10/2020          |  | Logged By                                   |  |

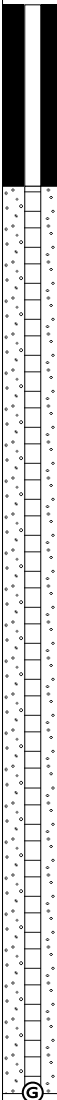
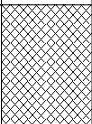
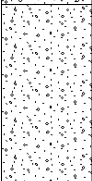
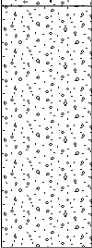
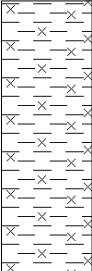
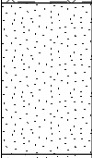
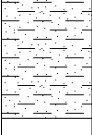
| Well | Water Strikes                                                                       | Sample and In Situ Testing |      |           | Depth (m)                                                                                                    | Level (m) | Legend                                                                              | Stratum Description                                                                                                                      |                                                                                                                                                                                                              |
|------|-------------------------------------------------------------------------------------|----------------------------|------|-----------|--------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                                     | Depth (m)                  | Type | Results   |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
|      |  | 0.20                       | ES   | 1.1kg/cm2 | 0.30                                                                                                         | 80.10     |    | Grass overlying dark greyish brown silty gravelly CLAY with frequent rootlets. TOPSOIL                                                   | <div style="text-align: center;">1</div> <div style="text-align: center;">2</div> <div style="text-align: center;">3</div> <div style="text-align: center;">4</div> <div style="text-align: center;">5</div> |
|      |                                                                                     | 0.50                       | D    |           |                                                                                                              |           |    | Firm bluish grey and orangish brown mottled silty CLAY. BLACK PARK GRAVEL MEMBER                                                         |                                                                                                                                                                                                              |
|      |                                                                                     | 0.50                       | PP   |           |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
|      |                                                                                     | 0.60                       | ES   |           |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
|      |                                                                                     | 1.00                       | D    | 1.2kg/cm2 | 1.40                                                                                                         | 79.00     |   | Stiff orangish brown and grey mottled very sandy CLAY with orange staining and some sand lenses 1-2mm. BLACK PARK GRAVEL MEMBER          |                                                                                                                                                                                                              |
|      |                                                                                     | 1.00                       | PP   |           |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
|      |                                                                                     | 1.50                       | D    | 1.8kg/cm2 | 2.00                                                                                                         | 78.40     |  | Slightly wet orangish brown medium SAND with black flecking. BLACK PARK GRAVEL MEMBER                                                    |                                                                                                                                                                                                              |
|      |                                                                                     | 1.50                       | PP   |           |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
|      |                                                                                     | 2.00                       | PP   | 1.6kg/cm2 | 2.60                                                                                                         | 77.80     |  | Stiff thinly bedded orangish brown, greenish grey and bluish grey mottled slightly sandy CLAY with some sand lenses 1-2mm. LAMBETH GROUP |                                                                                                                                                                                                              |
|      |                                                                                     | 2.10                       | D    |           |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
| 2.50 | D                                                                                   | 2.0kg/cm2                  | 3.00 | 77.40     |  End of Borehole at 3.00m |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
| 3.00 | D                                                                                   |                            |      |           |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |
| 3.00 | PP                                                                                  |                            |      |           |                                                                                                              |           |                                                                                     |                                                                                                                                          |                                                                                                                                                                                                              |

| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks         |  |
|----------|-----------|----------------------|---------|-------------------|----------|-----------------|---------------------------------------------------------------------------------------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |                 |                                                                                       |
|          |           | 3.00                 | 3.00    |                   |          | Collapse to 2.5 |                                                                                       |

|                                                                                                                                                     |  |                       |  |                            |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net |  | <h1>Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS07</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                     |  | Project No. GE19428   |  | Co-ords: 471486E - 176791N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                   |  |                       |  | Level: 81.06               |  | Scale 1:25                                  |  |
| Client: Vistry Thames Valley                                                                                                                        |  |                       |  | Dates: 29/10/2020          |  | Logged By KOD                               |  |

| Well                                                                               | Water Strikes | Sample and In Situ Testing |           |                          | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                                    |                                                                                      |
|------------------------------------------------------------------------------------|---------------|----------------------------|-----------|--------------------------|-----------|-----------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                                                                                    |               | Depth (m)                  | Type      | Results                  |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|  |               | 0.20                       | ES        |                          | 0.40      | 80.66     |    | Grass overlying dark brown clayey gravelly SAND with frequent rootlets, rare brick fragments and rare clinker. Gravel is fine to coarse sub rounded flint. MADE GROUND |  |
|                                                                                    |               | 0.50                       | D         |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               | 0.60                       | ES        |                          | 0.70      | 80.36     |    | Orangish brown clayey SAND and GRAVEL with black ferruginous fragments. Sand is medium. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER           |                                                                                      |
|                                                                                    |               |                            |           |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               | 1.00                       | D         |                          | 1.30      | 79.76     |    | Orangish brown thinly bedded slightly gravelly fine to medium SAND with black flecking. Gravel is fine to medium sub angular flint. BLACK PARK GRAVEL MEMBER           |                                                                                      |
|                                                                                    |               | 1.40                       | ES        |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               | 1.50                       | D         |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               | 2.00                       | D         |                          | 2.10      | 78.96     |   | Orangish brown cobbly SAND and GRAVEL with black ferruginous fragments. Sand is fine. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER             |                                                                                      |
|                                                                                    |               |                            |           |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               | 2.50                       | D         |                          | 3.00      | 78.06     |  | Firm to stiff bluish grey, orangish brown and reddish brown mottled silty CLAY with rare sand lenses 1-2mm. Sand is fine. LAMBETH GROUP                                |                                                                                      |
|                                                                                    |               | 2.50                       | PP        | 2.1kg/cm2                |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               |                            |           |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               | 2.90                       | D         |                          | 3.50      | 77.56     |  | Orangish brown medium SAND. LAMBETH GROUP                                                                                                                              |                                                                                      |
|                                                                                    |               | 3.00                       | PP        | 1.8kg/cm2                |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    |               | 3.40                       | D         |                          | 3.90      | 77.16     |  | Very stiff thinly bedded bluish grey, greenish grey and orange mottled sandy CLAY with black flecking. LAMBETH GROUP                                                   |                                                                                      |
|                                                                                    | 3.50          | PP                         | 1.6kg/cm2 |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    | 3.80          | PP                         | 3.5kg/cm2 |                          |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |
|                                                                                    | 3.90          | D                          |           | End of Borehole at 3.90m |           |           |                                                                                     |                                                                                                                                                                        |                                                                                      |

| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks                                                  |
|----------|-----------|----------------------|---------|-------------------|----------|----------------------------------------------------------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |                                                          |
|          |           |                      |         |                   |          | Collapse of borehole at depth prior to well installation |





Geo-Environmental www.gesl.net

Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

# Borehole Log

Borehole No.

**WS08**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471579E - 176791N

Hole Type  
WLS

Location: Reading

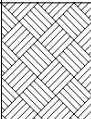
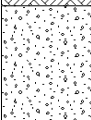
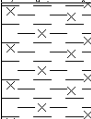
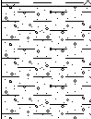
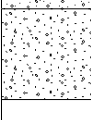
Level: 81.28

Scale  
1:25

Client: Vistry Thames Valley

Dates: 28/10/2020

Logged By  
KOD

| Well | Water Strikes | Sample and In Situ Testing |      |           | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                                                    |   |
|------|---------------|----------------------------|------|-----------|-----------|-----------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                  | Type | Results   |           |           |                                                                                     |                                                                                                                                                                                        |   |
|      |               | 0.30                       | ES   |           | 0.40      | 80.88     |    | Grass overlying dark brown gravelly SILT with abundant rootlets and roots 1-2mm. TOPSOIL                                                                                               |   |
|      |               | 0.50                       | D    |           |           |           |    | Orangish brown slightly clayey cobbly SAND and GRAVEL with black ferruginous fragments BLACK PARK GRAVEL MEMBER                                                                        |   |
|      |               | 0.60                       | ES   |           |           |           |                                                                                     |                                                                                                                                                                                        |   |
|      |               | 1.00                       | D    |           |           |           |                                                                                     |                                                                                                                                                                                        | 1 |
|      |               | 1.50                       | D    |           |           |           |                                                                                     |                                                                                                                                                                                        |   |
|      |               | 2.00                       | D    |           | 2.10      | 79.18     |  | Stiff becoming firm bluish grey, orangish brown and grey mottled silty CLAY with orange and reddish orange staining. BLACK PARK GRAVEL MEMBER                                          | 2 |
|      |               | 2.50                       | D    |           |           |           |                                                                                     |                                                                                                                                                                                        |   |
|      |               | 2.50                       | PP   | 3.8kg/cm2 |           |           |                                                                                     |                                                                                                                                                                                        |   |
|      |               | 3.00                       | D    |           | 3.10      | 78.18     |  | Firm wet orangish brown gravelly very sandy CLAY with black flecking and orange staining. Sand is fine to medium. Gravel is fine to medium sub angular flint. BLACK PARK GRAVEL MEMBER | 3 |
|      |               | 3.00                       | PP   | 1.3kg/cm2 |           |           |                                                                                     |                                                                                                                                                                                        |   |
|      |               | 3.50                       | D    |           | 3.70      | 77.58     |  | Poor recovery of orangish brown and grey mottled slightly gravelly fine SAND. Gravel is fine to medium sub angular flint. BLACK PARK GRAVEL MEMBER                                     |   |
|      |               | 4.00                       | D    |           | 4.00      | 77.28     |                                                                                     | End of Borehole at 4.00m                                                                                                                                                               | 4 |
|      |               |                            |      |           |           |           |                                                                                     |                                                                                                                                                                                        | 5 |

Casing

Water Strikes (mbgl)

Chiselling (mbgl)

Remarks

Diameter

Depth (m)

Depth Strike

Rose to

Depth from

Depth to





Geo-Environmental  
www.gesl.net

Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL

# Borehole Log

Borehole No.

**WS09**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471640E - 176795N

Hole Type  
WLS

Location: Reading

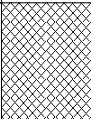
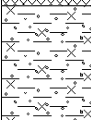
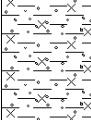
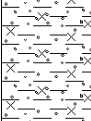
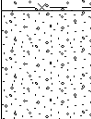
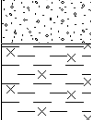
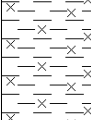
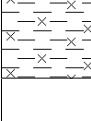
Level: 81.12

Scale  
1:25

Client: Vistry Thames Valley

Dates: 28/10/2020

Logged By  
KOD

| Well     | Water Strikes | Sample and In Situ Testing |         |                   | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                                          |   |
|----------|---------------|----------------------------|---------|-------------------|-----------|-----------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|          |               | Depth (m)                  | Type    | Results           |           |           |                                                                                     |                                                                                                                                                                              |   |
|          |               | 0.20                       | ES      |                   | 0.40      | 80.72     |    | Grass overlying dark brown gravelly SILT with frequent rootlets brick fragments and some clinker. Gravel is fine to medium sub rounded flint. MADE GROUND                    | 1 |
|          |               | 0.50                       | D       |                   |           |           |    | Stiff orangish brown and grey mottled slightly gravelly silty CLAY with black ferruginous fragments, frequent rootlets and some roots 1-2mm. Gravel BLACK PARK GRAVEL MEMBER |   |
|          |               | 0.50                       | ES      | 2.0kg/cm2         |           |           |    |                                                                                                                                                                              |   |
|          |               | 1.00                       | D       |                   | 1.60      | 79.52     |    |                                                                                                                                                                              | 2 |
|          |               | 1.00                       | PP      | 2.2kg/cm2         |           |           |   | Orangish brown slightly gravelly medium SAND with black flecking. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER                                       |   |
|          |               | 1.50                       | D       |                   |           |           |  |                                                                                                                                                                              |   |
|          |               | 1.50                       | PP      | 2.5kg/cm2         | 2.10      | 79.02     |  | Very stiff pale orangish brown and grey mottled very silty CLAY with orange staining. BLACK PARK GRAVEL MEMBER                                                               | 3 |
|          |               | 2.00                       | D       |                   |           |           |  |                                                                                                                                                                              |   |
|          |               | 2.50                       | D       |                   |           |           |  |                                                                                                                                                                              |   |
|          |               | 2.50                       | PP      | 4.9kg/cm2         | 3.00      | 78.12     |  |                                                                                                                                                                              | 4 |
|          |               | 3.00                       | D       |                   |           |           |  |                                                                                                                                                                              |   |
|          |               | 3.00                       | PP      | 5.0kg/cm2         |           |           |  |                                                                                                                                                                              |   |
|          |               |                            |         |                   |           |           |                                                                                     | End of Borehole at 3.00m                                                                                                                                                     | 5 |
| Casing   |               | Water Strikes (mbgl)       |         | Chiselling (mbgl) |           | Remarks   |                                                                                     |                                                                                                                                                                              |   |
| Diameter | Depth (m)     | Depth Strike               | Rose to | Depth from        | Depth to  |           |                                                                                     |                                                                                                                                                                              |   |
|          |               |                            |         |                   |           |           |                                                                                     |                                                                                                                                                                              |   |





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# Borehole Log

Borehole No.

# WS10

Sheet 1 of 1

Project Name: Reading Golf Club

|             |
|-------------|
| Project No. |
| GE19428     |

Co-ords: 471754E - 176800N

| Hole Type | WLS |
|-----------|-----|
|-----------|-----|

Location: Reading

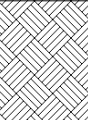
|        |       |
|--------|-------|
| Level: | 81.57 |
|--------|-------|

Scale  
1:25

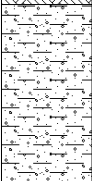
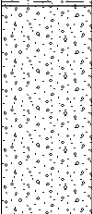
Client: Vistry Thames Valley

Dates: 28/10/2020

Logged By  
KOD

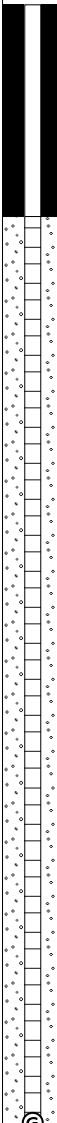
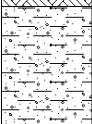
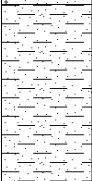
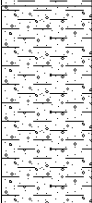
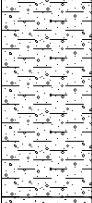
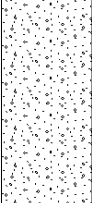
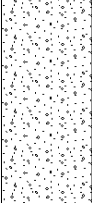
| Well | Water Strikes | Sample and In Situ Testing |      |           | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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|      |               | Depth (m)                  | Type | Results   |           |           |                                                                                   |                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|      |               | 0.20                       | ES   | 2.1kg/cm2 | 0.40      | 81.17     |  | Grass overlying dark brown gravelly SILT with abundant rootlets. Gravel is fine to medium sub angular flint.<br>TOPSOIL | 1<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br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|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net |  | <h1>Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS11</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                     |  | Project No. GE19428   |  | Co-ords: 471836E - 176836N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                   |  |                       |  | Level: 82.22               |  | Scale 1:25                                  |  |
| Client: Vistry Thames Valley                                                                                                                        |  |                       |  | Dates: 28/10/2020          |  | Logged By KOD                               |  |

| Well | Water Strikes | Sample and In Situ Testing |               |           | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                                                   |   |
|------|---------------|----------------------------|---------------|-----------|-----------|-----------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                  | Type          | Results   |           |           |                                                                                   |                                                                                                                                                       |   |
|      |               | 0.10                       | ES            | 2.0kg/cm2 | 0.30      | 81.92     |  | Grass overlying dark brown slightly gravelly sandy SILT with abundant rootlets and roots 1-2mm. TOPSOIL                                               | 1 |
|      |               | 0.40<br>0.50<br>0.50       | ES<br>D<br>PP |           |           |           |  |                                                                                                                                                       |   |
|      |               | 1.00                       | D             |           | 0.90      | 81.32     |  | Orangish brown clayey SAND and GRAVEL with some cobbles. Sand is fine to medium. Gravel is fine to coarse sub angular flint. BLACK PARK GRAVEL MEMBER |   |
|      |               | 1.50                       | D             |           |           |           | 1.60                                                                              |                                                                                                                                                       |   |
|      |               |                            |               |           |           |           |                                                                                   |                                                                                                                                                       | 3 |
|      |               |                            |               |           |           |           |                                                                                   |                                                                                                                                                       | 4 |
|      |               |                            |               |           |           |           |                                                                                   |                                                                                                                                                       | 5 |

|          |           |                      |         |                   |          |         |                                                                                       |
|----------|-----------|----------------------|---------|-------------------|----------|---------|---------------------------------------------------------------------------------------|
| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks |  |
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |         |                                                                                       |
|          |           |                      |         |                   |          |         |                                                                                       |

|                                                                                                                                                     |  |                       |  |                            |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net |  | <h1>Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS12</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                     |  | Project No. GE19428   |  | Co-ords: 471869E - 176760N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                   |  |                       |  | Level: 82.79               |  | Scale 1:25                                  |  |
| Client: Vistry Thames Valley                                                                                                                        |  |                       |  | Dates: 28/10/2020          |  | Logged By KOD                               |  |

| Well                                                                               | Water Strikes | Sample and In Situ Testing |           |           | Depth (m) | Level (m)                                                                                                                                                                                            | Legend                                                                                                                                                                                                                       | Stratum Description                                                                  |  |
|------------------------------------------------------------------------------------|---------------|----------------------------|-----------|-----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--|
|                                                                                    |               | Depth (m)                  | Type      | Results   |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|  |               | 0.20                       | ES        | 1.5kg/cm2 | 0.30      | 82.49                                                                                                                                                                                                |  Grass overlying dark brown gravelly SILT with abundant rootlets and roots 1-30mm. Gravel is fine to medium sub angular flint. TOPSOIL      |  |  |
|                                                                                    | 0.40          | ES                         |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    | 0.50          | D                          |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    | 0.50          | PP                         |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |  Firm orangish brown slightly gravelly very sandy CLAY with frequent rootlets and some rotting roots and rootlets. BLACK PARK GRAVEL MEMBER |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |  Stiff orangish brown and grey mottled very sandy CLAY with rare rootlets. BLACK PARK GRAVEL MEMBER                                         |                                                                                      |  |
|                                                                                    | 1.00          | D                          | 2.5kg/cm2 | 0.70      | 82.09     |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    | 1.00          | PP                         |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |  Firm orangish brown and grey mottled very gravelly sandy CLAY with some black flecking. BLACK PARK GRAVEL MEMBER  |                                                                                                                                                                                                                              |                                                                                      |  |
| 1.40                                                                               | ES            | 1.30                       | 81.49     |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
| 1.50                                                                               | D             |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |  Firm orangish brown and grey mottled very gravelly sandy CLAY with some black flecking. BLACK PARK GRAVEL MEMBER |                                                                                                                                                                                                                              |                                                                                      |  |
| 2.00                                                                               | D             | 2.60                       | 80.19     |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |  Slightly wet orangish brown slightly gravelly medium SAND with black flecking. BLACK PARK GRAVEL MEMBER          |                                                                                                                                                                                                                              |                                                                                      |  |
| 2.50                                                                               | D             | 3.00                       | 3         |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |  Slightly wet orangish brown slightly gravelly medium SAND with black flecking. BLACK PARK GRAVEL MEMBER          |                                                                                                                                                                                                                              |                                                                                      |  |
| 3.00                                                                               | D             | 3.50                       | 4         |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |  Slightly wet orangish brown slightly gravelly medium SAND with black flecking. BLACK PARK GRAVEL MEMBER          |                                                                                                                                                                                                                              |                                                                                      |  |
| 3.50                                                                               | D             | 4.00                       | 78.79     |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              |                                                                                      |  |
|                                                                                    |               |                            |           |           |           | End of Borehole at 4.00m                                                                                                                                                                             |                                                                                                                                                                                                                              | 4                                                                                    |  |
|                                                                                    |               |                            |           |           |           |                                                                                                                                                                                                      |                                                                                                                                                                                                                              | 5                                                                                    |  |

|          |           |                      |         |                   |          |         |                                                                                       |
|----------|-----------|----------------------|---------|-------------------|----------|---------|---------------------------------------------------------------------------------------|
| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks |  |
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |         |                                                                                       |
|          |           |                      |         |                   |          |         |                                                                                       |

Refusal at 4.0m bgl on hard layer. Collapse at depth prior to well installation.



Geo-Environmental

Unit 7, Danworth Farm  
Hurstpierpoint  
BN6 9GL  
www.gesl.net

# Borehole Log

Borehole No.

**WS13**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471697E - 176705N

Hole Type  
WLS

Location: Reading

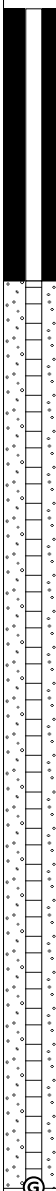
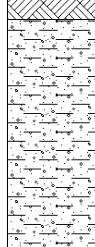
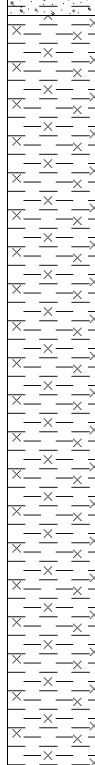
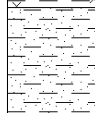
Level: 81.79

Scale  
1:25

Client: Vistry Thames Valley

Dates: 28/10/2020

Logged By  
KOD

| Well                                                                                  | Water Strikes                                                                       | Sample and In Situ Testing |               |                      | Depth (m)  | Level (m)                                        | Legend                                                                              | Stratum Description                                                                                                                                                                                               |       |                                                                                    |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------|---------------|----------------------|------------|--------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------|
|                                                                                       |                                                                                     | Depth (m)                  | Type          | Results              |            |                                                  |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |
|     |  | 0.20                       | ES            | 1.2kg/cm2            | 0.30       | 81.49                                            |    | Grass over dark brown gravelly SILT with abundant rootlets. Gravel is fine to medium sub angular flint TOPSOIL                                                                                                    | 1     |                                                                                    |
|                                                                                       |                                                                                     | 0.50<br>0.50<br>0.60       | D<br>PP<br>ES |                      |            |                                                  |    | Firm becoming soft brown to greyish brown slightly gravelly sandy CLAY with black ferruginous fragments and some reddish brown staining. Sand is fine. Gravel is fine sub angular flint. BLACK PARK GRAVEL MEMBER |       |                                                                                    |
|                                                                                       |                                                                                     | 1.00<br>1.00               | D<br>PP       |                      |            |                                                  | 0.7kg/cm2                                                                           | 1.10                                                                                                                                                                                                              | 80.69 |  |
|                                                                                       |                                                                                     | 1.30                       | ES            |                      |            |                                                  |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |
|                                                                                       |                                                                                     | 1.50<br>1.50               | D<br>PP       | 1.5kg/cm2            |            |                                                  |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |
|                                                                                       |                                                                                     | 2.00<br>2.00               | D<br>PP       | 0.9kg/cm2            |            |                                                  |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |
|                                                                                       |                                                                                     | 2.50<br>2.50               | D<br>PP       | 1.2kg/cm2            |            |                                                  |                                                                                     |                                                                                                                                                                                                                   | 3     |                                                                                    |
|                                                                                       |                                                                                     | 3.00<br>3.00               | D<br>PP       | 1.0kg/cm2            |            |                                                  |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |
|                                                                                       |                                                                                     | 3.50<br>3.50               | D<br>PP       | 0.6kg/cm2            | 3.60       | 78.19                                            |  | Soft wet orangish brown and grey mottled sandy CLAY with black ferruginous fragments. Sand is fine to medium. BLACK PARK GRAVEL MEMBER                                                                            |       |                                                                                    |
|                                                                                       |                                                                                     | 4.00<br>4.00               | D<br>PP       | 0.7kg/cm2            | 4.00       | 77.79                                            |                                                                                     | End of Borehole at 4.00m                                                                                                                                                                                          |       | 4                                                                                  |
|                                                                                       |                                                                                     |                            |               |                      |            |                                                  |                                                                                     |                                                                                                                                                                                                                   |       | 5                                                                                  |
|                                                                                       |                                                                                     | Casing                     |               | Water Strikes (mbgl) |            | Chiselling (mbgl)                                |                                                                                     | Remarks                                                                                                                                                                                                           |       |                                                                                    |
| Diameter                                                                              |                                                                                     | Depth (m)                  | Depth Strike  | Rose to              | Depth from | Depth to                                         |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |
|                                                                                       |                                                                                     | 3.00                       | 3.00          |                      |            | Collapse in borehole prior to well installation. |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |
|  |                                                                                     |                            |               |                      |            |                                                  |                                                                                     |                                                                                                                                                                                                                   |       |                                                                                    |



|                                                                                                                                                     |  |                       |  |                            |  |                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|----------------------------|--|---------------------------------------------|--|
|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net |  | <h1>Borehole Log</h1> |  |                            |  | Borehole No.<br><b>WS14</b><br>Sheet 1 of 1 |  |
| Project Name: Reading Golf Club                                                                                                                     |  | Project No. GE19428   |  | Co-ords: 471539E - 176711N |  | Hole Type WLS                               |  |
| Location: Reading                                                                                                                                   |  |                       |  | Level: 81.47               |  | Scale 1:25                                  |  |
| Client: Vistry Thames Valley                                                                                                                        |  |                       |  | Dates: 29/10/2020          |  | Logged By KOD                               |  |

| Well | Water Strikes | Sample and In Situ Testing |      |           | Depth (m) | Level (m) | Legend                   | Stratum Description                                                                                                                                                    |   |
|------|---------------|----------------------------|------|-----------|-----------|-----------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                  | Type | Results   |           |           |                          |                                                                                                                                                                        |   |
|      |               | 0.20                       | ES   |           | 0.30      | 81.17     |                          | Grass overlying gravelly SILT with abundant rootlets and some brick fragments. Gravel is fine to medium sub angular flint. MADE GROUND                                 |   |
|      |               | 0.40                       | ES   |           |           |           |                          | Firm orangish brown slightly gravelly silty CLAY with orange staining and frequent rootlets. BLACK PARK GRAVEL MEMBER                                                  |   |
|      |               | 0.50                       | D    |           |           |           |                          | Greyish brown sandy GRAVEL with orange staining. BLACK PARK GRAVEL MEMBER                                                                                              |   |
|      |               | 0.50                       | PP   | 1.3kg/cm2 | 0.60      | 80.87     |                          | Greyish brown sandy GRAVEL with orange staining. BLACK PARK GRAVEL MEMBER                                                                                              |   |
|      |               |                            |      |           | 0.90      | 80.57     |                          | Orangish brown clayey SAND and GRAVEL with some rootlets and roots 1-2mm. Sand is fine to medium. Gravel is fine to medium sub angular flint. BLACK PARK GRAVEL MEMBER | 1 |
|      |               | 1.00                       | D    |           |           |           |                          | Orangish brown clayey SAND and GRAVEL with some rootlets and roots 1-2mm. Sand is fine to medium. Gravel is fine to medium sub angular flint. BLACK PARK GRAVEL MEMBER |   |
|      |               | 1.50                       | D    |           | 1.40      | 80.07     |                          | Stiff pale bluish grey and orangish brown mottled silty CLAY with some roots 1-2mm and some rotting roots and rootlets. LAMBETH GROUP                                  |   |
|      |               | 1.50                       | PP   | 1.8kg/cm2 |           |           |                          | Stiff pale bluish grey and orangish brown mottled silty CLAY with some roots 1-2mm and some rotting roots and rootlets. LAMBETH GROUP                                  |   |
|      |               | 1.60                       | ES   |           |           |           |                          | Stiff pale bluish grey and orangish brown mottled silty CLAY with some roots 1-2mm and some rotting roots and rootlets. LAMBETH GROUP                                  |   |
|      |               | 2.00                       | D    |           |           |           |                          | Stiff pale bluish grey and orangish brown mottled silty CLAY with some roots 1-2mm and some rotting roots and rootlets. LAMBETH GROUP                                  | 2 |
|      |               | 2.00                       | PP   | 3.2kg/cm2 |           |           |                          | Stiff pale bluish grey and orangish brown mottled silty CLAY with some roots 1-2mm and some rotting roots and rootlets. LAMBETH GROUP                                  |   |
|      |               |                            |      |           | 2.30      | 79.17     |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 2.50                       | D    |           |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 2.50                       | PP   | 1.5kg/cm2 |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 3.00                       | D    |           |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  | 3 |
|      |               | 3.00                       | PP   | 2.1kg/cm2 |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 3.50                       | D    |           |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 3.50                       | PP   | 1.6kg/cm2 |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 4.00                       | D    |           |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  | 4 |
|      |               | 4.00                       | PP   | 1.8kg/cm2 |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 4.50                       | D    |           |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 4.50                       | PP   | 2.2kg/cm2 |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               | 5.00                       | D    |           | 5.00      | 76.47     |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  | 5 |
|      |               | 5.00                       | PP   | 2.4kg/cm2 |           |           |                          | Stiff bluish grey, greenish grey and orangish brown mottled silty CLAY with rotting roots and rootlets and some reddish brown staining. LAMBETH GROUP                  |   |
|      |               |                            |      |           |           |           | End of Borehole at 5.00m |                                                                                                                                                                        |   |

|          |           |                      |         |                   |          |         |                                                                                       |
|----------|-----------|----------------------|---------|-------------------|----------|---------|---------------------------------------------------------------------------------------|
| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks |  |
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |         |                                                                                       |
|          |           |                      |         |                   |          |         |                                                                                       |



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# Borehole Log

Borehole No.

## C1

Sheet 1 of 1

Project Name: Reading Golf Club

|             |
|-------------|
| Project No. |
| GE19428     |

Co-ords: 471932E - 176766N

| Hole Type | WS  |
|-----------|-----|
| 1         | 1   |
| 2         | 2   |
| 3         | 3   |
| 4         | 4   |
| 5         | 5   |
| 6         | 6   |
| 7         | 7   |
| 8         | 8   |
| 9         | 9   |
| 10        | 10  |
| 11        | 11  |
| 12        | 12  |
| 13        | 13  |
| 14        | 14  |
| 15        | 15  |
| 16        | 16  |
| 17        | 17  |
| 18        | 18  |
| 19        | 19  |
| 20        | 20  |
| 21        | 21  |
| 22        | 22  |
| 23        | 23  |
| 24        | 24  |
| 25        | 25  |
| 26        | 26  |
| 27        | 27  |
| 28        | 28  |
| 29        | 29  |
| 30        | 30  |
| 31        | 31  |
| 32        | 32  |
| 33        | 33  |
| 34        | 34  |
| 35        | 35  |
| 36        | 36  |
| 37        | 37  |
| 38        | 38  |
| 39        | 39  |
| 40        | 40  |
| 41        | 41  |
| 42        | 42  |
| 43        | 43  |
| 44        | 44  |
| 45        | 45  |
| 46        | 46  |
| 47        | 47  |
| 48        | 48  |
| 49        | 49  |
| 50        | 50  |
| 51        | 51  |
| 52        | 52  |
| 53        | 53  |
| 54        | 54  |
| 55        | 55  |
| 56        | 56  |
| 57        | 57  |
| 58        | 58  |
| 59        | 59  |
| 60        | 60  |
| 61        | 61  |
| 62        | 62  |
| 63        | 63  |
| 64        | 64  |
| 65        | 65  |
| 66        | 66  |
| 67        | 67  |
| 68        | 68  |
| 69        | 69  |
| 70        | 70  |
| 71        | 71  |
| 72        | 72  |
| 73        | 73  |
| 74        | 74  |
| 75        | 75  |
| 76        | 76  |
| 77        | 77  |
| 78        | 78  |
| 79        | 79  |
| 80        | 80  |
| 81        | 81  |
| 82        | 82  |
| 83        | 83  |
| 84        | 84  |
| 85        | 85  |
| 86        | 86  |
| 87        | 87  |
| 88        | 88  |
| 89        | 89  |
| 90        | 90  |
| 91        | 91  |
| 92        | 92  |
| 93        | 93  |
| 94        | 94  |
| 95        | 95  |
| 96        | 96  |
| 97        | 97  |
| 98        | 98  |
| 99        | 99  |
| 100       | 100 |

Location: Reading

|        |       |
|--------|-------|
| Level: | 84.14 |
|--------|-------|

Scale  
1:25

Client: Vistry Thames Valley

Dates: 30/10/2020

Logged By  
KOD

[illegible]

|  Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br><a href="http://www.gesl.net">www.gesl.net</a> |               | <h1 style="text-align: center;">Borehole Log</h1> |         |                            |                      | Borehole No.<br><h2 style="text-align: center;">C2</h2> Sheet 1 of 1 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------|---------|----------------------------|----------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Project Name: Reading Golf Club                                                                                                                                                       |               | Project No. GE19428                               |         | Co-ords: 471934E - 176780N |                      | Hole Type WS                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
| Location: Reading                                                                                                                                                                     |               |                                                   |         | Level: 83.96               |                      | Scale 1:25                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
| Client: Vistry Thames Valley                                                                                                                                                          |               |                                                   |         | Dates: 30/10/2020          |                      | Logged By KOD                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
| Well                                                                                                                                                                                  | Water Strikes | Sample and In Situ Testing                        |         |                            | Depth (m)            | Level (m)                                                            | Legend                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Stratum Description                                                                                                   |
|                                                                                                                                                                                       |               | Depth (m)                                         | Type    | Results                    |                      |                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
|                                                                                                                                                                                       |               | 0.20                                              | ES      |                            | 0.09<br>0.17<br>0.26 | 83.87<br>83.79<br>83.70                                              |  Tarmacadam<br> MADE GROUND<br> Brown SAND and GRAVEL. Sand is fine to coarse. Gravel is fine to coarse sub angular flint.<br> MADE GROUND<br> Dark brown very gravelly SILT with a mild organic malodour and rare brick fragments. SUBSOIL.<br> MADE GROUND | <div style="border: 1px dashed black; padding: 2px; margin-top: 10px;">         End of Borehole at 0.26m       </div> |
| <div style="display: flex; justify-content: space-between;"> <span>1</span> <span>2</span> <span>3</span> <span>4</span> <span>5</span> </div>                                        |               |                                                   |         |                            |                      |                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
| Casing                                                                                                                                                                                |               | Water Strikes (mbgl)                              |         | Chiselling (mbgl)          |                      | Remarks                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
| Diameter                                                                                                                                                                              | Depth (m)     | Depth Strike                                      | Rose to | Depth from                 | Depth to             |                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |
|                                                                                                                                                                                       |               |                                                   |         |                            |                      |                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |





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# Borehole Log

Borehole No.

### C3

Sheet 1 of 1

Project Name: Reading Golf Club

|             |
|-------------|
| Project No. |
| GE19428     |

Co-ords: 471932E - 176791N

| Hole Type | WS  |
|-----------|-----|
| 1         | 1   |
| 2         | 2   |
| 3         | 3   |
| 4         | 4   |
| 5         | 5   |
| 6         | 6   |
| 7         | 7   |
| 8         | 8   |
| 9         | 9   |
| 10        | 10  |
| 11        | 11  |
| 12        | 12  |
| 13        | 13  |
| 14        | 14  |
| 15        | 15  |
| 16        | 16  |
| 17        | 17  |
| 18        | 18  |
| 19        | 19  |
| 20        | 20  |
| 21        | 21  |
| 22        | 22  |
| 23        | 23  |
| 24        | 24  |
| 25        | 25  |
| 26        | 26  |
| 27        | 27  |
| 28        | 28  |
| 29        | 29  |
| 30        | 30  |
| 31        | 31  |
| 32        | 32  |
| 33        | 33  |
| 34        | 34  |
| 35        | 35  |
| 36        | 36  |
| 37        | 37  |
| 38        | 38  |
| 39        | 39  |
| 40        | 40  |
| 41        | 41  |
| 42        | 42  |
| 43        | 43  |
| 44        | 44  |
| 45        | 45  |
| 46        | 46  |
| 47        | 47  |
| 48        | 48  |
| 49        | 49  |
| 50        | 50  |
| 51        | 51  |
| 52        | 52  |
| 53        | 53  |
| 54        | 54  |
| 55        | 55  |
| 56        | 56  |
| 57        | 57  |
| 58        | 58  |
| 59        | 59  |
| 60        | 60  |
| 61        | 61  |
| 62        | 62  |
| 63        | 63  |
| 64        | 64  |
| 65        | 65  |
| 66        | 66  |
| 67        | 67  |
| 68        | 68  |
| 69        | 69  |
| 70        | 70  |
| 71        | 71  |
| 72        | 72  |
| 73        | 73  |
| 74        | 74  |
| 75        | 75  |
| 76        | 76  |
| 77        | 77  |
| 78        | 78  |
| 79        | 79  |
| 80        | 80  |
| 81        | 81  |
| 82        | 82  |
| 83        | 83  |
| 84        | 84  |
| 85        | 85  |
| 86        | 86  |
| 87        | 87  |
| 88        | 88  |
| 89        | 89  |
| 90        | 90  |
| 91        | 91  |
| 92        | 92  |
| 93        | 93  |
| 94        | 94  |
| 95        | 95  |
| 96        | 96  |
| 97        | 97  |
| 98        | 98  |
| 99        | 99  |
| 100       | 100 |

Location: Reading

Level: 83.98

Scale  
1:25

Client: Vistry Thames Valley

Dates: 30/10/2020

Logged By  
KOD

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m)            | Level (m)               | Legend                                                                                                                                                                                                                                                  | Stratum Description                                                                                                                                                                                                                                                                                                                             |   |
|------|---------------|----------------------------|------|---------|----------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                  | Type | Results |                      |                         |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                 |   |
|      |               | 0.20                       | ES   |         | 0.11<br>0.16<br>0.26 | 83.86<br>83.82<br>83.72 | <div style="border: 1px solid black; padding: 5px;"> <div style="background-color: #cccccc; width: 20px; height: 10px; margin-bottom: 5px;"></div> <div style="background-color: #cccccc; width: 20px; height: 10px; margin-bottom: 5px;"></div> </div> | Tarmacadam<br>MADE GROUND<br>Brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse sub rounded flint. POTENTIALLY AGGREGATE<br>MADE GROUND<br>Orangish brown slightly clayey gravelly SAND with rare brick fragments. SUBSOIL<br>MADE GROUND<br><div style="text-align: right; font-size: small;">End of Borehole at 0.26m</div> |   |
|      |               |                            |      |         |                      |                         |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                 | 1 |
|      |               |                            |      |         |                      |                         |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                 | 2 |
|      |               |                            |      |         |                      |                         |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                 | 3 |
|      |               |                            |      |         |                      |                         |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                 | 4 |
|      |               |                            |      |         |                      |                         |                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                 | 5 |

| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks |
|----------|-----------|----------------------|---------|-------------------|----------|---------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |         |
|          |           |                      |         |                   |          |         |





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# Borehole Log

Borehole No.

## C4

Sheet 1 of 1

Project Name: Reading Golf Club

|             |
|-------------|
| Project No. |
| GE19428     |

Co-ords: 471928E - 176809N

| Hole Type | WS |
|-----------|----|
|-----------|----|

Location: Reading

Level:

Scale  
1:25

Client: Vistry Thames Valley

Dates: 30/10/2020

Logged By  
KOD

[illegible]



[www.gesl.net](http://www.gesl.net)

# Borehole Log

Borehole No.

**C5**

Sheet 1 of 1

Project Name: Reading Golf Club

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| Project No. |
| GE19428     |

Co-ords: 471922E - 176826N

| Hole Type | WS  |
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| Location: | Reading |
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| Level: | 83.45 |
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Scale  
1:25

Client: Vistry Thames Valley

Dates: 30/10/2020

Logged By  
KOD

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m)            | Level (m)               | Legend                                                  | Stratum Description                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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|      |               | Depth (m)                  | Type | Results |                      |                         |                                                         |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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|      |               | 0.30                       | ES   |         | 0.07<br>0.27<br>0.32 | 83.38<br>83.18<br>83.13 | <div><div></div><div></div><div></div><div></div></div> | Tarmacadam<br>MADE GROUND<br>Type 1<br>MADE GROUND<br>Dark brown slightly gravelly silty CLAY with a mild organic malodour<br>BLACK PARK GRAVEL MEMBER<br>End of Borehole at 0.32m | 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[www.gesl.net](http://www.gesl.net)

# Borehole Log

Borehole No.

## C6

Sheet 1 of 1

Project Name: Reading Golf Club

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| Project No. |
| GE19428     |

Co-ords: 471913E - 176853N

| Hole Type | WS  |
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| 100       | 100 |

Location: Reading

Level:

Scale  
1:25

Client: Vistry Thames Valley

Dates: 30/10/2020

Logged By  
KOD

| Well | Water Strikes                                                                     | Sample and In Situ Testing                                              |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description |   |
|------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|---------------------|---|
|      |                                                                                   | Depth (m)                                                               | Type | Results |           |           |                                                                                   |                     |   |
|      |                                                                                   | 0.30                                                                    | ES   |         | 0.07      |           |  | Tarmacadam          | 1 |
|      |                                                                                   |                                                                         |      |         |           |           | MADE GROUND                                                                       |                     |   |
|      |                                                                                   |                                                                         |      |         |           |           | Pinkish grey sandy GRAVEL. Type 1.                                                |                     |   |
|      |                                                                                   |                                                                         |      |         |           |           | MADE GROUND                                                                       |                     |   |
|      |                                                                                   |                                                                         |      |         | 0.28      |           |                                                                                   |                     |   |
| 0.38 |  | Dark greyish brown slightly gravelly SILT with a mild organic malodour. | 2    |         |           |           |                                                                                   |                     |   |
|      |  | BLACK PARK GRAVEL MEMBER                                                |      |         |           |           |                                                                                   |                     |   |
|      |                                                                                   |                                                                         |      |         |           |           | End of Borehole at 0.38m                                                          | 3                   |   |
|      |                                                                                   |                                                                         |      |         |           |           |                                                                                   | 4                   |   |
|      |                                                                                   |                                                                         |      |         |           |           |                                                                                   | 5                   |   |

| Casing   |           | Water Strikes (mbgl) |         | Chiselling (mbgl) |          | Remarks |
|----------|-----------|----------------------|---------|-------------------|----------|---------|
| Diameter | Depth (m) | Depth Strike         | Rose to | Depth from        | Depth to |         |
|          |           |                      |         |                   |          |         |







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# Borehole Log

Borehole No.

## C8

Sheet 1 of 1

Project Name: Reading Golf Club

|             |         |
|-------------|---------|
| Project No. | GE19428 |
|-------------|---------|

Co-ords: 471868E - 176861N

| Hole Type | WS  |
|-----------|-----|
| 1         | 1   |
| 2         | 2   |
| 3         | 3   |
| 4         | 4   |
| 5         | 5   |
| 6         | 6   |
| 7         | 7   |
| 8         | 8   |
| 9         | 9   |
| 10        | 10  |
| 11        | 11  |
| 12        | 12  |
| 13        | 13  |
| 14        | 14  |
| 15        | 15  |
| 16        | 16  |
| 17        | 17  |
| 18        | 18  |
| 19        | 19  |
| 20        | 20  |
| 21        | 21  |
| 22        | 22  |
| 23        | 23  |
| 24        | 24  |
| 25        | 25  |
| 26        | 26  |
| 27        | 27  |
| 28        | 28  |
| 29        | 29  |
| 30        | 30  |
| 31        | 31  |
| 32        | 32  |
| 33        | 33  |
| 34        | 34  |
| 35        | 35  |
| 36        | 36  |
| 37        | 37  |
| 38        | 38  |
| 39        | 39  |
| 40        | 40  |
| 41        | 41  |
| 42        | 42  |
| 43        | 43  |
| 44        | 44  |
| 45        | 45  |
| 46        | 46  |
| 47        | 47  |
| 48        | 48  |
| 49        | 49  |
| 50        | 50  |
| 51        | 51  |
| 52        | 52  |
| 53        | 53  |
| 54        | 54  |
| 55        | 55  |
| 56        | 56  |
| 57        | 57  |
| 58        | 58  |
| 59        | 59  |
| 60        | 60  |
| 61        | 61  |
| 62        | 62  |
| 63        | 63  |
| 64        | 64  |
| 65        | 65  |
| 66        | 66  |
| 67        | 67  |
| 68        | 68  |
| 69        | 69  |
| 70        | 70  |
| 71        | 71  |
| 72        | 72  |
| 73        | 73  |
| 74        | 74  |
| 75        | 75  |
| 76        | 76  |
| 77        | 77  |
| 78        | 78  |
| 79        | 79  |
| 80        | 80  |
| 81        | 81  |
| 82        | 82  |
| 83        | 83  |
| 84        | 84  |
| 85        | 85  |
| 86        | 86  |
| 87        | 87  |
| 88        | 88  |
| 89        | 89  |
| 90        | 90  |
| 91        | 91  |
| 92        | 92  |
| 93        | 93  |
| 94        | 94  |
| 95        | 95  |
| 96        | 96  |
| 97        | 97  |
| 98        | 98  |
| 99        | 99  |
| 100       | 100 |

Location: Reading

|        |       |
|--------|-------|
| Level: | 82.40 |
|--------|-------|

Scale  
1:25

Client: Vistry Thames Valley

Dates: 30/10/2020

Logged By  
KOD

[illegible]



## Borehole No.

Sheet 1 of 1

Logged By

|         |             |      |                    |                                                                                       |      |
|---------|-------------|------|--------------------|---------------------------------------------------------------------------------------|------|
| Remarks | Fall Height | 1    | Cone Base Diameter |  |      |
|         | Hammer Wt   | 50.0 | Final Depth        |                                                                                       | 8.00 |
|         | Probe Type  | DPSH | Log Scale          |                                                                                       | 1:50 |





Geo-Environmental

# Probe Log

Borehole No.

**SHDP02**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471464.31 - 176915.76

Hole Type  
DP

Location: Reading

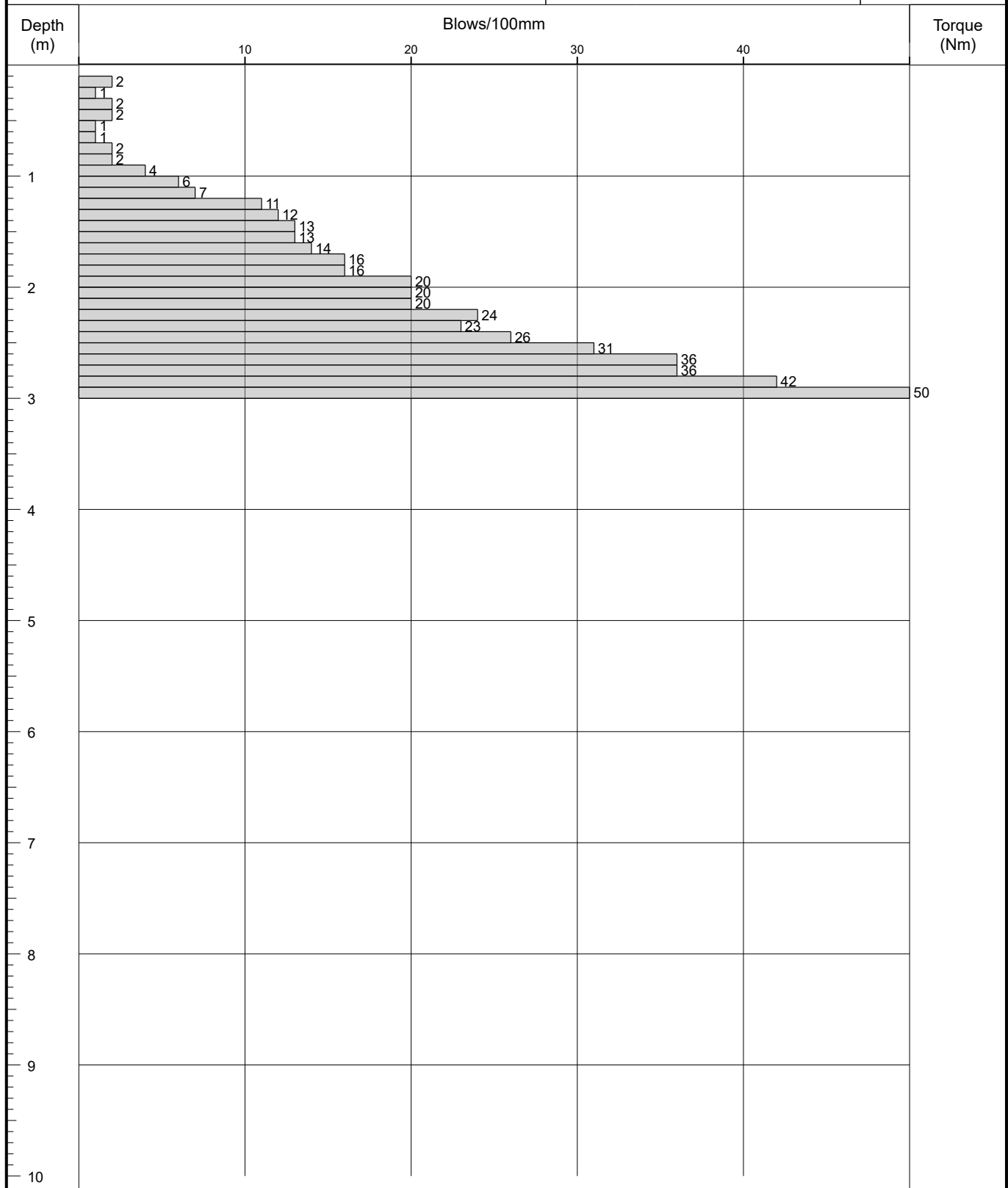
Level: 77.73

Scale  
1:50

Client: Vistry Thames Valley

Dates: -

Logged By



Remarks

Fall Height 1

Cone Base Diameter

Hammer Wt 50.0

Final Depth 2.90

Probe Type DPSH

Log Scale 1:50





Geo-Environmental

# Probe Log

Borehole No.

**SHDP03**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471402.13 - 176858.91

Hole Type  
DP

Location: Reading

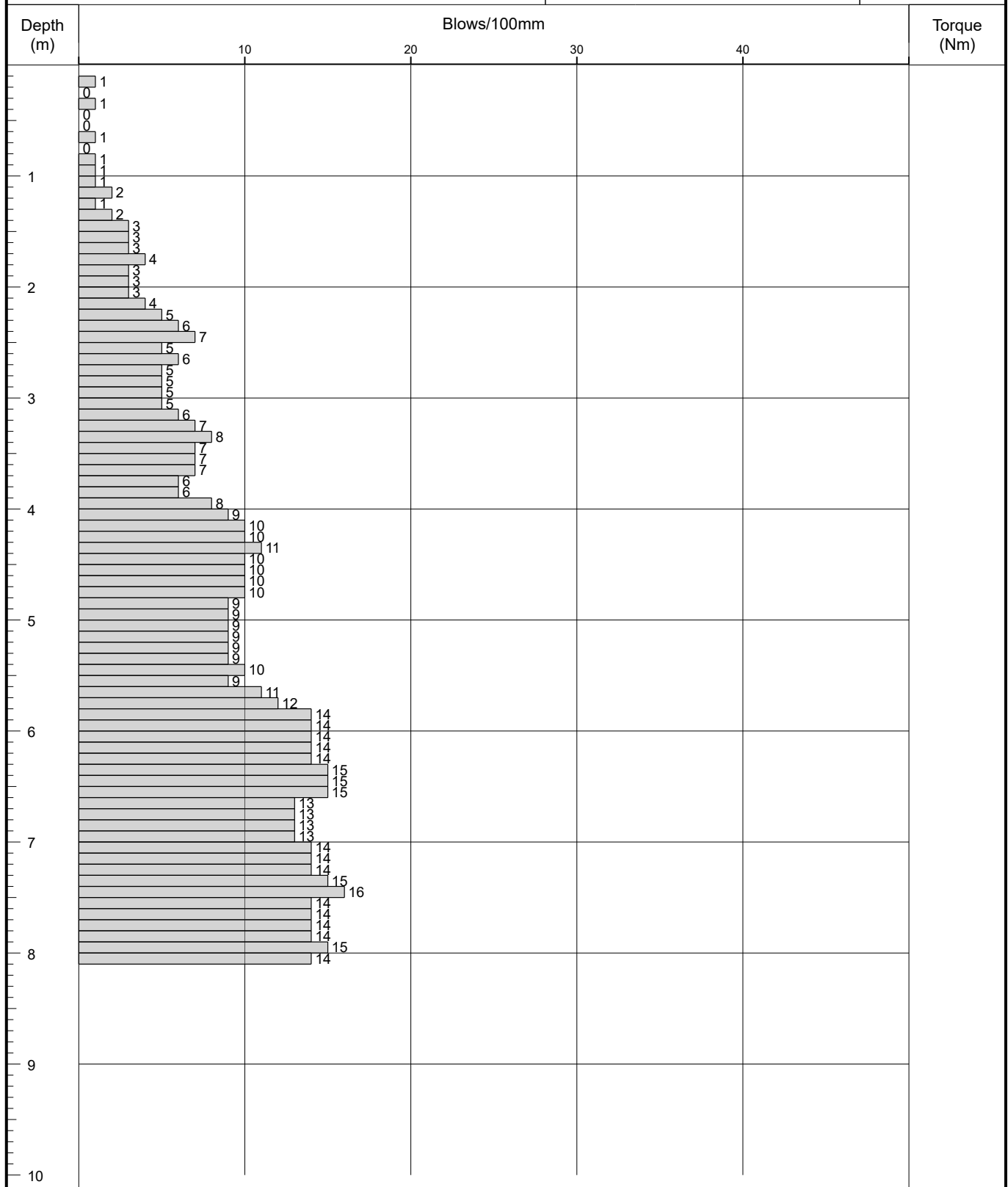
Level: 78.47

Scale  
1:50

Client: Vistry Thames Valley

Dates: -

Logged By



Remarks

Fall Height 1

Cone Base Diameter

Hammer Wt 50.0

Final Depth 8.00

Probe Type DPSH

Log Scale 1:50





Geo-Environmental

# Probe Log

Borehole No.

**SHDP04**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471547.73 - 176889.68

Hole Type  
DP

Location: Reading

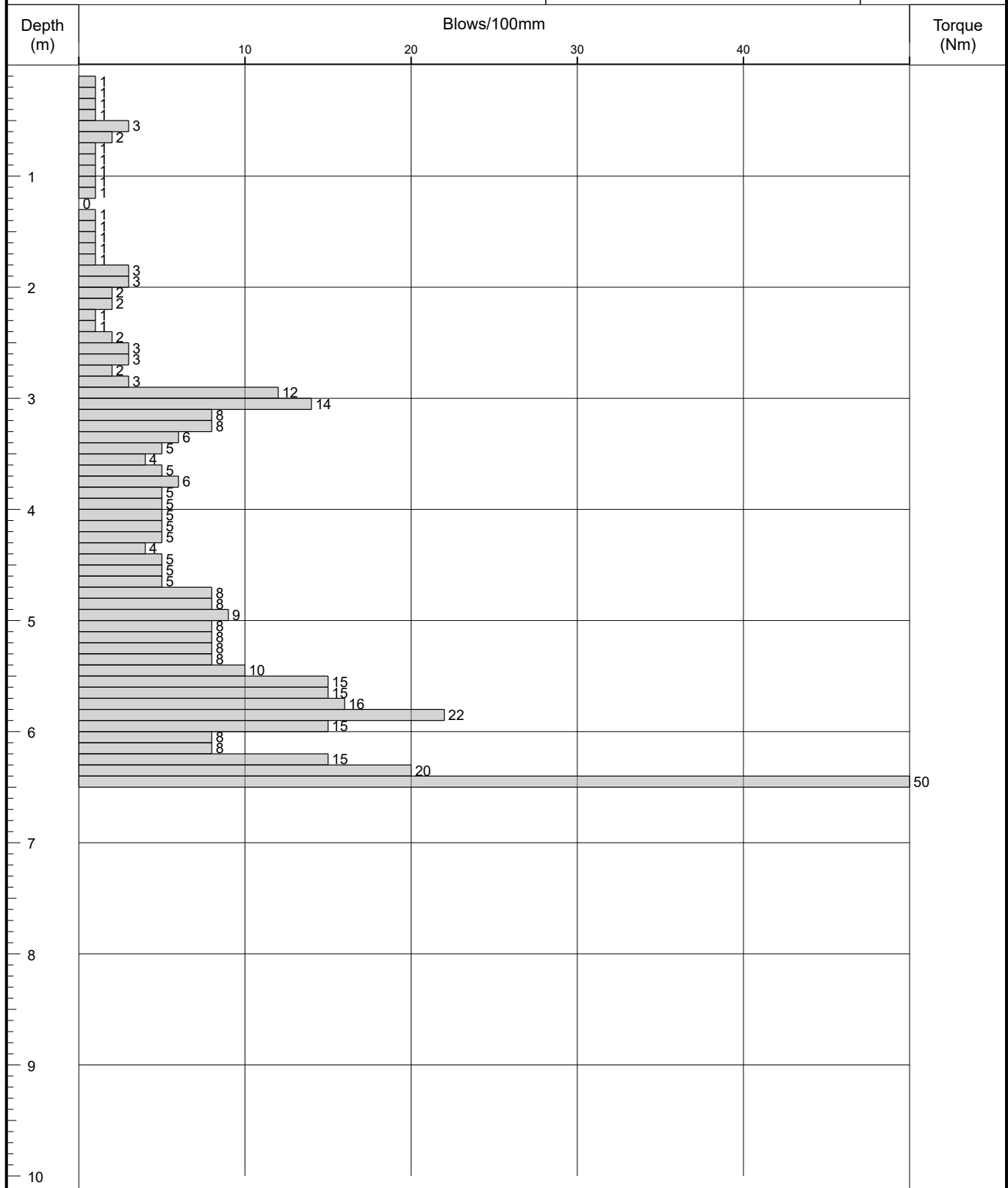
Level: 79.59

Scale  
1:50

Client: Vistry Thames Valley

Dates: -

Logged By



Remarks

Fall Height 1

Cone Base Diameter

Hammer Wt 50.0

Final Depth 6.40

Probe Type DPSH

Log Scale 1:50





## Borehole No.

SHDP05

Sheet 1 of 1

Project Name: Reading Golf Club

|             |
|-------------|
| Project No. |
| GE19428     |

Co-ords: 471538.38 - 176865.07

| Hole Type |
|-----------|
| DP        |

Location: Reading

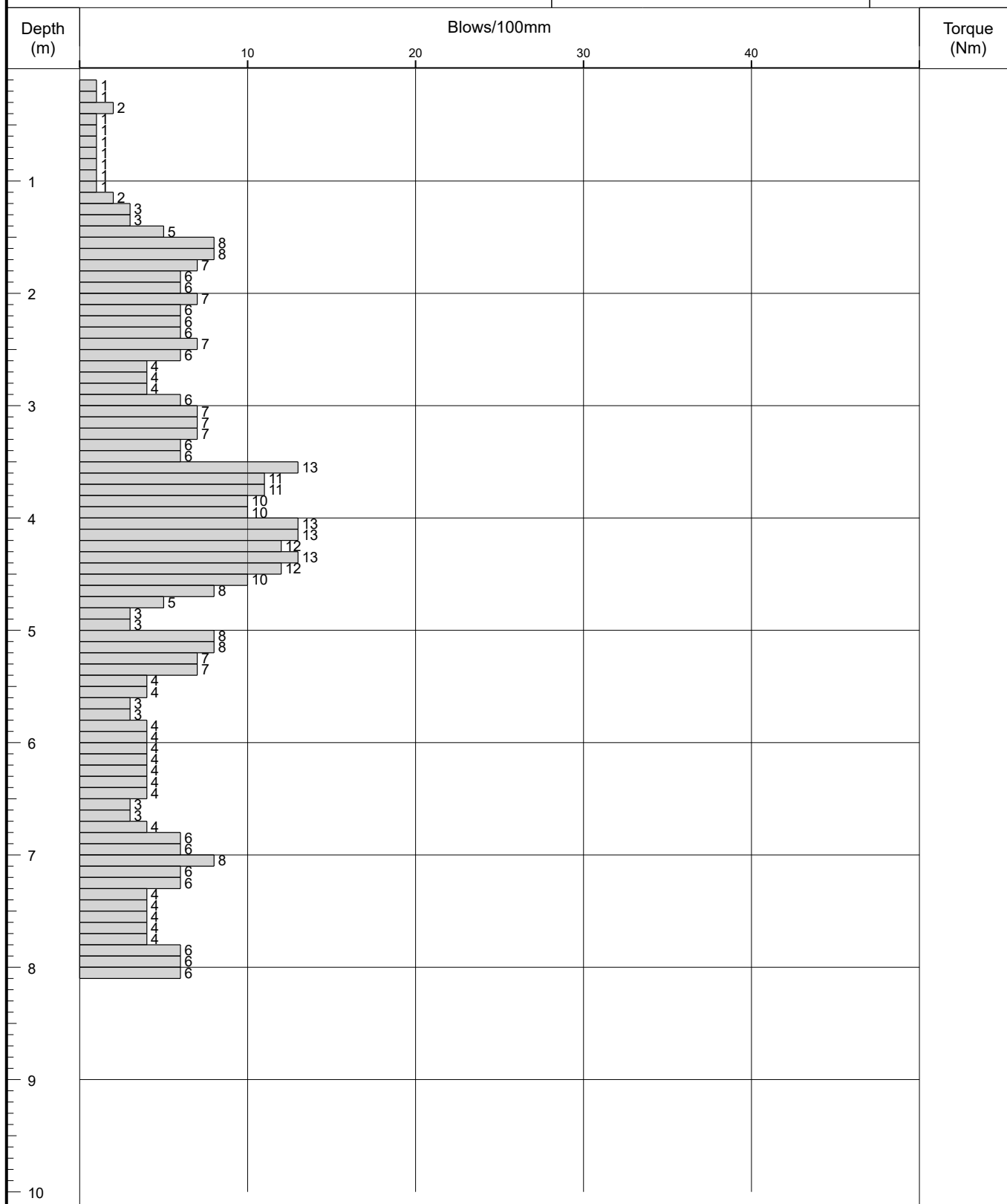
|        |       |
|--------|-------|
| Level: | 79.64 |
|--------|-------|

Scale  
1:50

Client: Vistry Thames Valley

Dates: -

Logged By



|         |
|---------|
| Remarks |
|---------|

|             |   |
|-------------|---|
| Fall Height | 1 |
|-------------|---|

|                    |
|--------------------|
| Cone Base Diameter |
|--------------------|

|           |      |
|-----------|------|
| Hammer Wt | 50.0 |
|-----------|------|

|             |      |
|-------------|------|
| Final Depth | 8.00 |
|-------------|------|

|            |      |
|------------|------|
| Probe Type | DPSH |
|------------|------|

|           |      |
|-----------|------|
| Log Scale | 1:50 |
|-----------|------|





Geo-Environmental

# Probe Log

Borehole No.

**SHDP08**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471627.39 - 176802.18

Hole Type  
DP

Location: Reading

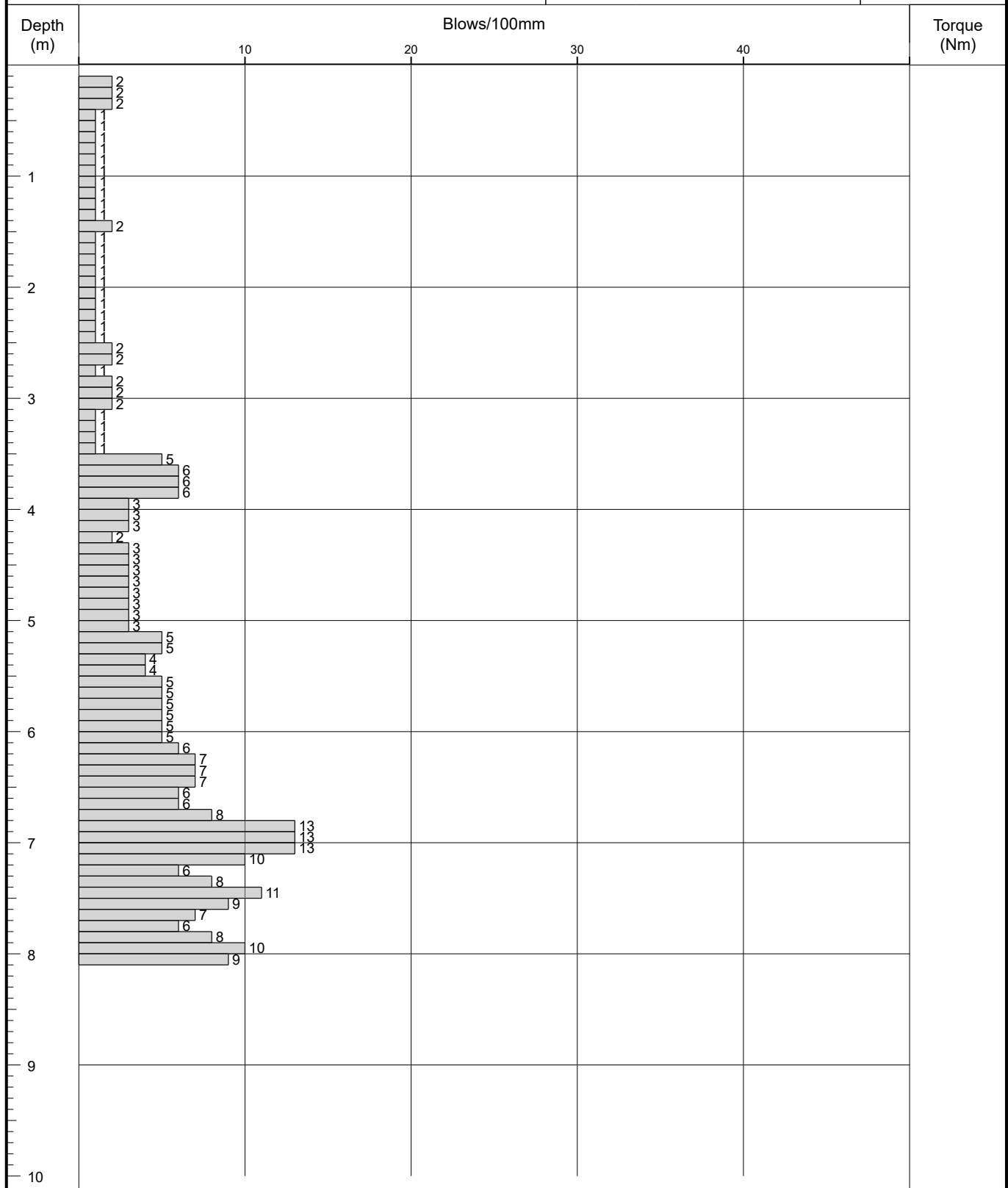
Level: 80.91

Scale  
1:50

Client: Vistry Thames Valley

Dates: -

Logged By



Remarks

Fall Height 1

Cone Base Diameter

Hammer Wt 50.0

Final Depth 8.00

Probe Type DPSH

Log Scale 1:50





Geo-Environmental

# Probe Log

Borehole No.

**SHDP09**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471519.18 - 176718.86

Hole Type  
DP

Location: Reading

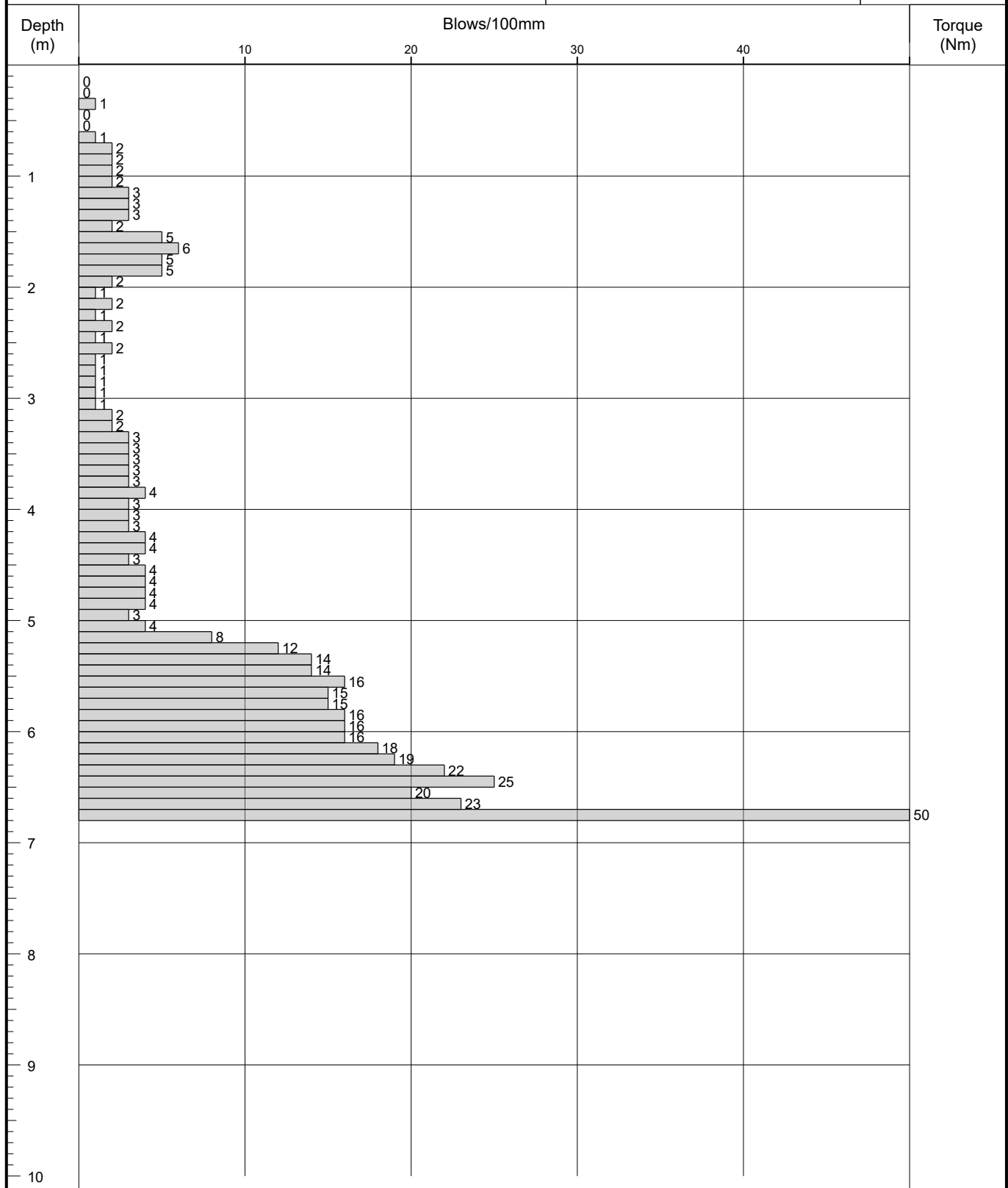
Level: 81.46

Scale  
1:50

Client: Vistry Thames Valley

Dates: -

Logged By



Remarks

Fall Height 1

Cone Base Diameter

Hammer Wt 50.0

Final Depth 6.70

Probe Type DPSH

Log Scale 1:50





Geo-Environmental

# Probe Log

Borehole No.

**SHDP10**

Sheet 1 of 1

Project Name: Reading Golf Club

Project No.  
GE19428

Co-ords: 471765.30 - 176782.76

Hole Type  
DP

Location: Reading

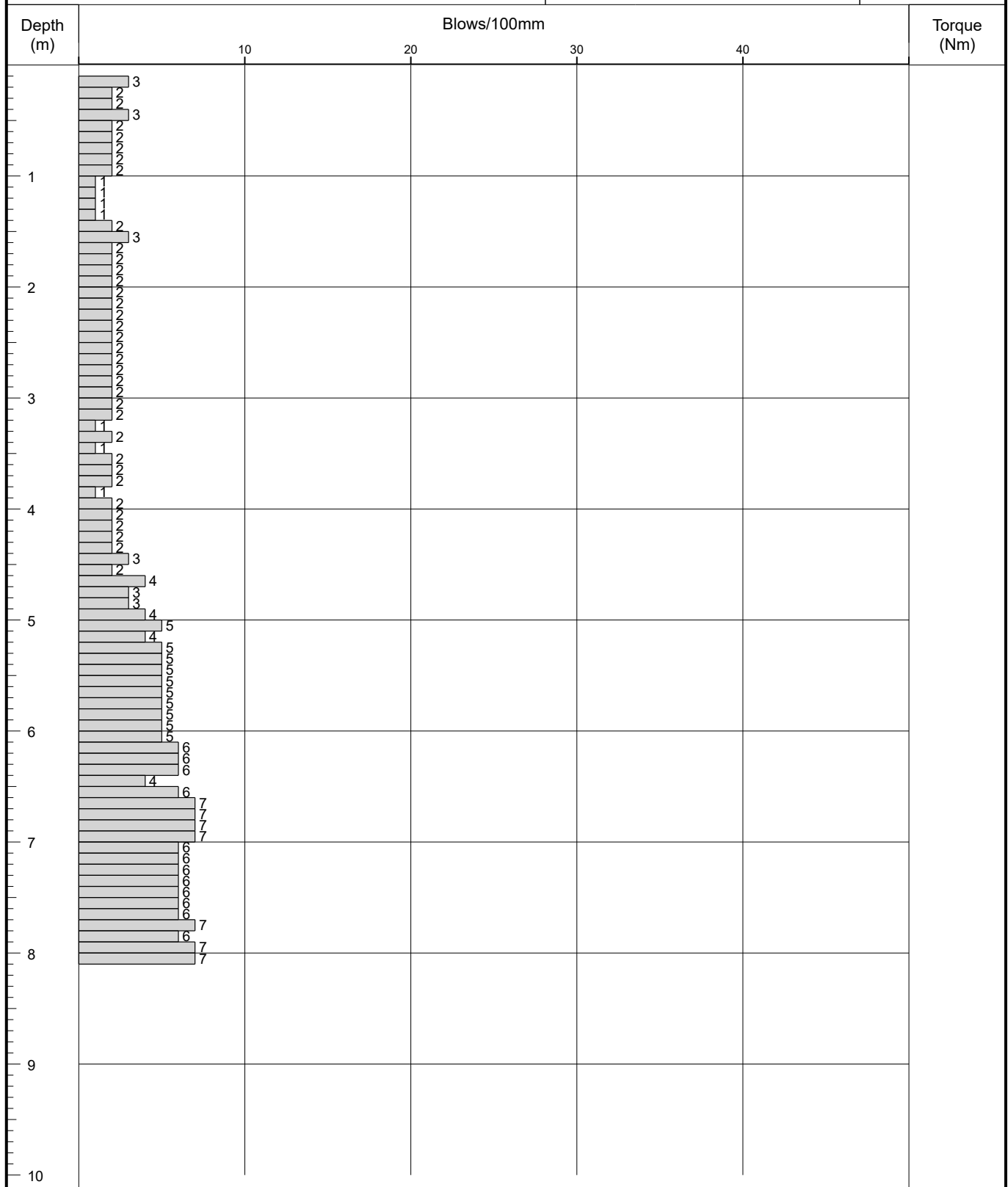
Level: 81.46

Scale  
1:50

Client: Vistry Thames Valley

Dates: -

Logged By



|         |             |      |                    |      |
|---------|-------------|------|--------------------|------|
| Remarks | Fall Height | 1    | Cone Base Diameter |      |
|         | Hammer Wt   | 50.0 | Final Depth        | 8.00 |
|         | Probe Type  | DPSH | Log Scale          | 1:50 |



|                                                                                                               |                                                         |                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Geo-Environmental</b> | <b>Soakaway Test Results<br/>(after BRE Digest 365)</b> | <b>Geo-Environmental Services Limited</b><br>Unit 7 Danworth Farm, Cuckfield Road,<br>Hurstpierpoint, West Sussex BN6 9GL<br>+44(0)1273 832972 www.gesl.net |
| <b>Project Name :</b> Reading Golf Club                                                                       |                                                         | <b>Job No. :</b> GE19428                                                                                                                                    |
| <b>Client :</b> Vistry Thames Valley                                                                          |                                                         | <b>Date :</b> 03/11/2020                                                                                                                                    |

|                             |             |
|-----------------------------|-------------|
| <b>Pit reference</b>        | <b>TP01</b> |
| Pit depth (m)               | 3.10        |
| Pit width (m)               | 0.60        |
| Pit length (m)              | 1.90        |
| Depth to standing water (m) |             |

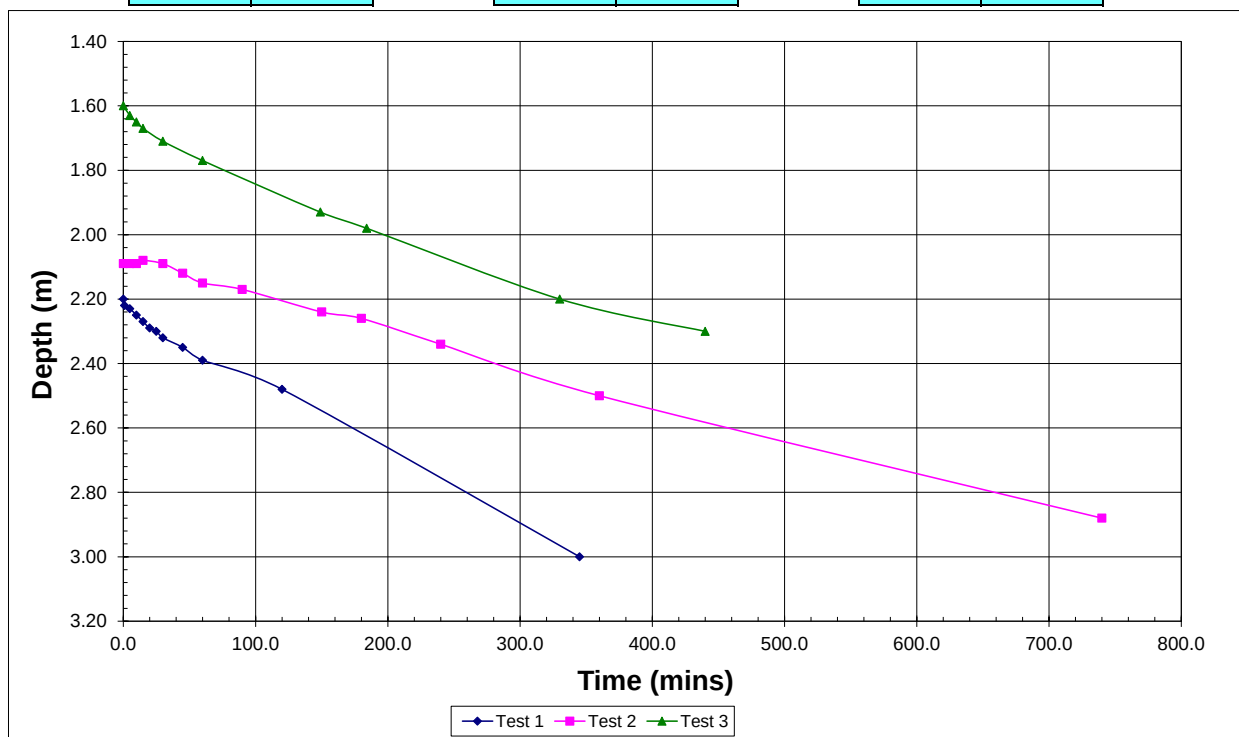
Test 3  
Pit depth: 2.50

| Test 1     |           |
|------------|-----------|
| Time (min) | Depth (m) |
| 0.1        | 2.20      |
| 1.0        | 2.22      |
| 5.0        | 2.23      |
| 10.0       | 2.25      |
| 15.0       | 2.27      |
| 20.0       | 2.29      |
| 25.0       | 2.30      |
| 30.0       | 2.32      |
| 45.0       | 2.35      |
| 60.0       | 2.39      |
| 120.0      | 2.48      |
| 345.0      | 3.00      |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |

DRY

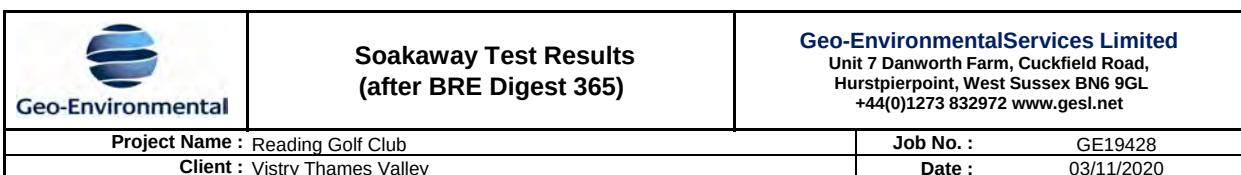
| Test 2     |           |
|------------|-----------|
| Time (min) | Depth (m) |
| 0.1        | 2.09      |
| 5.0        | 2.09      |
| 10.0       | 2.09      |
| 15.0       | 2.08      |
| 30.0       | 2.09      |
| 45.0       | 2.12      |
| 60.0       | 2.15      |
| 90.0       | 2.17      |
| 150.0      | 2.24      |
| 180.0      | 2.26      |
| 240.0      | 2.34      |
| 360.0      | 2.50      |
| 740.0      | 2.88      |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |

| Test 3     |           |
|------------|-----------|
| Time (min) | Depth (m) |
| 0.1        | 1.60      |
| 5.0        | 1.63      |
| 10.0       | 1.65      |
| 15.0       | 1.67      |
| 30.0       | 1.71      |
| 60.0       | 1.77      |
| 149.0      | 1.93      |
| 184.0      | 1.98      |
| 330.0      | 2.20      |
| 440.0      | 2.30      |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |



|                         |        |        |        |
|-------------------------|--------|--------|--------|
| Max. depth (m)          | 3.10   | 3.10   | 2.50   |
| Effective depth (m)     | 0.90   | 1.01   | 0.90   |
| 75% effective depth (m) | 2.43   | 2.34   | 1.83   |
| 50% effective depth (m) | 2.65   | 2.60   | 2.05   |
| 25% effective depth (m) | 2.88   | 2.85   | 2.28   |
| t75 (min)               | 90.00  | 240.00 | 80.00  |
| t50 (min)               | 190.00 | 430.00 | 220.00 |
| t25 (min)               | 330.00 | 700.00 | 420.00 |
| Vp 75-25                | 0.51   | 0.58   | 0.51   |
| ap 50                   | 3.39   | 3.665  | 3.39   |
| tp 75-25                | 240.00 | 460.00 | 340.00 |

|                                |          |          |          |
|--------------------------------|----------|----------|----------|
| Soil infiltration rate (m/s)   | 1.1E-05  | 5.7E-06  | 7.4E-06  |
| Soil infiltration rate (mm/hr) | 3.78E+01 | 2.05E+01 | 2.67E+01 |



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Job No. : GE19428

**Date :** 03/11/2020

## Test 1

## Test 2

### Test 3

| Time (mins) | Depth (m) at 1.5 m | Depth (m) at 1.7 m | Depth (m) at 1.9 m |
|-------------|--------------------|--------------------|--------------------|
| 0           | 1.3                | 1.5                | 1.7                |
| 50          | 1.4                | 1.6                | 1.8                |
| 100         | 1.5                | 1.7                | 1.9                |
| 150         | 1.7                | 1.9                | 2.0                |
| 200         | 1.8                | 1.9                | 2.0                |
| 250         | 1.85               | 2.0                | 2.05               |
| 1100        | 2.4                | 2.4                | 2.4                |
| 1650        | 2.6                | 2.6                | 2.7                |

3.00

1.71

1.72

2.15

2.57

110.00

700.00

1700.00

1.08

5.877

1590.00

|                                |          |          |          |
|--------------------------------|----------|----------|----------|
| Soil infiltration rate (m/s)   | 2.1E-06  | 1.9E-06  | 1.9E-06  |
| Soil infiltration rate (mm/hr) | 7.57E+00 | 6.84E+00 | 6.92E+00 |



|                                                                                                               |                                                               |                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Geo-Environmental</b> | <b>Soakaway Test Results</b><br><b>(after BRE Digest 365)</b> | <b>Geo-Environmental Services Limited</b><br>Unit 7 Danworth Farm, Cuckfield Road,<br>Hurstpierpoint, West Sussex BN6 9GL<br>+44(0)1273 832972 www.gesl.net |
| Project Name : Reading Golf Club                                                                              |                                                               | Job No. : GE19428                                                                                                                                           |
| Client : Vistry Thames Valley                                                                                 |                                                               | Date : 03/11/2020                                                                                                                                           |

|                             |      |
|-----------------------------|------|
| Pit reference               | TP05 |
| Pit depth (m)               | 3.10 |
| Pit width (m)               | 0.60 |
| Pit length (m)              | 2.10 |
| Depth to standing water (m) |      |

Test 2  
Pit depth: 2.9

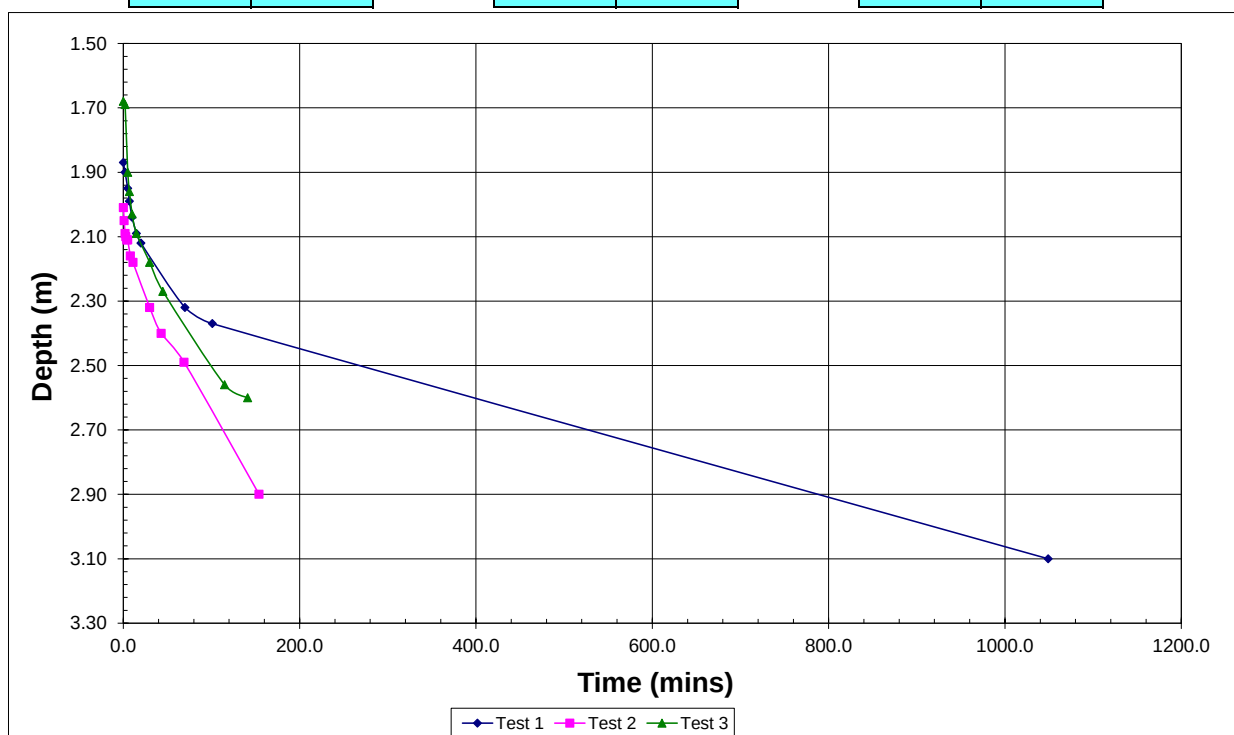
Test 3  
Pit depth: 2.70

| Test 1     |           |
|------------|-----------|
| Time (min) | Depth (m) |
| 0.1        | 1.87      |
| 2.0        | 1.90      |
| 5.0        | 1.95      |
| 7.0        | 1.99      |
| 10.0       | 2.04      |
| 15.0       | 2.09      |
| 20.0       | 2.12      |
| 70.0       | 2.32      |
| 101.0      | 2.37      |
| 1049.0     | 3.10      |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |

| Test 2     |           |
|------------|-----------|
| Time (min) | Depth (m) |
| 0.1        | 2.01      |
| 1.0        | 2.05      |
| 2.0        | 2.09      |
| 3.0        | 2.10      |
| 4.0        | 2.11      |
| 5.0        | 2.11      |
| 8.0        | 2.16      |
| 11.0       | 2.18      |
| 30.0       | 2.32      |
| 43.0       | 2.40      |
| 69.0       | 2.49      |
| 154.0      | 2.90      |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |

DRY

| Test 3     |           |
|------------|-----------|
| Time (min) | Depth (m) |
| 0.1        | 1.68      |
| 2.0        | 1.69      |
| 5.0        | 1.90      |
| 7.0        | 1.96      |
| 10.0       | 2.03      |
| 15.0       | 2.09      |
| 30.0       | 2.18      |
| 45.0       | 2.27      |
| 115.0      | 2.56      |
| 141.0      | 2.60      |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |
|            |           |



|                         |        |        |       |
|-------------------------|--------|--------|-------|
| Max. depth (m)          | 3.10   | 2.90   | 2.70  |
| Effective depth (m)     | 1.23   | 0.89   | 1.02  |
| 75% effective depth (m) | 2.18   | 2.23   | 1.94  |
| 50% effective depth (m) | 2.49   | 2.46   | 2.19  |
| 25% effective depth (m) | 2.79   | 2.68   | 2.45  |
| t75 (min)               | 40.00  | 25.00  | 6.00  |
| t50 (min)               | 245.00 | 60.00  | 32.00 |
| t25 (min)               | 640.00 | 100.00 | 90.00 |
| Vp 75-25                | 0.77   | 0.56   | 0.64  |
| ap 50                   | 4.581  | 3.663  | 4.014 |
| tp 75-25                | 600.00 | 75.00  | 84.00 |

|                                |          |          |          |
|--------------------------------|----------|----------|----------|
| Soil infiltration rate (m/s)   | 4.7E-06  | 3.4E-05  | 3.2E-05  |
| Soil infiltration rate (mm/hr) | 1.69E+01 | 1.22E+02 | 1.14E+02 |

## **APPENDIX B**

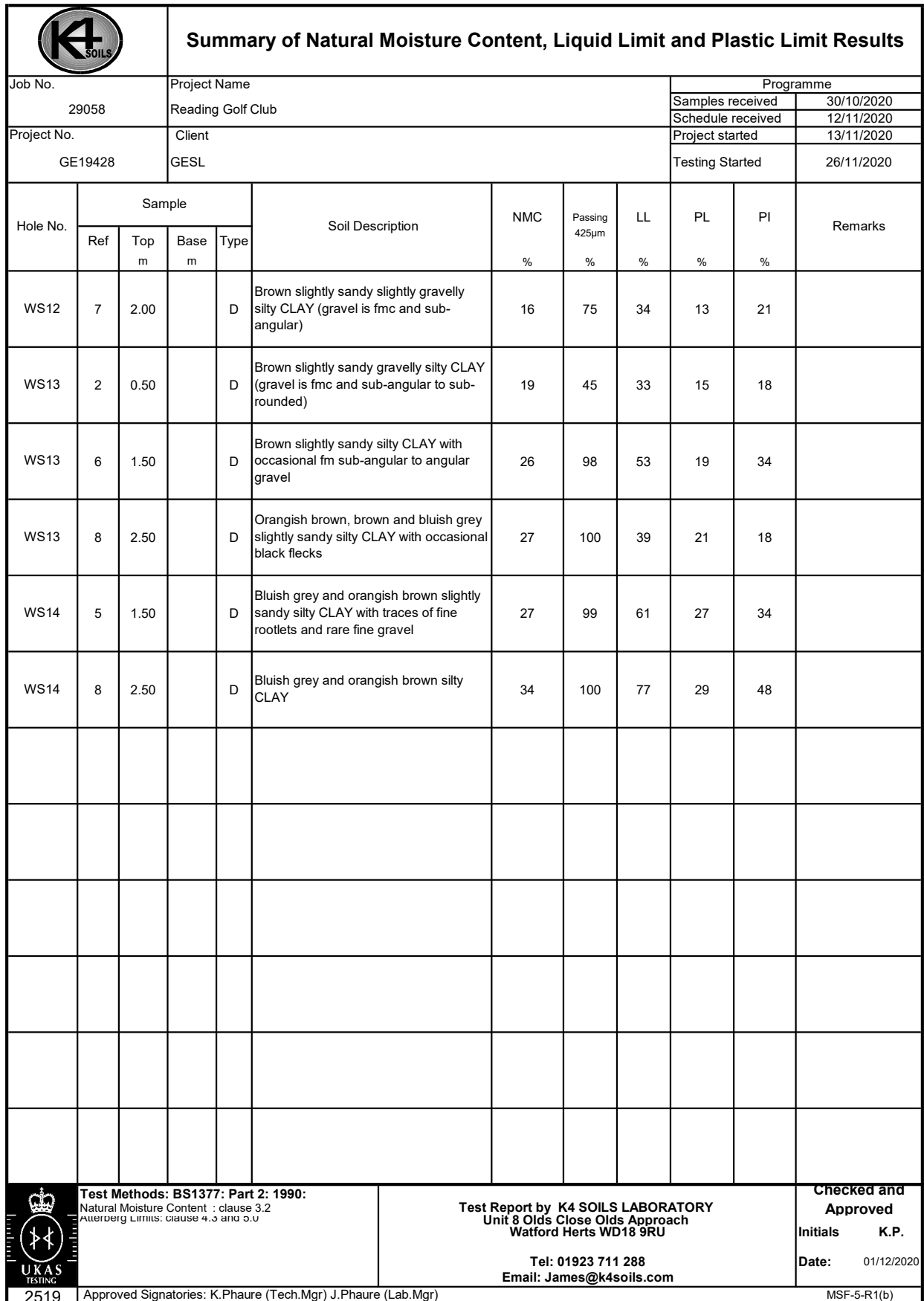
### **Geotechnical Laboratory Results**



|                                                                                                                                |        | Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results |           |      |                                                                                                                                                              |          |                       |                   |            |         |                                                                                |             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------|-----------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------|-------------------|------------|---------|--------------------------------------------------------------------------------|-------------|--|
| Job No.<br>29058                                                                                                                                                                                                |        | Project Name<br>Reading Golf Club                                           |           |      |                                                                                                                                                              |          |                       | Programme         |            |         |                                                                                |             |  |
|                                                                                                                                                                                                                 |        |                                                                             |           |      |                                                                                                                                                              |          |                       | Samples received  | 30/10/2020 |         |                                                                                |             |  |
| Project No.<br>GE19428                                                                                                                                                                                          |        | Client<br>GESL                                                              |           |      |                                                                                                                                                              |          |                       | Schedule received | 12/11/2020 |         |                                                                                |             |  |
|                                                                                                                                                                                                                 |        |                                                                             |           |      |                                                                                                                                                              |          |                       | Project started   | 13/11/2020 |         |                                                                                |             |  |
|                                                                                                                                                                                                                 |        |                                                                             |           |      |                                                                                                                                                              |          |                       | Testing Started   | 26/11/2020 |         |                                                                                |             |  |
| Hole No.                                                                                                                                                                                                        | Sample |                                                                             |           |      | Soil Description                                                                                                                                             | NMC<br>% | Passing<br>425µm<br>% | LL<br>%           | PL<br>%    | PI<br>% | Remarks                                                                        |             |  |
|                                                                                                                                                                                                                 | Ref    | Top<br>m                                                                    | Base<br>m | Type |                                                                                                                                                              |          |                       |                   |            |         |                                                                                |             |  |
| TP02                                                                                                                                                                                                            | 2      | 0.50                                                                        |           | D    | Dark brown gravelly sandy silty CLAY (gravel is fmc and sub-angular to sub-rounded)                                                                          | 14       | 44                    | 23                | 13         | 10      | Sample washed to obtain test fraction                                          |             |  |
| TP02                                                                                                                                                                                                            | 5      | 1.50                                                                        |           | D    | Orangish brown clayey gravelly SAND with traces of rootlets (gravel is fmc and sub-angular to angular)                                                       | 9.4      | 59                    | 23                | 14         | 9       | Sample washed to obtain test fraction                                          |             |  |
| TP03                                                                                                                                                                                                            | 3      | 0.50                                                                        |           | D    | Brown and orangish brown slightly gravelly sandy silty CLAY with traces of rootlets (gravel is fmc and sub-angular to angular)                               | 21       | 80                    | 57                | 17         | 40      |                                                                                |             |  |
| TP04                                                                                                                                                                                                            | 4      | 1.00                                                                        |           | D    | Orangish brown slightly mottled grey slightly sandy silty CLAY with traces of fine rootlets                                                                  | 18       | 100                   | 34                | 17         | 17      |                                                                                |             |  |
| TP04                                                                                                                                                                                                            | 6      | 2.00                                                                        |           | D    | Grey slightly mottled orangish brown silty CLAY with traces of fine rootlets and rare fine gravel                                                            | 19       | 99                    | 40                | 21         | 19      |                                                                                |             |  |
| TP05                                                                                                                                                                                                            | 4      | 1.00                                                                        |           | D    | Orangish brown slightly mottled grey slightly gravelly silty CLAY (gravel is fine)                                                                           | 30       | 97                    | 69                | 26         | 43      |                                                                                |             |  |
| TP06                                                                                                                                                                                                            | 3      | 0.50                                                                        |           | D    | Orangish brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular to angular)                                                         | 19       | 90                    | 42                | 20         | 22      |                                                                                |             |  |
| TP06                                                                                                                                                                                                            | 5      | 1.50                                                                        |           | D    | Orangish brown sandy silty CLAY with rare fine gravel                                                                                                        | 11       | 99                    | 29                | 15         | 14      |                                                                                |             |  |
| TP08                                                                                                                                                                                                            | 4      | 1.00                                                                        |           | D    | Orangish brown clayey sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)                                                                            | 8.5      | 22                    | 45                | 22         | 23      |                                                                                |             |  |
| TP08                                                                                                                                                                                                            | 8      | 3.00                                                                        |           | D    | Orangish brown and reddish brown mottled CLAY with occasional fm sub-angular to angular gravel)                                                              | 25       | 94                    | 80                | 24         | 56      |                                                                                |             |  |
| WS01                                                                                                                                                                                                            | 4      | 1.00                                                                        |           | D    | Brown and orangish brown slightly sandy gravelly silty CLAY (gravel is fm and sub-rounded to sub-angular)                                                    | 16       | 40                    | 30                | 12         | 18      |                                                                                |             |  |
| WS03                                                                                                                                                                                                            | 4      | 1.00                                                                        |           | D    | Orangish brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)                                                             | 16       | 46                    | 40                | 17         | 23      | Sample washed to obtain test fraction                                          |             |  |
|  <b>Test Methods: BS1377: Part 2: 1990:</b><br>Natural Moisture Content : clause 3.2<br>Atterberg Limits: clause 4.3 and 5.0 |        |                                                                             |           |      | <b>Test Report by K4 SOILS LABORATORY</b><br>Unit 8 Olds Close Olds Approach<br>Watford Herts WD18 9RU<br><br>Tel: 01923 711 288<br>Email: James@k4soils.com |          |                       |                   |            |         | <b>Checked and Approved</b><br>Initials      K.P.<br><br>Date:      01/12/2020 |             |  |
| 2519                                                                                                                                                                                                            |        | Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)                |           |      |                                                                                                                                                              |          |                       |                   |            |         |                                                                                | MSF-5-R1(b) |  |

|  |        | Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results |           |      |                                                                                                                                                          |     |                  |                   |            |    |                                       |
|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------|-------------------|------------|----|---------------------------------------|
| Job No.                                                                           |        | Project Name                                                                |           |      |                                                                                                                                                          |     |                  | Programme         |            |    |                                       |
| 29058                                                                             |        | Reading Golf Club                                                           |           |      |                                                                                                                                                          |     |                  | Samples received  | 30/10/2020 |    |                                       |
| Project No.                                                                       |        | Client                                                                      |           |      |                                                                                                                                                          |     |                  | Schedule received | 12/11/2020 |    |                                       |
| GE19428                                                                           |        | GESL                                                                        |           |      |                                                                                                                                                          |     |                  | Project started   | 13/11/2020 |    |                                       |
|                                                                                   |        |                                                                             |           |      |                                                                                                                                                          |     |                  | Testing Started   | 26/11/2020 |    |                                       |
| Hole No.                                                                          | Sample |                                                                             |           |      | Soil Description                                                                                                                                         | NMC | Passing<br>425µm | LL                | PL         | PI | Remarks                               |
|                                                                                   | Ref    | Top<br>m                                                                    | Base<br>m | Type |                                                                                                                                                          |     |                  |                   |            |    |                                       |
| WS04                                                                              | 5      | 1.50                                                                        |           | D    | Orangish brown and yellowish brown silty CLAY                                                                                                            | 31  | 99               | 82                | 24         | 58 |                                       |
| WS05                                                                              | 3      | 0.50                                                                        |           | D    | Brown, orangish brown and bluish grey slightly sandy slightly gravelly silty CLAY with traces of fine rootlets (gravel is fm and sub-angular to angular) | 28  | 95               | 59                | 21         | 38 |                                       |
| WS05                                                                              | 6      | 2.00                                                                        |           | D    | Greenish grey slightly mottled orangish brown silty CLAY                                                                                                 | 30  | 100              | 74                | 28         | 46 |                                       |
| WS06                                                                              | 4      | 1.00                                                                        |           | D    | Light grey slightly mottled light orangish brown silty CLAY                                                                                              | 40  | 100              | 71                | 26         | 45 |                                       |
| WS06                                                                              | 8      | 3.00                                                                        |           | D    | Grey slightly mottled orangish brown slightly sandy silty CLAY                                                                                           | 31  | 100              | 52                | 22         | 30 |                                       |
| WS07                                                                              | 8      | 2.50                                                                        |           | D    | Grey slightly mottled light orangish brown silty CLAY                                                                                                    | 30  | 100              | 71                | 28         | 43 |                                       |
| WS08                                                                              | 7      | 2.50                                                                        |           | D    | Grey slightly mottled orangish brown and dark orangish brown silty CLAY                                                                                  | 28  | 100              | 63                | 27         | 36 |                                       |
| WS09                                                                              | 3      | 0.50                                                                        |           | D    | Orangish brown silty CLAY with traces of fine rootlets and dark grey carbonaceous stains                                                                 | 24  | 100              | 43                | 21         | 22 |                                       |
| WS09                                                                              | 7      | 2.50                                                                        |           | D    | Orangish brown slightly mottled grey silty CLAY                                                                                                          | 18  | 100              | 48                | 22         | 26 |                                       |
| WS10                                                                              | 5      | 1.50                                                                        |           | D    | Brown sandy gravelly silty CLAY (gravel is fm and sub-angular to angular)                                                                                | 11  | 38               | 39                | 15         | 24 | Sample washed to obtain test fraction |
| WS11                                                                              | 4      | 1.00                                                                        |           | D    | Orangish brown clayey sandy GRAVEL (gravel is fmc and sub-angular)                                                                                       | 8   | 28               | 38                | 17         | 21 | Sample washed to obtain test fraction |
| WS12                                                                              | 4      | 1.00                                                                        |           | D    | Dark orangish brown slightly gravelly sandy silty CLAY (gravel is fm and sub-angular to rounded)                                                         | 15  | 90               | 28                | 16         | 12 |                                       |

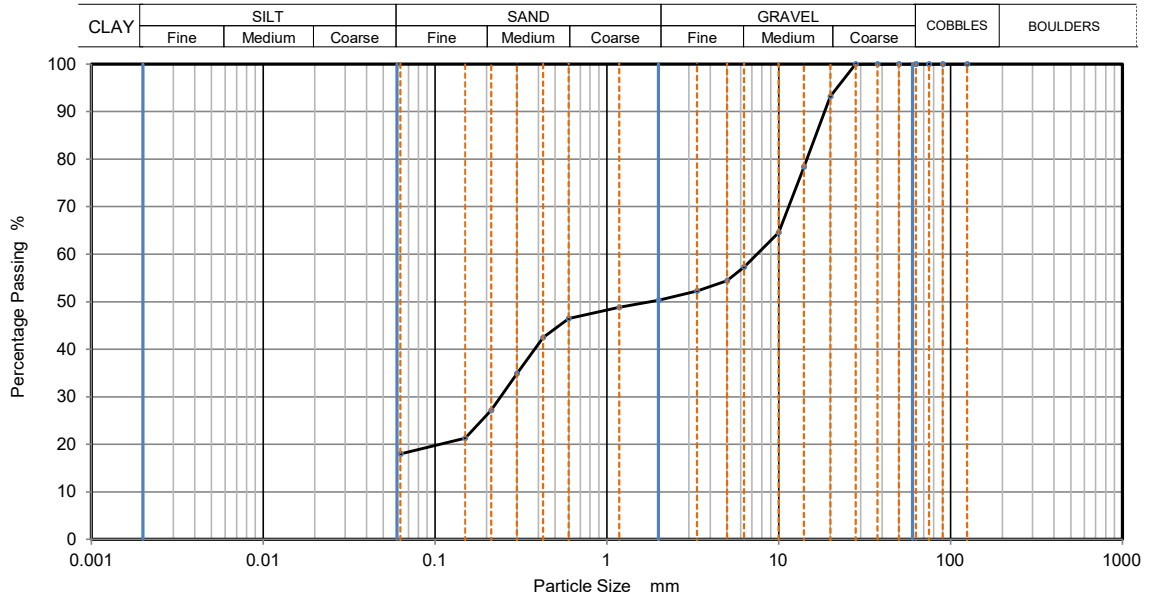
|                                                                                     |                                                                                                                             |                                                                                                                                                              |                                                                                    |
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|  | <b>Test Methods: BS1377: Part 2: 1990:</b><br>Natural Moisture Content : clause 3.2<br>Atterberg Limits: clause 4.3 and 5.0 | <b>Test Report by K4 SOILS LABORATORY</b><br>Unit 8 Olds Close Olds Approach<br>Watford Herts WD18 9RU<br><br>Tel: 01923 711 288<br>Email: James@k4soils.com | <b>Checked and Approved</b><br><br>Initials      K.P.<br><br>Date:      01/12/2020 |
|                                                                                     | Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)                                                                |                                                                                                                                                              | MSF-5-R1(b)                                                                        |





## PARTICLE SIZE DISTRIBUTION

|                                                                                   |                                                                                                                |        |      |                    |            |   |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------|------|--------------------|------------|---|
|  | PARTICLE SIZE DISTRIBUTION                                                                                     |        |      | Job Ref            | 29058      |   |
|                                                                                   |                                                                                                                |        |      | Borehole/Pit No.   | TP01       |   |
| Site Name                                                                         | Reading Golf Club                                                                                              |        |      | Sample No.         | 5          |   |
| Project No.                                                                       | GE19428                                                                                                        | Client | GESL | Depth Top          | 1.50       | m |
| Soil Description                                                                  | Orangish brown clayey very sandy GRAVEL with traces of rootlets (gravel is fmc and sub-rounded to sub-angular) |        |      | Depth Base         | -          | m |
|                                                                                   |                                                                                                                |        |      | Sample Type        | D          |   |
|                                                                                   |                                                                                                                |        |      | Samples received   | 30/10/2020 |   |
|                                                                                   |                                                                                                                |        |      | Schedules received | 12/11/2020 |   |
| Test Method                                                                       | BS1377:Part 2: 1990, clause 9.0                                                                                |        |      | Project started    | 13/11/2020 |   |
|                                                                                   |                                                                                                                |        |      | Date tested        | 23/11/2020 |   |



| Sieving          |           | Sedimentation    |           |
|------------------|-----------|------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125              | 100       |                  |           |
| 90               | 100       |                  |           |
| 75               | 100       |                  |           |
| 63               | 100       |                  |           |
| 50               | 100       |                  |           |
| 37.5             | 100       |                  |           |
| 28               | 100       |                  |           |
| 20               | 93        |                  |           |
| 14               | 78        |                  |           |
| 10               | 65        |                  |           |
| 6.3              | 57        |                  |           |
| 5                | 54        |                  |           |
| 3.35             | 52        |                  |           |
| 2                | 50        |                  |           |
| 1.18             | 49        |                  |           |
| 0.6              | 47        |                  |           |
| 0.425            | 43        |                  |           |
| 0.3              | 35        |                  |           |
| 0.212            | 27        |                  |           |
| 0.15             | 21        |                  |           |
| 0.063            | 18        |                  |           |

| Sample Proportions | % dry mass |
|--------------------|------------|
| Very coarse        | 0.0        |
| Gravel             | 49.7       |
| Sand               | 32.3       |
| Fines <0.063mm     | 18.0       |

| Grading Analysis       |    |
|------------------------|----|
| D100                   | mm |
| D60                    | mm |
| D30                    | mm |
| D10                    | mm |
| Uniformity Coefficient |    |
| Curvature Coefficient  |    |

Remarks  
Preparation and testing in accordance with BS1377 unless noted below



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Checked and Approved

Initials: K.P.

Date: 01/12/2020

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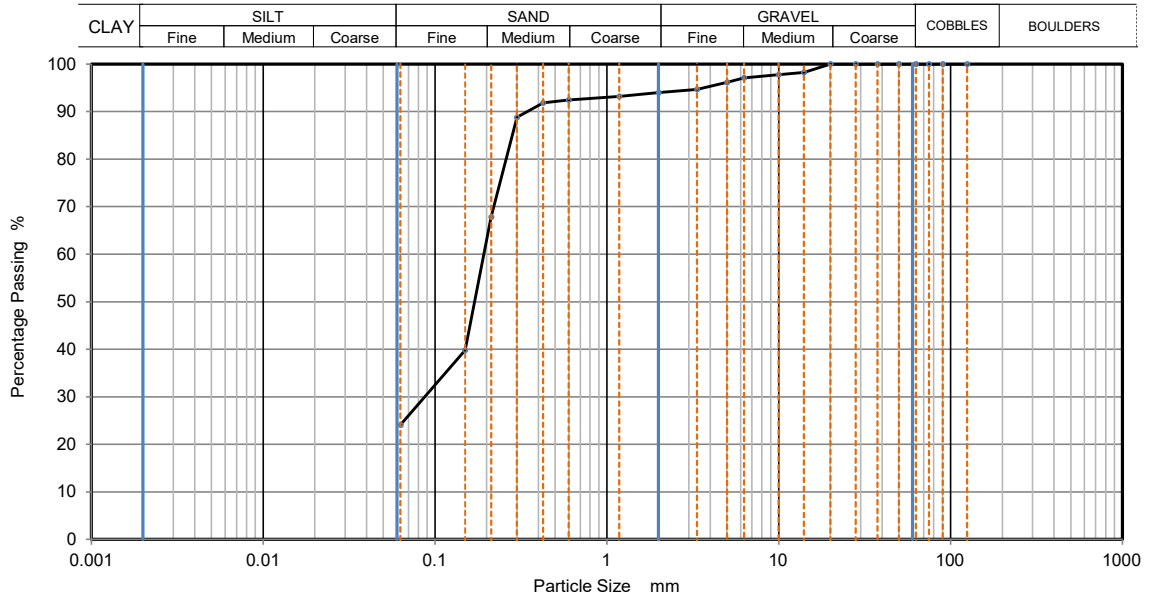
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3



## PARTICLE SIZE DISTRIBUTION

|                                                                                   |                                                                                           |        |      |                    |            |   |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|--------|------|--------------------|------------|---|
|  | PARTICLE SIZE DISTRIBUTION                                                                |        |      | Job Ref            | 29058      |   |
|                                                                                   |                                                                                           |        |      | Borehole/Pit No.   | WS07       |   |
| Site Name                                                                         | Reading Golf Club                                                                         |        |      | Sample No.         | 4          |   |
| Project No.                                                                       | GE19428                                                                                   | Client | GESL | Depth Top          | 1.00       | m |
| Soil Description                                                                  | Orangish brown and grey very clayey slightly gravelly SAND (gravel is fm and sub-angular) |        |      | Depth Base         | -          | m |
|                                                                                   |                                                                                           |        |      | Sample Type        | D          |   |
|                                                                                   |                                                                                           |        |      | Samples received   | 30/10/2020 |   |
|                                                                                   |                                                                                           |        |      | Schedules received | 12/11/2020 |   |
| Test Method                                                                       | BS1377:Part 2: 1990, clause 9.0                                                           |        |      | Project started    | 13/11/2020 |   |
|                                                                                   |                                                                                           |        |      | Date tested        | 25/11/2020 |   |



| Sieving          |           | Sedimentation    |           |
|------------------|-----------|------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125              | 100       |                  |           |
| 90               | 100       |                  |           |
| 75               | 100       |                  |           |
| 63               | 100       |                  |           |
| 50               | 100       |                  |           |
| 37.5             | 100       |                  |           |
| 28               | 100       |                  |           |
| 20               | 100       |                  |           |
| 14               | 98        |                  |           |
| 10               | 98        |                  |           |
| 6.3              | 97        |                  |           |
| 5                | 96        |                  |           |
| 3.35             | 95        |                  |           |
| 2                | 94        |                  |           |
| 1.18             | 93        |                  |           |
| 0.6              | 93        |                  |           |
| 0.425            | 92        |                  |           |
| 0.3              | 89        |                  |           |
| 0.212            | 68        |                  |           |
| 0.15             | 40        |                  |           |
| 0.063            | 24        |                  |           |

| Sample Proportions | % dry mass |
|--------------------|------------|
| Very coarse        | 0.0        |
| Gravel             | 6.0        |
| Sand               | 69.9       |
| Fines <0.063mm     | 24.1       |

| Grading Analysis       |    |
|------------------------|----|
| D100                   | mm |
| D60                    | mm |
| D30                    | mm |
| D10                    | mm |
| Uniformity Coefficient |    |
| Curvature Coefficient  |    |

Remarks  
 Preparation and testing in accordance with BS1377 unless noted below



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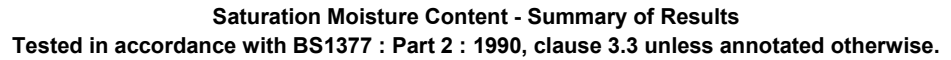
Initials: K.P.

Date: 01/12/2020

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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3



|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|----------------------------|--------|-----------------------------------|-----------|------|---------------------------------------------------------|----------|----------|--------------------------|-------------------------|------------------------------------------------------------------------|------------|
| Job No.<br><br>29058       |        | Project Name<br>Reading Golf Club |           |      |                                                         |          |          |                          |                         | Programme                                                              |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         | Samples received                                                       | 30/11/2020 |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         | Schedule received                                                      | 12/11/2020 |
| Project No.<br><br>GE19428 |        | Client<br>GESL                    |           |      |                                                         |          |          |                          |                         | Project started                                                        | 13/11/2020 |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         | Testing Started                                                        | 27/11/2020 |
| Hole No.                   | Sample |                                   |           |      | Description                                             | SMC<br>% | NMC<br>% | Bulk<br>Density<br>Mg/m3 | Dry<br>Density<br>Mg/m3 | Remarks - Sample size<br>complies with BS1377:1990:<br>Part 2 (Yes/No) |            |
|                            | Ref    | Top<br>m                          | Base<br>m | Type |                                                         |          |          |                          |                         |                                                                        |            |
| TP05                       | 7      | 2.50                              |           | D    | Off white putty CHALK with fm intact<br>chalk fragments | 28       | 26       | 1.94                     | 1.54                    |                                                                        |            |
| WS03                       | 7      | 2.50                              |           | D    | Off white putty CHALK with fm intact<br>chalk fragments | 26       | 29       | 2.04                     | 1.58                    |                                                                        |            |
| WS04                       | 6      | 2.00                              |           | D    | Off white putty CHALK with fm intact<br>chalk fragments | 28       | 28       | 1.98                     | 1.54                    |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
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|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |
|                            |        |                                   |           |      |                                                         |          |          |                          |                         |                                                                        |            |



## **APPENDIX C**

### **Geochemical Laboratory Results**





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## THE ENVIRONMENTAL LABORATORY LTD

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**Analytical Report Number:** 20-30688

**Issue:** 1

**Date of Issue:** 11/11/2020

**Contact:** Katie O'Dea

**Customer Details:** GESL  
Unit 7  
Danworth Farm  
Hurstpierpoint  
West Sussex BN6 9GL

**Quotation No:** Q19-01488

**Order No:** 3172

**Customer Reference:** GE19428

**Date Received:** 04/11/2020

**Date Approved:** 11/11/2020

**Details:** Reading Golf Club

**Approved by:** 

Mike Varley, Technical Manager

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## Sample Summary

Report No.: 20-30688, issue number 1

| Elab No. | Client's Ref. | Date Sampled | Date Scheduled | Description       | Deviations |
|----------|---------------|--------------|----------------|-------------------|------------|
| 219038   | C1 0.15       | 30/10/2020   | 04/11/2020     | Sandy loam        |            |
| 219039   | C2 0.20       | 30/10/2020   | 04/11/2020     |                   |            |
| 219040   | C3 0.20       | 30/10/2020   | 04/11/2020     |                   |            |
| 219041   | C5 0.30       | 30/10/2020   | 04/11/2020     |                   |            |
| 219042   | C6 0.30       | 30/10/2020   | 04/11/2020     | Sandy silty loam  |            |
| 219043   | C7 0.25       | 30/10/2020   | 04/11/2020     |                   |            |
| 219044   | C8 0.20       | 30/10/2020   | 04/11/2020     |                   |            |
| 219045   | TP01 0.10     | 26/10/2020   | 04/11/2020     |                   |            |
| 219046   | TP01 0.40     | 26/10/2020   | 04/11/2020     |                   |            |
| 219047   | TP02 0.20     | 26/10/2020   | 04/11/2020     |                   |            |
| 219048   | TP02 0.60     | 26/10/2020   | 04/11/2020     |                   |            |
| 219049   | TP03 0.20     | 26/10/2020   | 04/11/2020     |                   |            |
| 219050   | TP03 0.50     | 26/10/2020   | 04/11/2020     |                   |            |
| 219051   | TP04 0.20     | 26/10/2020   | 04/11/2020     |                   |            |
| 219052   | TP04 0.60     | 26/10/2020   | 04/11/2020     |                   |            |
| 219053   | TP05 0.30     | 26/10/2020   | 04/11/2020     | Silty loam        | fg         |
| 219054   | TP05 0.50     | 26/10/2020   | 04/11/2020     |                   |            |
| 219055   | TP06 0.20     | 26/10/2020   | 04/11/2020     |                   |            |
| 219056   | TP06 0.50     | 26/10/2020   | 04/11/2020     |                   |            |
| 219057   | TP07 0.10     | 27/10/2020   | 04/11/2020     |                   |            |
| 219058   | TP07 0.50     | 27/10/2020   | 04/11/2020     |                   |            |
| 219059   | TP08 0.30     | 26/10/2020   | 04/11/2020     |                   |            |
| 219060   | TP08 0.50     | 26/10/2020   | 04/11/2020     |                   |            |
| 219061   | WS01 0.30     | 30/10/2020   | 04/11/2020     | Sandy silty loam  |            |
| 219062   | WS01 0.70     | 30/10/2020   | 04/11/2020     | Sandy clayey loam |            |
| 219063   | WS02 0.20     | 29/10/2020   | 04/11/2020     | Sandy silty loam  |            |
| 219064   | WS02 0.40     | 29/10/2020   | 04/11/2020     |                   |            |
| 219065   | WS03 0.20     | 29/10/2020   | 04/11/2020     |                   |            |
| 219066   | WS03 0.40     | 29/10/2020   | 04/11/2020     | Sandy silty loam  |            |
| 219067   | WS03 1.50     | 29/10/2020   | 04/11/2020     | Sandy clayey loam |            |
| 219068   | WS04 0.10     | 30/10/2020   | 04/11/2020     |                   |            |
| 219069   | WS04 0.40     | 30/10/2020   | 04/11/2020     |                   |            |
| 219070   | WS05 0.10     | 30/10/2020   | 04/11/2020     | Silty loam        |            |
| 219071   | WS05 0.40     | 30/10/2020   | 04/11/2020     | Silty clayey loam |            |
| 219072   | WS06 0.20     | 30/10/2020   | 04/11/2020     | Silty loam        |            |
| 219073   | WS06 0.60     | 30/10/2020   | 04/11/2020     |                   |            |
| 219074   | WS07 0.20     | 29/10/2020   | 04/11/2020     | Sandy silty loam  |            |
| 219075   | WS07 0.60     | 29/10/2020   | 04/11/2020     | Sandy loam        |            |
| 219076   | WS07 1.40     | 29/10/2020   | 04/11/2020     | Loamy sand        |            |
| 219077   | WS08 0.30     | 28/10/2020   | 04/11/2020     |                   |            |
| 219078   | WS08 0.60     | 28/10/2020   | 04/11/2020     | Loamy sand        |            |
| 219079   | WS09 0.20     | 28/10/2020   | 04/11/2020     | Silty loam        |            |
| 219080   | WS09 0.50     | 28/10/2020   | 04/11/2020     |                   |            |
| 219081   | WS10 0.20     | 28/10/2020   | 04/11/2020     | Sandy silty loam  |            |
| 219082   | WS10 0.60     | 28/10/2020   | 04/11/2020     | Sandy loam        |            |
| 219083   | WS11 0.10     | 28/10/2020   | 04/11/2020     | Silty loam        |            |
| 219084   | WS11 0.40     | 28/10/2020   | 04/11/2020     | Sandy clayey loam |            |
| 219085   | WS12 0.20     | 28/10/2020   | 04/11/2020     | Silty loam        |            |
| 219086   | WS12 0.40     | 28/10/2020   | 04/11/2020     |                   |            |
| 219087   | WS12 1.40     | 28/10/2020   | 04/11/2020     | Loamy sand        |            |
| 219088   | WS13 0.20     | 28/10/2020   | 04/11/2020     |                   |            |
| 219089   | WS13 0.60     | 28/10/2020   | 04/11/2020     | Silty clayey loam |            |
| 219090   | WS13 1.30     | 28/10/2020   | 04/11/2020     | Silty clayey loam |            |
| 219091   | WS14 0.20     | 29/10/2020   | 04/11/2020     | Sandy silty loam  |            |
| 219092   | WS14 0.40     | 29/10/2020   | 04/11/2020     | Silty clayey loam |            |
| 219093   | WS14 1.60     | 29/10/2020   | 04/11/2020     | Sandy clayey loam |            |



## Results Summary

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| ELAB Reference                            |       |          |      | 219038     | 219042     | 219061     | 219062     | 219063     |
|-------------------------------------------|-------|----------|------|------------|------------|------------|------------|------------|
| Customer Reference                        |       |          |      |            |            |            |            |            |
| Sample ID                                 |       |          |      |            |            |            |            |            |
| Sample Type                               |       |          |      | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location                           |       |          |      | C1         | C6         | WS01       | WS01       | WS02       |
| Sample Depth (m)                          |       |          |      | 0.15       | 0.30       | 0.30       | 0.70       | 0.20       |
| Sampling Date                             |       |          |      | 30/10/2020 | 30/10/2020 | 30/10/2020 | 30/10/2020 | 29/10/2020 |
| Determinand                               | Codes | Units    | LOD  |            |            |            |            |            |
| <b>Soil sample preparation parameters</b> |       |          |      |            |            |            |            |            |
| Material removed                          | N     | %        | 0.1  | 60.2       | 34.4       | 42.1       | 33.3       | 11.1       |
| Description of Inert material removed     | N     |          | 0    | Stones     | Stones     | Stones     | Stones     | Stones     |
| <b>Metals</b>                             |       |          |      |            |            |            |            |            |
| Arsenic                                   | M     | mg/kg    | 1    | 13.7       | 59.3       | 14.6       | n/t        | 25.2       |
| Beryllium                                 | U     | mg/kg    | 1    | < 1.0      | < 1.0      | < 1.0      | n/t        | 1.0        |
| Cadmium                                   | M     | mg/kg    | 0.5  | < 0.5      | 0.7        | < 0.5      | n/t        | < 0.5      |
| Chromium                                  | M     | mg/kg    | 5    | 25.4       | 21.2       | 23.6       | n/t        | 22.6       |
| Copper                                    | M     | mg/kg    | 5    | 26.4       | 16.8       | 19.8       | n/t        | 21.0       |
| Lead                                      | M     | mg/kg    | 5    | 78.0       | 81.2       | 53.2       | n/t        | 70.4       |
| Mercury                                   | M     | mg/kg    | 0.5  | < 0.5      | < 0.5      | < 0.5      | n/t        | < 0.5      |
| Nickel                                    | M     | mg/kg    | 5    | 20.9       | 18.6       | 18.6       | n/t        | 18.6       |
| Selenium                                  | M     | mg/kg    | 1    | < 1.0      | < 1.0      | < 1.0      | n/t        | < 1.0      |
| Vanadium                                  | M     | mg/kg    | 5    | 46.2       | 29.2       | 38.4       | n/t        | 40.9       |
| Zinc                                      | M     | mg/kg    | 5    | 108        | 228        | 71.1       | n/t        | 78.8       |
| <b>Anions</b>                             |       |          |      |            |            |            |            |            |
| Water Soluble Chloride                    | M     | mg/kg    | 40   | < 40       | < 40       | < 40       | n/t        | < 40       |
| Water Soluble Sulphate                    | M     | g/l      | 0.02 | 0.26       | 0.04       | < 0.02     | < 0.02     | < 0.02     |
| <b>Inorganics</b>                         |       |          |      |            |            |            |            |            |
| Elemental Sulphur                         | M     | mg/kg    | 20   | < 20       | 67         | < 20       | n/t        | < 20       |
| Hexavalent Chromium                       | N     | mg/kg    | 0.8  | < 0.8      | < 0.8      | < 0.8      | n/t        | < 0.8      |
| Total Sulphide                            | N     | mg/kg    | 2    | < 2        | < 2        | < 2        | n/t        | < 2        |
| Total Cyanide                             | M     | mg/kg    | 1    | < 1.0      | < 1.0      | < 1.0      | n/t        | < 1.0      |
| Total Sulphur                             | N     | %        | 0.01 | n/t        | n/t        | n/t        | < 0.01     | n/t        |
| Acid Soluble Sulphate (SO <sub>4</sub> )  | U     | %        | 0.02 | 0.27       | 0.14       | 0.02       | < 0.02     | 0.06       |
| Water Soluble Boron                       | N     | mg/kg    | 0.5  | 1.1        | 0.8        | 0.7        | n/t        | 1.3        |
| <b>Miscellaneous</b>                      |       |          |      |            |            |            |            |            |
| pH                                        | M     | pH units | 0.1  | 11.3       | 8.4        | 6.7        | 7.0        | 7.1        |
| Total Organic Carbon                      | N     | %        | 0.01 | 3.0        | 1.8        | 1.1        | n/t        | 3.2        |
| <b>Organics</b>                           |       |          |      |            |            |            |            |            |
| >C8-C10 BCB                               | N     | mg/kg    | 1    | < 1.0      | < 1.0      | n/t        | n/t        | < 1.0      |
| >C10-C12 BCB                              | N     | mg/kg    | 1    | 5.0        | < 1.0      | n/t        | n/t        | < 1.0      |
| >C12-C16 BCB                              | N     | mg/kg    | 1    | 20.8       | < 1.0      | n/t        | n/t        | < 1.0      |
| >C16-C21 BCB                              | N     | mg/kg    | 1    | 39.4       | < 1.0      | n/t        | n/t        | < 1.0      |
| Diesel Range Organics (>C10-C25)          | N     | mg/kg    | 1    | 66         | < 1        | n/t        | n/t        | 1          |
| Petrol Range Organics (>C6-C10)           | N     | mg/kg    | 0.01 | 0.66       | 0.05       | n/t        | n/t        | < 0.01     |



## Results Summary

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| ELAB Reference                           |       |       |      | 219038     | 219042     | 219061     | 219062     | 219063     |
|------------------------------------------|-------|-------|------|------------|------------|------------|------------|------------|
| Customer Reference                       |       |       |      |            |            |            |            |            |
| Sample ID                                |       |       |      |            |            |            |            |            |
| Sample Type                              |       |       |      | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location                          |       |       |      | C1         | C6         | WS01       | WS01       | WS02       |
| Sample Depth (m)                         |       |       |      | 0.15       | 0.30       | 0.30       | 0.70       | 0.20       |
| Sampling Date                            |       |       |      | 30/10/2020 | 30/10/2020 | 30/10/2020 | 30/10/2020 | 29/10/2020 |
| Determinand                              | Codes | Units | LOD  |            |            |            |            |            |
| <b>Phenols</b>                           |       |       |      |            |            |            |            |            |
| Total Phenols                            | N     | mg/kg | 6    | < 6        | < 6        | < 6        | n/t        | < 6        |
| <b>Polyaromatic hydrocarbons</b>         |       |       |      |            |            |            |            |            |
| Naphthalene                              | M     | mg/kg | 0.1  | 0.6        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Acenaphthylene                           | M     | mg/kg | 0.1  | 0.2        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Acenaphthene                             | M     | mg/kg | 0.1  | 0.4        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Fluorene                                 | M     | mg/kg | 0.1  | 0.4        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Phenanthrene                             | M     | mg/kg | 0.1  | 2.3        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Anthracene                               | M     | mg/kg | 0.1  | 0.5        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Fluoranthene                             | M     | mg/kg | 0.1  | 2.6        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Pyrene                                   | M     | mg/kg | 0.1  | 2.4        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Benzo(a)anthracene                       | M     | mg/kg | 0.1  | 1.1        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Chrysene                                 | M     | mg/kg | 0.1  | 1.8        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Benzo(b)fluoranthene                     | M     | mg/kg | 0.1  | 2.0        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Benzo(k)fluoranthene                     | M     | mg/kg | 0.1  | 2.3        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Benzo(a)pyrene                           | M     | mg/kg | 0.1  | 1.8        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Indeno(1,2,3-cd)pyrene                   | M     | mg/kg | 0.1  | 1.7        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Dibenzo(a,h)anthracene                   | M     | mg/kg | 0.1  | 0.6        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Benzo[g,h,i]perylene                     | M     | mg/kg | 0.1  | 1.3        | < 0.1      | < 0.1      | n/t        | < 0.1      |
| Total PAH(16)                            | M     | mg/kg | 0.4  | 22.0       | < 0.4      | < 0.4      | n/t        | < 0.4      |
| <b>BTEX</b>                              |       |       |      |            |            |            |            |            |
| Benzene                                  | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | n/t        | < 10.0     |
| Toluene                                  | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | n/t        | < 10.0     |
| Ethylbenzene                             | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | n/t        | < 10.0     |
| Xylenes                                  | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | n/t        | < 10.0     |
| MTBE                                     | N     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | n/t        | < 10.0     |
| <b>TPH CWG</b>                           |       |       |      |            |            |            |            |            |
| >C5-C6 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | n/t        | < 0.01     |
| >C6-C8 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | n/t        | < 0.01     |
| >C8-C10 Aliphatic                        | N     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | n/t        | < 1.0      |
| >C10-C12 Aliphatic                       | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | n/t        | < 1.0      |
| >C12-C16 Aliphatic                       | M     | mg/kg | 1    | 2.1        | < 1.0      | < 1.0      | n/t        | < 1.0      |
| >C16-C21 Aliphatic                       | M     | mg/kg | 1    | 2.5        | < 1.0      | < 1.0      | n/t        | < 1.0      |
| >C21-C35 Aliphatic                       | M     | mg/kg | 1    | 27.7       | 5.7        | 2.6        | n/t        | 3.3        |
| >C35-C40 Aliphatic                       | M     | mg/kg | 1    | 18.7       | 4.2        | 1.6        | n/t        | 2.2        |
| Total aliphatic hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 51.7       | 10.5       | 4.5        | n/t        | 6.3        |
| >C5-C7 Aromatic                          | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | n/t        | < 0.01     |
| >C7-C8 Aromatic                          | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | n/t        | < 0.01     |
| >C8-C10 Aromatic                         | N     | mg/kg | 1    | 1.7        | < 1.0      | < 1.0      | n/t        | < 1.0      |
| >C10-C12 Aromatic                        | M     | mg/kg | 1    | 1.6        | < 1.0      | < 1.0      | n/t        | < 1.0      |
| >C12-C16 Aromatic                        | M     | mg/kg | 1    | 6.2        | 1.2        | < 1.0      | n/t        | < 1.0      |
| >C16-C21 Aromatic                        | M     | mg/kg | 1    | 14.5       | < 1.0      | < 1.0      | n/t        | 3.1        |
| >C21-C35 Aromatic                        | M     | mg/kg | 1    | 198        | 28.0       | 10.0       | n/t        | 12.2       |
| >C35-C40 Aromatic                        | M     | mg/kg | 1    | 215        | 12.9       | 4.2        | n/t        | 5.3        |
| Total aromatic hydrocarbons (>C5 - C40)  | N     | mg/kg | 1    | 437        | 44.0       | 15.6       | n/t        | 22.0       |
| Total petroleum hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 489        | 54.6       | 20.1       | n/t        | 28.3       |

# Results Summary

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|                                           |              |              |            |            |            |
|-------------------------------------------|--------------|--------------|------------|------------|------------|
| ELAB Reference                            | 219066       | 219067       | 219070     | 219071     | 219072     |
| Customer Reference                        |              |              |            |            |            |
| Sample ID                                 |              |              |            |            |            |
| Sample Type                               | SOIL         | SOIL         | SOIL       | SOIL       | SOIL       |
| Sample Location                           | WS03         | WS03         | WS05       | WS05       | WS06       |
| Sample Depth (m)                          | 0.40         | 1.50         | 0.10       | 0.40       | 0.20       |
| Sampling Date                             | 29/10/2020   | 29/10/2020   | 30/10/2020 | 30/10/2020 | 30/10/2020 |
| <b>Determinand</b>                        | <b>Codes</b> | <b>Units</b> | <b>LOD</b> |            |            |
| <b>Soil sample preparation parameters</b> |              |              |            |            |            |
| Material removed                          | N            | %            | 0.1        | 54.5       | 63.4       |
| Description of Inert material removed     | N            |              | 0          | Stones     | Stones     |
| <b>Metals</b>                             |              |              |            |            |            |
| Arsenic                                   | M            | mg/kg        | 1          | 11.9       | 26.8       |
| Beryllium                                 | U            | mg/kg        | 1          | < 1.0      | 1.4        |
| Cadmium                                   | M            | mg/kg        | 0.5        | < 0.5      | < 0.5      |
| Chromium                                  | M            | mg/kg        | 5          | 21.8       | 40.5       |
| Copper                                    | M            | mg/kg        | 5          | 14.7       | 17.0       |
| Lead                                      | M            | mg/kg        | 5          | 29.4       | 19.6       |
| Mercury                                   | M            | mg/kg        | 0.5        | < 0.5      | < 0.5      |
| Nickel                                    | M            | mg/kg        | 5          | 15.7       | 34.4       |
| Selenium                                  | M            | mg/kg        | 1          | < 1.0      | < 1.0      |
| Vanadium                                  | M            | mg/kg        | 5          | 34.9       | 66.0       |
| Zinc                                      | M            | mg/kg        | 5          | 59.4       | 65.9       |
| <b>Anions</b>                             |              |              |            |            |            |
| Water Soluble Chloride                    | M            | mg/kg        | 40         | < 40       | < 40       |
| Water Soluble Sulphate                    | M            | g/l          | 0.02       | < 0.02     | < 0.02     |
| <b>Inorganics</b>                         |              |              |            |            |            |
| Elemental Sulphur                         | M            | mg/kg        | 20         | < 20       | < 20       |
| Hexavalent Chromium                       | N            | mg/kg        | 0.8        | < 0.8      | < 0.8      |
| Total Sulphide                            | N            | mg/kg        | 2          | < 2        | < 2        |
| Total Cyanide                             | M            | mg/kg        | 1          | < 1.0      | < 1.0      |
| Total Sulphur                             | N            | %            | 0.01       | n/t        | < 0.01     |
| Acid Soluble Sulphate (SO <sub>4</sub> )  | U            | %            | 0.02       | 0.03       | < 0.02     |
| Water Soluble Boron                       | N            | mg/kg        | 0.5        | < 0.5      | < 0.5      |
| <b>Miscellaneous</b>                      |              |              |            |            |            |
| pH                                        | M            | pH units     | 0.1        | 6.7        | 7.0        |
| Total Organic Carbon                      | N            | %            | 0.01       | 0.75       | 0.24       |
| <b>Organics</b>                           |              |              |            |            |            |
| >C8-C10 BCB                               | N            | mg/kg        | 1          | n/t        | n/t        |
| >C10-C12 BCB                              | N            | mg/kg        | 1          | n/t        | n/t        |
| >C12-C16 BCB                              | N            | mg/kg        | 1          | n/t        | n/t        |
| >C16-C21 BCB                              | N            | mg/kg        | 1          | n/t        | n/t        |
| Diesel Range Organics (>C10-C25)          | N            | mg/kg        | 1          | n/t        | n/t        |
| Petrol Range Organics (>C6-C10)           | N            | mg/kg        | 0.01       | n/t        | n/t        |



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| ELAB Reference                           |       |       |      | 219066     | 219067     | 219070     | 219071     | 219072     |
|------------------------------------------|-------|-------|------|------------|------------|------------|------------|------------|
| Customer Reference                       |       |       |      |            |            |            |            |            |
| Sample ID                                |       |       |      |            |            |            |            |            |
| Sample Type                              |       |       |      | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location                          |       |       |      | WS03       | WS03       | WS05       | WS05       | WS06       |
| Sample Depth (m)                         |       |       |      | 0.40       | 1.50       | 0.10       | 0.40       | 0.20       |
| Sampling Date                            |       |       |      | 29/10/2020 | 29/10/2020 | 30/10/2020 | 30/10/2020 | 30/10/2020 |
| Determinand                              | Codes | Units | LOD  |            |            |            |            |            |
| <b>Phenols</b>                           |       |       |      |            |            |            |            |            |
| Total Phenols                            | N     | mg/kg | 6    | < 6        | < 6        | < 6        | < 6        | < 6        |
| <b>Polyaromatic hydrocarbons</b>         |       |       |      |            |            |            |            |            |
| Naphthalene                              | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Acenaphthylene                           | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Acenaphthene                             | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Fluorene                                 | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Phenanthrene                             | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Anthracene                               | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Fluoranthene                             | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Pyrene                                   | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Benzo(a)anthracene                       | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Chrysene                                 | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Benzo(b)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Benzo(k)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Benzo(a)pyrene                           | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Indeno(1,2,3-cd)pyrene                   | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Dibenzo(a,h)anthracene                   | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Benzo[g,h,i]perylene                     | M     | mg/kg | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | < 0.1      |
| Total PAH(16)                            | M     | mg/kg | 0.4  | < 0.4      | < 0.4      | < 0.4      | < 0.4      | < 0.4      |
| <b>BTEX</b>                              |       |       |      |            |            |            |            |            |
| Benzene                                  | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | < 10.0     | < 10.0     |
| Toluene                                  | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | < 10.0     | < 10.0     |
| Ethylbenzene                             | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | < 10.0     | < 10.0     |
| Xylenes                                  | M     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | < 10.0     | < 10.0     |
| MTBE                                     | N     | ug/kg | 10   | < 10.0     | < 10.0     | < 10.0     | < 10.0     | < 10.0     |
| <b>TPH CWG</b>                           |       |       |      |            |            |            |            |            |
| >C5-C6 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | < 0.01     | < 0.01     |
| >C6-C8 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | < 0.01     | < 0.01     |
| >C8-C10 Aliphatic                        | N     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C10-C12 Aliphatic                       | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C12-C16 Aliphatic                       | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C16-C21 Aliphatic                       | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C21-C35 Aliphatic                       | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | 2.1        | < 1.0      |
| >C35-C40 Aliphatic                       | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | 1.4        | < 1.0      |
| Total aliphatic hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 1.3        | 1.1        | 1.1        | 4.4        | 1.4        |
| >C5-C7 Aromatic                          | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | < 0.01     | < 0.01     |
| >C7-C8 Aromatic                          | N     | mg/kg | 0.01 | < 0.01     | < 0.01     | < 0.01     | < 0.01     | < 0.01     |
| >C8-C10 Aromatic                         | N     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C10-C12 Aromatic                        | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C12-C16 Aromatic                        | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C16-C21 Aromatic                        | M     | mg/kg | 1    | < 1.0      | < 1.0      | < 1.0      | < 1.0      | < 1.0      |
| >C21-C35 Aromatic                        | M     | mg/kg | 1    | 2.3        | 2.2        | 2.2        | 7.0        | 2.6        |
| >C35-C40 Aromatic                        | M     | mg/kg | 1    | 1.4        | 1.4        | 1.4        | 4.2        | 1.7        |
| Total aromatic hydrocarbons (>C5 - C40)  | N     | mg/kg | 1    | 4.1        | 4.0        | 3.9        | 13.6       | 4.7        |
| Total petroleum hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 5.3        | 5.1        | 5.0        | 18.0       | 6.1        |



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| ELAB Reference                            |       |          |      | 219074     | 219075     | 219076     | 219078     | 219079     |
|-------------------------------------------|-------|----------|------|------------|------------|------------|------------|------------|
| Customer Reference                        |       |          |      |            |            |            |            |            |
| Sample ID                                 |       |          |      |            |            |            |            |            |
| Sample Type                               |       |          |      | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location                           |       |          |      | WS07       | WS07       | WS07       | WS08       | WS09       |
| Sample Depth (m)                          |       |          |      | 0.20       | 0.60       | 1.40       | 0.60       | 0.20       |
| Sampling Date                             |       |          |      | 29/10/2020 | 29/10/2020 | 29/10/2020 | 28/10/2020 | 28/10/2020 |
| Determinand                               | Codes | Units    | LOD  |            |            |            |            |            |
| <b>Soil sample preparation parameters</b> |       |          |      |            |            |            |            |            |
| Material removed                          | N     | %        | 0.1  | 15.5       | 57.1       | 17.7       | 38.2       | 37.2       |
| Description of Inert material removed     | N     |          | 0    | Stones     | Stones     | Stones     | Stones     | Stones     |
| <b>Metals</b>                             |       |          |      |            |            |            |            |            |
| Arsenic                                   | M     | mg/kg    | 1    | 13.2       | 28.5       | n/t        | n/t        | 12.8       |
| Beryllium                                 | U     | mg/kg    | 1    | < 1.0      | 1.7        | n/t        | n/t        | < 1.0      |
| Cadmium                                   | M     | mg/kg    | 0.5  | < 0.5      | < 0.5      | n/t        | n/t        | < 0.5      |
| Chromium                                  | M     | mg/kg    | 5    | 22.2       | 51.8       | n/t        | n/t        | 29.2       |
| Copper                                    | M     | mg/kg    | 5    | 27.6       | 24.1       | n/t        | n/t        | 18.3       |
| Lead                                      | M     | mg/kg    | 5    | 66.4       | 24.7       | n/t        | n/t        | 35.7       |
| Mercury                                   | M     | mg/kg    | 0.5  | < 0.5      | < 0.5      | n/t        | n/t        | < 0.5      |
| Nickel                                    | M     | mg/kg    | 5    | 13.1       | 32.5       | n/t        | n/t        | 18.8       |
| Selenium                                  | M     | mg/kg    | 1    | < 1.0      | < 1.0      | n/t        | n/t        | < 1.0      |
| Vanadium                                  | M     | mg/kg    | 5    | 34.6       | 78.1       | n/t        | n/t        | 39.6       |
| Zinc                                      | M     | mg/kg    | 5    | 69.5       | 60.7       | n/t        | n/t        | 61.3       |
| <b>Anions</b>                             |       |          |      |            |            |            |            |            |
| Water Soluble Chloride                    | M     | mg/kg    | 40   | < 40       | < 40       | n/t        | n/t        | < 40       |
| Water Soluble Sulphate                    | M     | g/l      | 0.02 | < 0.02     | < 0.02     | < 0.02     | < 0.02     | < 0.02     |
| <b>Inorganics</b>                         |       |          |      |            |            |            |            |            |
| Elemental Sulphur                         | M     | mg/kg    | 20   | < 20       | < 20       | n/t        | n/t        | < 20       |
| Hexavalent Chromium                       | N     | mg/kg    | 0.8  | < 0.8      | < 0.8      | n/t        | n/t        | < 0.8      |
| Total Sulphide                            | N     | mg/kg    | 2    | < 2        | < 2        | n/t        | n/t        | < 2        |
| Total Cyanide                             | M     | mg/kg    | 1    | < 1.0      | < 1.0      | n/t        | n/t        | < 1.0      |
| Total Sulphur                             | N     | %        | 0.01 | n/t        | n/t        | < 0.01     | < 0.01     | n/t        |
| Acid Soluble Sulphate (SO <sub>4</sub> )  | U     | %        | 0.02 | 0.03       | < 0.02     | < 0.02     | < 0.02     | 0.03       |
| Water Soluble Boron                       | N     | mg/kg    | 0.5  | 0.9        | < 0.5      | n/t        | n/t        | < 0.5      |
| <b>Miscellaneous</b>                      |       |          |      |            |            |            |            |            |
| pH                                        | M     | pH units | 0.1  | 6.1        | 6.7        | 6.9        | 6.6        | 5.8        |
| Total Organic Carbon                      | N     | %        | 0.01 | 1.6        | 0.16       | n/t        | n/t        | 1.5        |
| <b>Organics</b>                           |       |          |      |            |            |            |            |            |
| >C8-C10 BCB                               | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | n/t        | < 1.0      |
| >C10-C12 BCB                              | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | n/t        | < 1.0      |
| >C12-C16 BCB                              | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | n/t        | < 1.0      |
| >C16-C21 BCB                              | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | n/t        | < 1.0      |
| Diesel Range Organics (>C10-C25)          | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | n/t        | 2          |
| Petrol Range Organics (>C6-C10)           | N     | mg/kg    | 0.01 | n/t        | n/t        | n/t        | n/t        | < 0.01     |



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|                    |            |            |            |            |            |
|--------------------|------------|------------|------------|------------|------------|
| ELAB Reference     | 219074     | 219075     | 219076     | 219078     | 219079     |
| Customer Reference |            |            |            |            |            |
| Sample ID          |            |            |            |            |            |
| Sample Type        | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location    | WS07       | WS07       | WS07       | WS08       | WS09       |
| Sample Depth (m)   | 0.20       | 0.60       | 1.40       | 0.60       | 0.20       |
| Sampling Date      | 29/10/2020 | 29/10/2020 | 29/10/2020 | 28/10/2020 | 28/10/2020 |

| Determinand                              | Codes | Units | LOD  |        |        |     |     |        |
|------------------------------------------|-------|-------|------|--------|--------|-----|-----|--------|
| <b>Phenols</b>                           |       |       |      |        |        |     |     |        |
| Total Phenols                            | N     | mg/kg | 6    | < 6    | < 6    | n/t | n/t | < 6    |
| <b>Polyaromatic hydrocarbons</b>         |       |       |      |        |        |     |     |        |
| Naphthalene                              | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Acenaphthylene                           | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Acenaphthene                             | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Fluorene                                 | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Phenanthrene                             | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Anthracene                               | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Fluoranthene                             | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Pyrene                                   | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Benzo(a)anthracene                       | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Chrysene                                 | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Benzo(b)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Benzo(k)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Benzo(a)pyrene                           | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Indeno(1,2,3-cd)pyrene                   | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Dibenzo(a,h)anthracene                   | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Benzo[g,h,i]perylene                     | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | n/t | < 0.1  |
| Total PAH(16)                            | M     | mg/kg | 0.4  | < 0.4  | < 0.4  | n/t | n/t | < 0.4  |
| <b>BTEX</b>                              |       |       |      |        |        |     |     |        |
| Benzene                                  | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | n/t | < 10.0 |
| Toluene                                  | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | n/t | < 10.0 |
| Ethylbenzene                             | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | n/t | < 10.0 |
| Xylenes                                  | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | n/t | < 10.0 |
| MTBE                                     | N     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | n/t | < 10.0 |
| <b>TPH CWG</b>                           |       |       |      |        |        |     |     |        |
| >C5-C6 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | n/t | < 0.01 |
| >C6-C8 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | n/t | < 0.01 |
| >C8-C10 Aliphatic                        | N     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | < 1.0  |
| >C10-C12 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | < 1.0  |
| >C12-C16 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | < 1.0  |
| >C16-C21 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | < 1.0  |
| >C21-C35 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | 1.7    |
| >C35-C40 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | 1.2    |
| Total aliphatic hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | < 1.0  | 1.6    | n/t | n/t | 3.3    |
| >C5-C7 Aromatic                          | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | n/t | < 0.01 |
| >C7-C8 Aromatic                          | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | n/t | < 0.01 |
| >C8-C10 Aromatic                         | N     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | < 1.0  |
| >C10-C12 Aromatic                        | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | < 1.0  |
| >C12-C16 Aromatic                        | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | n/t | < 1.0  |
| >C16-C21 Aromatic                        | M     | mg/kg | 1    | 1.1    | < 1.0  | n/t | n/t | 2.5    |
| >C21-C35 Aromatic                        | M     | mg/kg | 1    | 1.6    | 3.1    | n/t | n/t | 6.3    |
| >C35-C40 Aromatic                        | M     | mg/kg | 1    | < 1.0  | 1.9    | n/t | n/t | 3.6    |
| Total aromatic hydrocarbons (>C5 - C40)  | N     | mg/kg | 1    | 3.4    | 5.6    | n/t | n/t | 13.1   |
| Total petroleum hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 4.0    | 7.2    | n/t | n/t | 16.4   |

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|                    |            |            |            |            |            |
|--------------------|------------|------------|------------|------------|------------|
| ELAB Reference     | 219081     | 219082     | 219083     | 219084     | 219085     |
| Customer Reference |            |            |            |            |            |
| Sample ID          |            |            |            |            |            |
| Sample Type        | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location    | WS10       | WS10       | WS11       | WS11       | WS12       |
| Sample Depth (m)   | 0.20       | 0.60       | 0.10       | 0.40       | 0.20       |
| Sampling Date      | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 |

| Determinand                               | Codes | Units    | LOD  |        |        |        |        |        |
|-------------------------------------------|-------|----------|------|--------|--------|--------|--------|--------|
| <b>Soil sample preparation parameters</b> |       |          |      |        |        |        |        |        |
| Material removed                          | N     | %        | 0.1  | 43.2   | 32.3   | < 0.1  | 12.3   | < 0.1  |
| Description of Inert material removed     | N     |          | 0    | Stones | Stones | None   | Stones | None   |
| <b>Metals</b>                             |       |          |      |        |        |        |        |        |
| Arsenic                                   | M     | mg/kg    | 1    | 18.6   | n/t    | 12.1   | 16.2   | 10.3   |
| Beryllium                                 | U     | mg/kg    | 1    | 1.1    | n/t    | < 1.0  | 1.0    | < 1.0  |
| Cadmium                                   | M     | mg/kg    | 0.5  | < 0.5  | n/t    | < 0.5  | < 0.5  | < 0.5  |
| Chromium                                  | M     | mg/kg    | 5    | 33.3   | n/t    | 24.2   | 44.6   | 21.5   |
| Copper                                    | M     | mg/kg    | 5    | 20.0   | n/t    | 18.6   | 16.7   | 15.6   |
| Lead                                      | M     | mg/kg    | 5    | 220    | n/t    | 50.9   | 17.2   | 50.6   |
| Mercury                                   | M     | mg/kg    | 0.5  | < 0.5  | n/t    | < 0.5  | < 0.5  | < 0.5  |
| Nickel                                    | M     | mg/kg    | 5    | 24.1   | n/t    | 16.5   | 21.6   | 12.5   |
| Selenium                                  | M     | mg/kg    | 1    | < 1.0  | n/t    | < 1.0  | < 1.0  | < 1.0  |
| Vanadium                                  | M     | mg/kg    | 5    | 49.0   | n/t    | 36.5   | 62.2   | 31.8   |
| Zinc                                      | M     | mg/kg    | 5    | 67.6   | n/t    | 55.6   | 40.7   | 48.8   |
| <b>Anions</b>                             |       |          |      |        |        |        |        |        |
| Water Soluble Chloride                    | M     | mg/kg    | 40   | < 40   | n/t    | < 40   | < 40   | < 40   |
| Water Soluble Sulphate                    | M     | g/l      | 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| <b>Inorganics</b>                         |       |          |      |        |        |        |        |        |
| Elemental Sulphur                         | M     | mg/kg    | 20   | < 20   | n/t    | < 20   | < 20   | < 20   |
| Hexavalent Chromium                       | N     | mg/kg    | 0.8  | < 0.8  | n/t    | < 0.8  | < 0.8  | < 0.8  |
| Total Sulphide                            | N     | mg/kg    | 2    | < 2    | n/t    | < 2    | < 2    | < 2    |
| Total Cyanide                             | M     | mg/kg    | 1    | < 1.0  | n/t    | < 1.0  | < 1.0  | < 1.0  |
| Total Sulphur                             | N     | %        | 0.01 | n/t    | 0.01   | n/t    | n/t    | n/t    |
| Acid Soluble Sulphate (SO <sub>4</sub> )  | U     | %        | 0.02 | 0.04   | < 0.02 | 0.04   | < 0.02 | 0.05   |
| Water Soluble Boron                       | N     | mg/kg    | 0.5  | < 0.5  | n/t    | 0.8    | < 0.5  | 1.0    |
| <b>Miscellaneous</b>                      |       |          |      |        |        |        |        |        |
| pH                                        | M     | pH units | 0.1  | 5.9    | 6.3    | 5.6    | 6.3    | 6.0    |
| Total Organic Carbon                      | N     | %        | 0.01 | 1.3    | n/t    | 2.1    | 0.32   | 2.9    |
| <b>Organics</b>                           |       |          |      |        |        |        |        |        |
| >C8-C10 BCB                               | N     | mg/kg    | 1    | n/t    | n/t    | n/t    | n/t    | n/t    |
| >C10-C12 BCB                              | N     | mg/kg    | 1    | n/t    | n/t    | n/t    | n/t    | n/t    |
| >C12-C16 BCB                              | N     | mg/kg    | 1    | n/t    | n/t    | n/t    | n/t    | n/t    |
| >C16-C21 BCB                              | N     | mg/kg    | 1    | n/t    | n/t    | n/t    | n/t    | n/t    |
| Diesel Range Organics (>C10-C25)          | N     | mg/kg    | 1    | n/t    | n/t    | n/t    | n/t    | n/t    |
| Petrol Range Organics (>C6-C10)           | N     | mg/kg    | 0.01 | n/t    | n/t    | n/t    | n/t    | n/t    |



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|                                          |       |       |      | ELAB Reference     | 219081     | 219082     | 219083     | 219084     | 219085     |
|------------------------------------------|-------|-------|------|--------------------|------------|------------|------------|------------|------------|
|                                          |       |       |      | Customer Reference |            |            |            |            |            |
|                                          |       |       |      | Sample ID          |            |            |            |            |            |
|                                          |       |       |      | Sample Type        | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
|                                          |       |       |      | Sample Location    | WS10       | WS10       | WS11       | WS11       | WS12       |
|                                          |       |       |      | Sample Depth (m)   | 0.20       | 0.60       | 0.10       | 0.40       | 0.20       |
|                                          |       |       |      | Sampling Date      | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 | 28/10/2020 |
| Determinand                              | Codes | Units | LOD  |                    |            |            |            |            |            |
| <b>Phenols</b>                           |       |       |      |                    |            |            |            |            |            |
| Total Phenols                            | N     | mg/kg | 6    | < 6                | n/t        | < 6        | < 6        | 6          |            |
| <b>Polyaromatic hydrocarbons</b>         |       |       |      |                    |            |            |            |            |            |
| Naphthalene                              | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Acenaphthylene                           | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Acenaphthene                             | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Fluorene                                 | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Phenanthrene                             | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Anthracene                               | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Fluoranthene                             | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Pyrene                                   | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Benzo(a)anthracene                       | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Chrysene                                 | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Benzo(b)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Benzo(k)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Benzo(a)pyrene                           | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Indeno(1,2,3-cd)pyrene                   | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Dibenzo(a,h)anthracene                   | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Benzo[g,h,i]perylene                     | M     | mg/kg | 0.1  | < 0.1              | n/t        | < 0.1      | < 0.1      | < 0.1      |            |
| Total PAH(16)                            | M     | mg/kg | 0.4  | < 0.4              | n/t        | < 0.4      | < 0.4      | < 0.4      |            |
| <b>BTEX</b>                              |       |       |      |                    |            |            |            |            |            |
| Benzene                                  | M     | ug/kg | 10   | < 10.0             | n/t        | < 10.0     | < 10.0     | < 10.0     |            |
| Toluene                                  | M     | ug/kg | 10   | < 10.0             | n/t        | < 10.0     | < 10.0     | < 10.0     |            |
| Ethylbenzene                             | M     | ug/kg | 10   | < 10.0             | n/t        | < 10.0     | < 10.0     | < 10.0     |            |
| Xylenes                                  | M     | ug/kg | 10   | < 10.0             | n/t        | < 10.0     | < 10.0     | < 10.0     |            |
| MTBE                                     | N     | ug/kg | 10   | < 10.0             | n/t        | < 10.0     | < 10.0     | < 10.0     |            |
| <b>TPH CWG</b>                           |       |       |      |                    |            |            |            |            |            |
| >C5-C6 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01             | n/t        | < 0.01     | < 0.01     | < 0.01     |            |
| >C6-C8 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01             | n/t        | < 0.01     | < 0.01     | < 0.01     |            |
| >C8-C10 Aliphatic                        | N     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C10-C12 Aliphatic                       | M     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C12-C16 Aliphatic                       | M     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C16-C21 Aliphatic                       | M     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C21-C35 Aliphatic                       | M     | mg/kg | 1    | 1.1                | n/t        | < 1.0      | < 1.0      | 2.7        |            |
| >C35-C40 Aliphatic                       | M     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | 1.5        |            |
| Total aliphatic hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 2.1                | n/t        | 1.4        | 1.1        | 4.5        |            |
| >C5-C7 Aromatic                          | N     | mg/kg | 0.01 | < 0.01             | n/t        | < 0.01     | < 0.01     | < 0.01     |            |
| >C7-C8 Aromatic                          | N     | mg/kg | 0.01 | < 0.01             | n/t        | < 0.01     | < 0.01     | < 0.01     |            |
| >C8-C10 Aromatic                         | N     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C10-C12 Aromatic                        | M     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C12-C16 Aromatic                        | M     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C16-C21 Aromatic                        | M     | mg/kg | 1    | < 1.0              | n/t        | < 1.0      | < 1.0      | < 1.0      |            |
| >C21-C35 Aromatic                        | M     | mg/kg | 1    | 3.9                | n/t        | 2.5        | 2.0        | 11.0       |            |
| >C35-C40 Aromatic                        | M     | mg/kg | 1    | 2.5                | n/t        | 1.7        | 1.3        | 6.5        |            |
| Total aromatic hydrocarbons (>C5 - C40)  | N     | mg/kg | 1    | 7.2                | n/t        | 4.6        | 3.6        | 19.2       |            |
| Total petroleum hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 9.3                | n/t        | 6.0        | 4.7        | 23.7       |            |



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| ELAB Reference                            |       |          |      | 219087     | 219089     | 219090     | 219091     | 219092     |
|-------------------------------------------|-------|----------|------|------------|------------|------------|------------|------------|
| Customer Reference                        |       |          |      |            |            |            |            |            |
| Sample ID                                 |       |          |      |            |            |            |            |            |
| Sample Type                               |       |          |      | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location                           |       |          |      | WS12       | WS13       | WS13       | WS14       | WS14       |
| Sample Depth (m)                          |       |          |      | 1.40       | 0.60       | 1.30       | 0.20       | 0.40       |
| Sampling Date                             |       |          |      | 28/10/2020 | 28/10/2020 | 28/10/2020 | 29/10/2020 | 29/10/2020 |
| Determinand                               | Codes | Units    | LOD  |            |            |            |            |            |
| <b>Soil sample preparation parameters</b> |       |          |      |            |            |            |            |            |
| Material removed                          | N     | %        | 0.1  | < 0.1      | < 0.1      | < 0.1      | < 0.1      | 43.5       |
| Description of Inert material removed     | N     |          | 0    | None       | None       | None       | None       | Stones     |
| <b>Metals</b>                             |       |          |      |            |            |            |            |            |
| Arsenic                                   | M     | mg/kg    | 1    | 21.5       | 9.9        | n/t        | 12.1       | 19.0       |
| Beryllium                                 | U     | mg/kg    | 1    | 1.2        | < 1.0      | n/t        | < 1.0      | < 1.0      |
| Cadmium                                   | M     | mg/kg    | 0.5  | < 0.5      | < 0.5      | n/t        | < 0.5      | < 0.5      |
| Chromium                                  | M     | mg/kg    | 5    | 39.3       | 22.0       | n/t        | 25.5       | 48.2       |
| Copper                                    | M     | mg/kg    | 5    | 19.2       | 12.3       | n/t        | 14.8       | 17.9       |
| Lead                                      | M     | mg/kg    | 5    | 16.8       | 19.6       | n/t        | 38.5       | 20.3       |
| Mercury                                   | M     | mg/kg    | 0.5  | < 0.5      | < 0.5      | n/t        | < 0.5      | < 0.5      |
| Nickel                                    | M     | mg/kg    | 5    | 23.0       | 14.6       | n/t        | 15.9       | 30.1       |
| Selenium                                  | M     | mg/kg    | 1    | < 1.0      | < 1.0      | n/t        | < 1.0      | < 1.0      |
| Vanadium                                  | M     | mg/kg    | 5    | 58.8       | 30.3       | n/t        | 37.7       | 65.0       |
| Zinc                                      | M     | mg/kg    | 5    | 48.8       | 51.5       | n/t        | 59.8       | 53.6       |
| <b>Anions</b>                             |       |          |      |            |            |            |            |            |
| Water Soluble Chloride                    | M     | mg/kg    | 40   | < 40       | < 40       | n/t        | < 40       | < 40       |
| Water Soluble Sulphate                    | M     | g/l      | 0.02 | < 0.02     | < 0.02     | < 0.02     | < 0.02     | < 0.02     |
| <b>Inorganics</b>                         |       |          |      |            |            |            |            |            |
| Elemental Sulphur                         | M     | mg/kg    | 20   | < 20       | < 20       | n/t        | < 20       | < 20       |
| Hexavalent Chromium                       | N     | mg/kg    | 0.8  | < 0.8      | < 0.8      | n/t        | < 0.8      | < 0.8      |
| Total Sulphide                            | N     | mg/kg    | 2    | < 2        | < 2        | n/t        | < 2        | < 2        |
| Total Cyanide                             | M     | mg/kg    | 1    | < 1.0      | < 1.0      | n/t        | < 1.0      | < 1.0      |
| Total Sulphur                             | N     | %        | 0.01 | < 0.01     | n/t        | < 0.01     | n/t        | n/t        |
| Acid Soluble Sulphate (SO <sub>4</sub> )  | U     | %        | 0.02 | < 0.02     | 0.02       | < 0.02     | 0.05       | 0.02       |
| Water Soluble Boron                       | N     | mg/kg    | 0.5  | < 0.5      | < 0.5      | n/t        | 0.6        | < 0.5      |
| <b>Miscellaneous</b>                      |       |          |      |            |            |            |            |            |
| pH                                        | M     | pH units | 0.1  | 7.4        | 7.0        | 7.0        | 6.7        | 7.0        |
| Total Organic Carbon                      | N     | %        | 0.01 | 0.14       | 0.49       | n/t        | 2.1        | 0.46       |
| <b>Organics</b>                           |       |          |      |            |            |            |            |            |
| >C8-C10 BCB                               | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | < 1.0      | n/t        |
| >C10-C12 BCB                              | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | < 1.0      | n/t        |
| >C12-C16 BCB                              | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | < 1.0      | n/t        |
| >C16-C21 BCB                              | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | 1.2        | n/t        |
| Diesel Range Organics (>C10-C25)          | N     | mg/kg    | 1    | n/t        | n/t        | n/t        | 2          | n/t        |
| Petrol Range Organics (>C6-C10)           | N     | mg/kg    | 0.01 | n/t        | n/t        | n/t        | 0.04       | n/t        |



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|                    |            |            |            |            |            |
|--------------------|------------|------------|------------|------------|------------|
| ELAB Reference     | 219087     | 219089     | 219090     | 219091     | 219092     |
| Customer Reference |            |            |            |            |            |
| Sample ID          |            |            |            |            |            |
| Sample Type        | SOIL       | SOIL       | SOIL       | SOIL       | SOIL       |
| Sample Location    | WS12       | WS13       | WS13       | WS14       | WS14       |
| Sample Depth (m)   | 1.40       | 0.60       | 1.30       | 0.20       | 0.40       |
| Sampling Date      | 28/10/2020 | 28/10/2020 | 28/10/2020 | 29/10/2020 | 29/10/2020 |

| Determinand                              | Codes | Units | LOD  |        |        |     |        |        |
|------------------------------------------|-------|-------|------|--------|--------|-----|--------|--------|
| <b>Phenols</b>                           |       |       |      |        |        |     |        |        |
| Total Phenols                            | N     | mg/kg | 6    | < 6    | < 6    | n/t | < 6    | < 6    |
| <b>Polyaromatic hydrocarbons</b>         |       |       |      |        |        |     |        |        |
| Naphthalene                              | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Acenaphthylene                           | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Acenaphthene                             | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Fluorene                                 | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Phenanthrene                             | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Anthracene                               | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Fluoranthene                             | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Pyrene                                   | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Benzo(a)anthracene                       | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Chrysene                                 | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Benzo(b)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Benzo(k)fluoranthene                     | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Benzo(a)pyrene                           | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Indeno(1,2,3-cd)pyrene                   | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Dibenzo(a,h)anthracene                   | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Benzo[g,h,i]perylene                     | M     | mg/kg | 0.1  | < 0.1  | < 0.1  | n/t | < 0.1  | < 0.1  |
| Total PAH(16)                            | M     | mg/kg | 0.4  | < 0.4  | < 0.4  | n/t | < 0.4  | < 0.4  |
| <b>BTEX</b>                              |       |       |      |        |        |     |        |        |
| Benzene                                  | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | < 10.0 | < 10.0 |
| Toluene                                  | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | < 10.0 | < 10.0 |
| Ethylbenzene                             | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | < 10.0 | < 10.0 |
| Xylenes                                  | M     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | < 10.0 | < 10.0 |
| MTBE                                     | N     | ug/kg | 10   | < 10.0 | < 10.0 | n/t | < 10.0 | < 10.0 |
| <b>TPH CWG</b>                           |       |       |      |        |        |     |        |        |
| >C5-C6 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | < 0.01 | < 0.01 |
| >C6-C8 Aliphatic                         | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | < 0.01 | < 0.01 |
| >C8-C10 Aliphatic                        | N     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C10-C12 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C12-C16 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C16-C21 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C21-C35 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C35-C40 Aliphatic                       | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| Total aliphatic hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | < 1.0  | 2.1    | n/t | < 1.0  | < 1.0  |
| >C5-C7 Aromatic                          | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | < 0.01 | < 0.01 |
| >C7-C8 Aromatic                          | N     | mg/kg | 0.01 | < 0.01 | < 0.01 | n/t | < 0.01 | < 0.01 |
| >C8-C10 Aromatic                         | N     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C10-C12 Aromatic                        | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C12-C16 Aromatic                        | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C16-C21 Aromatic                        | M     | mg/kg | 1    | < 1.0  | < 1.0  | n/t | < 1.0  | < 1.0  |
| >C21-C35 Aromatic                        | M     | mg/kg | 1    | 1.1    | 3.4    | n/t | < 1.0  | < 1.0  |
| >C35-C40 Aromatic                        | M     | mg/kg | 1    | < 1.0  | 2.0    | n/t | < 1.0  | < 1.0  |
| Total aromatic hydrocarbons (>C5 - C40)  | N     | mg/kg | 1    | 1.9    | 6.8    | n/t | < 1.0  | < 1.0  |
| Total petroleum hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | 2.5    | 9.0    | n/t | < 1.0  | < 1.0  |



## Results Summary

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|                    |            |
|--------------------|------------|
| ELAB Reference     | 219093     |
| Customer Reference |            |
| Sample ID          |            |
| Sample Type        | SOIL       |
| Sample Location    | WS14       |
| Sample Depth (m)   | 1.60       |
| Sampling Date      | 29/10/2020 |

| Determinand                               | Codes | Units    | LOD  |        |
|-------------------------------------------|-------|----------|------|--------|
| <b>Soil sample preparation parameters</b> |       |          |      |        |
| Material removed                          | N     | %        | 0.1  | < 0.1  |
| Description of Inert material removed     | N     |          | 0    | None   |
| <b>Metals</b>                             |       |          |      |        |
| Arsenic                                   | M     | mg/kg    | 1    | n/t    |
| Beryllium                                 | U     | mg/kg    | 1    | n/t    |
| Cadmium                                   | M     | mg/kg    | 0.5  | n/t    |
| Chromium                                  | M     | mg/kg    | 5    | n/t    |
| Copper                                    | M     | mg/kg    | 5    | n/t    |
| Lead                                      | M     | mg/kg    | 5    | n/t    |
| Mercury                                   | M     | mg/kg    | 0.5  | n/t    |
| Nickel                                    | M     | mg/kg    | 5    | n/t    |
| Selenium                                  | M     | mg/kg    | 1    | n/t    |
| Vanadium                                  | M     | mg/kg    | 5    | n/t    |
| Zinc                                      | M     | mg/kg    | 5    | n/t    |
| <b>Anions</b>                             |       |          |      |        |
| Water Soluble Chloride                    | M     | mg/kg    | 40   | n/t    |
| Water Soluble Sulphate                    | M     | g/l      | 0.02 | < 0.02 |
| <b>Inorganics</b>                         |       |          |      |        |
| Elemental Sulphur                         | M     | mg/kg    | 20   | n/t    |
| Hexavalent Chromium                       | N     | mg/kg    | 0.8  | n/t    |
| Total Sulphide                            | N     | mg/kg    | 2    | n/t    |
| Total Cyanide                             | M     | mg/kg    | 1    | n/t    |
| Total Sulphur                             | N     | %        | 0.01 | 0.01   |
| Acid Soluble Sulphate (SO <sub>4</sub> )  | U     | %        | 0.02 | < 0.02 |
| Water Soluble Boron                       | N     | mg/kg    | 0.5  | n/t    |
| <b>Miscellaneous</b>                      |       |          |      |        |
| pH                                        | M     | pH units | 0.1  | 6.8    |
| Total Organic Carbon                      | N     | %        | 0.01 | n/t    |
| <b>Organics</b>                           |       |          |      |        |
| >C8-C10 BCB                               | N     | mg/kg    | 1    | n/t    |
| >C10-C12 BCB                              | N     | mg/kg    | 1    | n/t    |
| >C12-C16 BCB                              | N     | mg/kg    | 1    | n/t    |
| >C16-C21 BCB                              | N     | mg/kg    | 1    | n/t    |
| Diesel Range Organics (>C10-C25)          | N     | mg/kg    | 1    | n/t    |
| Petrol Range Organics (>C6-C10)           | N     | mg/kg    | 0.01 | n/t    |



## Results Summary

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|                    |            |
|--------------------|------------|
| ELAB Reference     | 219093     |
| Customer Reference |            |
| Sample ID          |            |
| Sample Type        | SOIL       |
| Sample Location    | WS14       |
| Sample Depth (m)   | 1.60       |
| Sampling Date      | 29/10/2020 |

| Determinand                              | Codes | Units | LOD  |     |
|------------------------------------------|-------|-------|------|-----|
| <b>Phenols</b>                           |       |       |      |     |
| Total Phenols                            | N     | mg/kg | 6    | n/t |
| <b>Polyaromatic hydrocarbons</b>         |       |       |      |     |
| Naphthalene                              | M     | mg/kg | 0.1  | n/t |
| Acenaphthylene                           | M     | mg/kg | 0.1  | n/t |
| Acenaphthene                             | M     | mg/kg | 0.1  | n/t |
| Fluorene                                 | M     | mg/kg | 0.1  | n/t |
| Phenanthrene                             | M     | mg/kg | 0.1  | n/t |
| Anthracene                               | M     | mg/kg | 0.1  | n/t |
| Fluoranthene                             | M     | mg/kg | 0.1  | n/t |
| Pyrene                                   | M     | mg/kg | 0.1  | n/t |
| Benzo(a)anthracene                       | M     | mg/kg | 0.1  | n/t |
| Chrysene                                 | M     | mg/kg | 0.1  | n/t |
| Benzo(b)fluoranthene                     | M     | mg/kg | 0.1  | n/t |
| Benzo(k)fluoranthene                     | M     | mg/kg | 0.1  | n/t |
| Benzo(a)pyrene                           | M     | mg/kg | 0.1  | n/t |
| Indeno(1,2,3-cd)pyrene                   | M     | mg/kg | 0.1  | n/t |
| Dibenzo(a,h)anthracene                   | M     | mg/kg | 0.1  | n/t |
| Benzo[g,h,i]perylene                     | M     | mg/kg | 0.1  | n/t |
| Total PAH(16)                            | M     | mg/kg | 0.4  | n/t |
| <b>BTEX</b>                              |       |       |      |     |
| Benzene                                  | M     | ug/kg | 10   | n/t |
| Toluene                                  | M     | ug/kg | 10   | n/t |
| Ethylbenzene                             | M     | ug/kg | 10   | n/t |
| Xylenes                                  | M     | ug/kg | 10   | n/t |
| MTBE                                     | N     | ug/kg | 10   | n/t |
| <b>TPH CWG</b>                           |       |       |      |     |
| >C5-C6 Aliphatic                         | N     | mg/kg | 0.01 | n/t |
| >C6-C8 Aliphatic                         | N     | mg/kg | 0.01 | n/t |
| >C8-C10 Aliphatic                        | N     | mg/kg | 1    | n/t |
| >C10-C12 Aliphatic                       | M     | mg/kg | 1    | n/t |
| >C12-C16 Aliphatic                       | M     | mg/kg | 1    | n/t |
| >C16-C21 Aliphatic                       | M     | mg/kg | 1    | n/t |
| >C21-C35 Aliphatic                       | M     | mg/kg | 1    | n/t |
| >C35-C40 Aliphatic                       | M     | mg/kg | 1    | n/t |
| Total aliphatic hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | n/t |
| >C5-C7 Aromatic                          | N     | mg/kg | 0.01 | n/t |
| >C7-C8 Aromatic                          | N     | mg/kg | 0.01 | n/t |
| >C8-C10 Aromatic                         | N     | mg/kg | 1    | n/t |
| >C10-C12 Aromatic                        | M     | mg/kg | 1    | n/t |
| >C12-C16 Aromatic                        | M     | mg/kg | 1    | n/t |
| >C16-C21 Aromatic                        | M     | mg/kg | 1    | n/t |
| >C21-C35 Aromatic                        | M     | mg/kg | 1    | n/t |
| >C35-C40 Aromatic                        | M     | mg/kg | 1    | n/t |
| Total aromatic hydrocarbons (>C5 - C40)  | N     | mg/kg | 1    | n/t |
| Total petroleum hydrocarbons (>C5 - C40) | N     | mg/kg | 1    | n/t |



## Results Summary

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|                    |            |            |            |
|--------------------|------------|------------|------------|
| ELAB Reference     | 219053     | 219070     | 219079     |
| Customer Reference |            |            |            |
| Sample ID          |            |            |            |
| Sample Type        | SOIL       | SOIL       | SOIL       |
| Sample Location    | TP05       | WS05       | WS09       |
| Sample Depth (m)   | 0.30       | 0.10       | 0.20       |
| Sampling Date      | 26/10/2020 | 30/10/2020 | 28/10/2020 |

| Determinand                            | Codes | Units    | LOD  |        |        |        |
|----------------------------------------|-------|----------|------|--------|--------|--------|
| <b>Metals</b>                          |       |          |      |        |        |        |
| Arsenic 10:1 extract                   | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| Barium 10:1 extract                    | N     | ug/l     | 5    | < 5    | 16     | < 5    |
| Beryllium 10:1 extract                 | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| Boron 10:1 extract                     | N     | ug/l     | 5    | 20     | 9      | 9      |
| Cadmium 10:1 extract                   | N     | ug/l     | 1    | < 1    | < 1    | < 1    |
| Chromium 10:1 extract                  | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| Copper 10:1 extract                    | N     | ug/l     | 5    | 12     | 9      | < 5    |
| Lead 10:1 extract                      | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| Mercury 10:1 extract                   | N     | ug/l     | 0.1  | < 0.1  | < 0.1  | < 0.1  |
| Nickel 10:1 extract                    | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| Selenium 10:1 extract                  | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| Vanadium 10:1 extract                  | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| Zinc 10:1 extract                      | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| <b>Anions</b>                          |       |          |      |        |        |        |
| Chloride                               | N     | mg/l     | 1    | 1      | < 1    | < 1    |
| Sulphate 10:1 extract                  | N     | mg/l     | 1    | 1      | 1      | < 1    |
| <b>Inorganics</b>                      |       |          |      |        |        |        |
| Hexavalent chromium                    | N     | ug/l     | 100  | < 100  | < 100  | < 100  |
| Elemental Sulphur                      | N     | mg/l     | 0.1  | < 0.1  | < 0.1  | < 0.1  |
| Sulphide 10:1 extract                  | N     | mg/l     | 0.1  | < 0.1  | < 0.1  | 0.1    |
| Total Cyanide                          | N     | ug/l     | 5    | < 5    | < 5    | < 5    |
| <b>Miscellaneous</b>                   |       |          |      |        |        |        |
| Dissolved organic carbon               | N     | mg/l     | 1.5  | 14.0   | 14.3   | 11.6   |
| pH (10:1 extract)                      | N     | pH units | 0.1  | 6.8    | 7.4    | 6.6    |
| <b>Phenols</b>                         |       |          |      |        |        |        |
| Total Phenols (10:1 extract)           | N     | ug/l     | 6    | < 6    | < 6    | < 6    |
| <b>Polyaromatic hydrocarbons</b>       |       |          |      |        |        |        |
| Naphthalene Leachate GCMS              | N     | ug/l     | 0.01 | 0.02   | < 0.01 | 0.02   |
| Acenaphthylene Leachate GCMS           | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.02   |
| Acenaphthene Leachate GCMS             | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Fluorene Leachate GCMS                 | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Phenanthrene Leachate GCMS             | N     | ug/l     | 0.01 | 0.02   | 0.01   | 0.03   |
| Anthracene Leachate GCMS               | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.01   |
| Fluoranthene Leachate GCMS             | N     | ug/l     | 0.01 | 0.01   | 0.01   | 0.09   |
| Pyrene Leachate GCMS                   | N     | ug/l     | 0.01 | < 0.01 | 0.01   | 0.10   |
| Benzo (a) anthracene Leachate GCMS     | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.08   |
| Chrysene Leachate GCMS                 | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.10   |
| Benzo (b) fluoranthene Leachate GCMS   | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.09   |
| Benzo (k) fluoranthene Leachate GCMS   | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.09   |
| Benzo (a) pyrene Leachate GCMS         | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.08   |
| Indeno (1,2,3-cd) pyrene Leachate GCMS | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.06   |
| Dibenzo(a,h)anthracene Leachate GCMS   | N     | ug/l     | 0.01 | < 0.01 | < 0.01 | 0.02   |
| Benzo(ghi)perylene Leachate GCMS       | N     | ug/l     | 0.01 | 0.01   | < 0.01 | 0.08   |
| Total PAH(16) Leachate GCMS            | N     | ug/l     | 0.01 | 0.13   | 0.11   | 0.88   |



## Results Summary

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|                    |            |            |            |
|--------------------|------------|------------|------------|
| ELAB Reference     | 219053     | 219070     | 219079     |
| Customer Reference |            |            |            |
| Sample ID          |            |            |            |
| Sample Type        | SOIL       | SOIL       | SOIL       |
| Sample Location    | TP05       | WS05       | WS09       |
| Sample Depth (m)   | 0.30       | 0.10       | 0.20       |
| Sampling Date      | 26/10/2020 | 30/10/2020 | 28/10/2020 |

| Determinand                        | Codes | Units | LOD |           |        |        |
|------------------------------------|-------|-------|-----|-----------|--------|--------|
| <b>BTEX</b>                        |       |       |     |           |        |        |
| Benzene                            | N     | ug/l  | 1   | fg < 1.00 | < 1.00 | < 1.00 |
| Toluene                            | N     | ug/l  | 1   | fg < 1.00 | < 1.00 | < 1.00 |
| Ethylbenzene                       | N     | ug/l  | 1   | fg < 1.00 | < 1.00 | < 1.00 |
| Xylenes                            | N     | ug/l  | 1   | fg < 1.00 | < 1.00 | < 1.00 |
| <b>TPH CWG</b>                     |       |       |     |           |        |        |
| >C5-C6 Aliphatic in Leachate       | N     | ug/l  | 1   | fg < 1.0  | < 1.0  | < 1.0  |
| >C6-C8 Aliphatic in Leachate       | N     | ug/l  | 1   | fg < 1.0  | < 1.0  | < 1.0  |
| >C8-C10 Aliphatic Leachate         | N     | ug/l  | 5   | fg 5.6    | < 5.0  | < 5.0  |
| >C10-C12 Aliphatic Leachate        | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| >C12-C16 Aliphatic Leachate        | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| >C16-C21 Aliphatic Leachate        | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| >C21-C35 Aliphatic Leachate        | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| >C35-C40 Aliphatic Leachate        | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| Total (>C5-C40) Aliphatic Leachate | N     | ug/l  | 5   | fg 5.6    | < 5.0  | < 5.0  |
| >C5-C7 Aromatic in Leachate        | N     | ug/l  | 1   | fg < 1.0  | < 1.0  | < 1.0  |
| >C7-C8 Aromatic in Leachate        | N     | ug/l  | 1   | fg < 1.0  | < 1.0  | < 1.0  |
| >C8-C10 Aromatic Leachate          | N     | ug/l  | 5   | < 5.0     | < 5.0  | < 5.0  |
| >C10-C12 Aromatic Leachate         | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| >C12-C16 Aromatic Leachate         | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | 7.0    |
| >C16-C21 Aromatic Leachate         | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| >C21-C35 Aromatic Leachate         | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| >C35-C40 Aromatic Leachate         | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | < 5.0  |
| Total (>C5-C40) Aromatic Leachate  | N     | ug/l  | 5   | fg < 5.0  | < 5.0  | 7.0    |
| Total (>C5-C40) Ali/Aro Leachate   | N     | ug/l  | 5   | fg 5.6    | < 5.0  | 7.0    |

## Results Summary

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### Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)  
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

| Elab No | Depth (m) | Clients Reference | Description of Sample Matrix #                 | Asbestos             | Gravimetric Analysis Total | Gravimetric Analysis by ACM Type | Free Fibre Analysis | Total Asbestos |
|---------|-----------|-------------------|------------------------------------------------|----------------------|----------------------------|----------------------------------|---------------------|----------------|
| 219038  | 0.15      | C1                | Brown sandy soil, concrete, road-stone, brick, | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219039  | 0.20      | C2                | Brown soil, stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219040  | 0.20      | C3                | Brown soil, stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219041  | 0.30      | C5                | Brown soil, stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219042  | 0.30      | C6                | Brown soil, stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219043  | 0.25      | C7                | Brown soil, stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219044  | 0.20      | C8                | Brown soil, stones, plant-material             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219061  | 0.30      | WS01              | Brown soil, stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219063  | 0.20      | WS02              | Brown soil, stones, plant-material             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219066  | 0.40      | WS03              | Brown soil, stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219067  | 1.50      | WS03              | Brown Soil, Stones, Plant Material             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219070  | 0.10      | WS05              | Brown Soil, Stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219071  | 0.40      | WS05              | Brown Soil ( Clay ), Stones                    | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219072  | 0.20      | WS06              | Brown Soil, Stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219074  | 0.20      | WS07              | Brown Soil, Stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219075  | 0.60      | WS07              | Brown Soil, Stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219079  | 0.20      | WS09              | Brown Soil, Stones, Plant Material             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219081  | 0.20      | WS10              | Brown Soil, Stones, Plant Material             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219083  | 0.10      | WS11              | Brown Soil, Stones, Plant Material             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219084  | 0.40      | WS11              | Brown Soil, Stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219085  | 0.20      | WS12              | Brown Soil, Stones, Plant Material             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219087  | 1.40      | WS12              | Brown Soil, Stones                             | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219089  | 0.60      | WS13              | Brown Soil, Stones, Clinker                    | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219091  | 0.20      | WS14              | Brown Soil, Stones, Clinker                    | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |
| 219092  | 0.40      | WS14              | Brown Soil, Stones, Clinker                    | No asbestos detected | n/t                        | n/t                              | n/t                 | n/t            |

## Method Summary

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| Parameter                                | Codes | Analysis Undertaken On | Date Tested | Method Number | Technique          |
|------------------------------------------|-------|------------------------|-------------|---------------|--------------------|
| <b>Soil</b>                              |       |                        |             |               |                    |
| Aliphatic hydrocarbons in leachate       | N     |                        | 11/11/2020  |               | GC-FID             |
| Aliphatic/Aromatic hydrocarbons in leach | N     |                        | 11/11/2020  |               | GC-FID             |
| Aromatic hydrocarbons in leachate        | N     |                        | 11/11/2020  |               | GC-FID             |
| Carbon in leachates                      | N     |                        | 10/11/2020  |               | IR                 |
| Elemental Sulphur by HPLC in leachates   | N     | On prepared leachate   | 11/11/2020  |               | HPLC               |
| Leachate cyanide 10:1 extract            | N     |                        | 09/11/2020  |               | Colorimetry        |
| Leachate phenols 10:1 extract            | N     |                        | 09/11/2020  |               | HPLC               |
| Leachate sulphide 10:1 extract           | N     |                        | 10/11/2020  |               | Colorimetry        |
| Petrol range organics in soil            | N     | As submitted sample    | 06/11/2020  |               | GC-MS              |
| pH of leachates                          | N     |                        | 09/11/2020  |               | Electromeric       |
| Sulphide                                 | N     | As submitted sample    | 06/11/2020  | 109           | Colorimetry        |
| Hexavalent chromium                      | N     | As submitted sample    | 05/11/2020  | 110           | Colorimetry        |
| pH                                       | M     | Air dried sample       | 09/11/2020  | 113           | Electromeric       |
| Acid Soluble Sulphate                    | U     | Air dried sample       | 06/11/2020  | 115           | Ion Chromatography |
| Phenols in solids                        | N     | As submitted sample    | 04/11/2020  | 121           | HPLC               |
| Elemental Sulphur                        | M     | Air dried sample       | 05/11/2020  | 122           | HPLC               |
| PAH (GC-FID)                             | M     | As submitted sample    | 05/11/2020  | 133           | GC-FID             |
| PAHs and/or PCBs in leachates            | N     |                        | 11/11/2020  | 135           | GC-MS              |
| Water soluble anions                     | M     | Air dried sample       | 05/11/2020  | 172           | Ion Chromatography |
| Low range Aliphatic hydrocarbons soil    | N     | As submitted sample    | 05/11/2020  | 181           | GC-MS              |
| Low range Aromatic hydrocarbons soil     | N     | As submitted sample    | 05/11/2020  | 181           | GC-MS              |
| BTEX in solids                           | M     | As submitted sample    | 05/11/2020  | 181A          | GC-MS              |
| Low range Aliphatic hydrocarbons leachat | N     |                        | 11/11/2020  | 200           | GC-MS              |
| Low range Aromatic hydrocarbons leachate | N     |                        | 11/11/2020  | 200           | GC-MS              |
| BTEX in leachates                        | N     |                        | 11/11/2020  | 200A          | GC-MS              |
| Water soluble boron                      | N     | Air dried sample       | 05/11/2020  | 202           | Colorimetry        |
| Total cyanide                            | M     | As submitted sample    | 05/11/2020  | 204           | Colorimetry        |
| Total organic carbon/Total sulphur       | N     | Air dried sample       | 05/11/2020  | 210           | IR                 |
| Basic carbon banding in soil             | N     | As submitted sample    | 05/11/2020  | 218           | GC-FID             |
| Diesel range organics in soil            | N     | As submitted sample    | 06/11/2020  | 257           | GC-FID             |
| Anions in leachates                      | N     |                        | 09/11/2020  | 270           | Ion Chromatography |
| TPH CWG soil by gc-gc                    | M     | As submitted sample    | 05/11/2020  | 271           |                    |
| Asbestos identification                  | U     | Air dried sample       | 06/11/2020  | 280           | Microscopy         |
| Aqua regia extractable metals            | M     | Air dried sample       | 05/11/2020  | 300           | ICPMS              |
| Leachate metals 10:1 extract             | N     |                        | 09/11/2020  | 301           | ICPMS              |

Tests marked N are not UKAS accredited

## Report Information

Report No.: 20-30688, issue number 1

### Key

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|     |                                                                             |
|-----|-----------------------------------------------------------------------------|
| U   | hold UKAS accreditation                                                     |
| M   | hold MCERTS and UKAS accreditation                                          |
| N   | do not currently hold UKAS accreditation                                    |
| ^   | MCERTS accreditation not applicable for sample matrix                       |
| *   | UKAS accreditation not applicable for sample matrix                         |
| S   | Subcontracted to approved laboratory UKAS Accredited for the test           |
| SM  | Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test    |
| NS  | Subcontracted to approved laboratory. UKAS accreditation is not applicable. |
| I/S | Insufficient Sample                                                         |
| U/S | Unsuitable sample                                                           |
| n/t | Not tested                                                                  |
| <   | means "less than"                                                           |
| >   | means "greater than"                                                        |

LOD LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.  
Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.  
ELAB are unable to provide an interpretation or opinion on the content of this report.  
The results relate only to the sample received.  
PCB congener results may include any coeluting PCBs  
Uncertainty of measurement for the determinands tested are available upon request  
Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

### Deviation Codes

- 
- |   |                                                          |
|---|----------------------------------------------------------|
| a | No date of sampling supplied                             |
| b | No time of sampling supplied (Waters Only)               |
| c | Sample not received in appropriate containers            |
| d | Sample not received in cooled condition                  |
| e | The container has been incorrectly filled                |
| f | Sample age exceeds stability time (sampling to receipt)  |
| g | Sample age exceeds stability time (sampling to analysis) |

Where a sample has a deviation code, the applicable test result may be invalid.

### Sample Retention and Disposal

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All soil samples will be retained for a period of one month  
All water samples will be retained for 7 days following the date of the test report  
Charges may apply to extended sample storage

## **APPENDIX D**

### **Gas and Groundwater Monitoring Results**



Project: Reading Golf Course  
Ref: GE19428  
Client: Vistry Group



| Location | Date     | Time (sec) | CH <sub>4</sub> (%) | CO <sub>2</sub> (%) | O <sub>2</sub> (%) | Flow (l/hr) | VOC (ppm) | Pressure (mb) | GWL (m bgl) | GSV/Qhgs        |                 | Characteristic Situation |                 | CS1 Limiting Value Check |                 |                 | NHBC            |         |                 |       |
|----------|----------|------------|---------------------|---------------------|--------------------|-------------|-----------|---------------|-------------|-----------------|-----------------|--------------------------|-----------------|--------------------------|-----------------|-----------------|-----------------|---------|-----------------|-------|
|          |          |            |                     |                     |                    |             |           |               |             | CH <sub>4</sub> | CO <sub>2</sub> | BS8485 & C665            |                 | Flow                     | CH <sub>4</sub> | CO <sub>2</sub> | CH <sub>4</sub> |         | CO <sub>2</sub> |       |
|          |          |            |                     |                     |                    |             |           |               |             |                 |                 | CH <sub>4</sub>          | CO <sub>2</sub> |                          |                 |                 | GSV             | Conc.   | GSV             | Conc. |
| WS12     | 06/11/20 | 0          | 0.0                 | 0.0                 | 20.1               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 06/11/20 | 10         | 0.0                 | 2.5                 | 19.4               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 06/11/20 | 20         | 0.0                 | 3.2                 | 18.6               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 06/11/20 | 30         | 0.0                 | 3.2                 | 18.5               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 06/11/20 | 60         | 0.0                 | 3.1                 | 18.5               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 06/11/20 | 90         | 0.0                 | 2.9                 | 18.6               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 06/11/20 | 120        | 0.0                 | 3.7                 | 18.6               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 06/11/20 | 180        | 0.0                 | 2.4                 | 18.8               | 0.0         | 2.6       | 1017          | 0.90        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 0          | 0.0                 | 0.1                 | 20.2               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 10         | 0.0                 | 0.6                 | 20.1               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 20         | 0.0                 | 0.7                 | 20.0               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 30         | 0.0                 | 0.6                 | 19.9               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 60         | 0.0                 | 0.5                 | 19.9               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 90         | 0.0                 | 0.4                 | 20.1               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 120        | 0.0                 | 0.4                 | 20.1               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS13     | 06/11/20 | 180        | 0.0                 | 0.3                 | 20.2               | 0.0         | 0.5       | 1017          | 0.70        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 0          | 0.0                 | 0.0                 | 20.5               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 10         | 0.0                 | 0.9                 | 19.9               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 20         | 0.0                 | 0.9                 | 19.0               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 30         | 0.0                 | 0.9                 | 19.0               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 60         | 0.0                 | 0.9                 | 18.5               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 90         | 0.0                 | 0.9                 | 18.3               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 120        | 0.0                 | 0.9                 | 18.7               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS07     | 06/11/20 | 180        | 0.0                 | 2.0                 | 18.8               | 0.0         | 0.3       | 1017          | 1.95        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 0          | 0.0                 | 0.0                 | 20.5               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 10         | 0.0                 | 2.0                 | 16.0               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 20         | 0.0                 | 2.4                 | 15.9               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 30         | 0.0                 | 2.9                 | 15.8               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 60         | 0.0                 | 2.8                 | 15.6               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 90         | 0.0                 | 2.8                 | 15.6               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 120        | 0.0                 | 2.9                 | 15.5               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS03     | 06/11/20 | 180        | 0.0                 | 2.9                 | 15.4               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS01     | 06/11/20 | 0          | 1.3                 | 0.0                 | 20.1               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | CH4>CS1 limit   | NO              | GREEN           | AMBER 1 | GREEN           | GREEN |
| WS01     | 06/11/20 | 10         | 0.0                 | 2.2                 | 19.5               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS01     | 06/11/20 | 20         | 0.0                 | 2.1                 | 17.4               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS01     | 06/11/20 | 30         | 0.0                 | 2.0                 | 17.3               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS01     | 06/11/20 | 60         | 0.0                 | 2.2                 | 17.2               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS01     | 06/11/20 | 90         | 0.0                 | 2.1                 | 17.1               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS01     | 06/11/20 | 120        | 0.0                 | 2.3                 | 17.1               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS01     | 06/11/20 | 180        | 0.0                 | 2.2                 | 17.1               | 0.0         | 0.2       | 1017          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 17/11/20 | 0          | 0.0                 | 1.2                 | 17.9               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 17/11/20 | 10         | 0.0                 | 3.3                 | 17.7               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 17/11/20 | 20         | 0.0                 | 3.4                 | 17.6               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 17/11/20 | 30         | 0.0                 | 3.4                 | 17.5               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |
| WS12     | 17/11/20 | 60         | 0.0                 | 3.4                 | 17.5               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN   | GREEN           | GREEN |

Project: Reading Golf Course  
Ref: GE19428  
Client: Vistry Group



| Location | Date     | Time (sec) | CH <sub>4</sub> (%) | CO <sub>2</sub> (%) | O <sub>2</sub> (%) | Flow (l/hr) | VOC (ppm) | Pressure (mb) | GWL (m bgl) | GSV/Qhgs        |                 | Characteristic Situation |                 | CS1 Limiting Value Check |                 |                 | NHBC            |       |                 |       |
|----------|----------|------------|---------------------|---------------------|--------------------|-------------|-----------|---------------|-------------|-----------------|-----------------|--------------------------|-----------------|--------------------------|-----------------|-----------------|-----------------|-------|-----------------|-------|
|          |          |            |                     |                     |                    |             |           |               |             | CH <sub>4</sub> | CO <sub>2</sub> | BS8485 & C665            |                 | Flow                     | CH <sub>4</sub> | CO <sub>2</sub> | CH <sub>4</sub> |       | CO <sub>2</sub> |       |
|          |          |            |                     |                     |                    |             |           |               |             |                 |                 | CH <sub>4</sub>          | CO <sub>2</sub> |                          |                 |                 | GSV             | Conc. | GSV             | Conc. |
| WS12     | 17/11/20 | 90         | 0.0                 | 3.4                 | 17.5               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 17/11/20 | 120        | 0.0                 | 3.4                 | 17.5               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 17/11/20 | 180        | 0.0                 | 3.4                 | 17.5               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 0          | 0.0                 | 0.0                 | 20.4               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 10         | 0.0                 | 1.2                 | 20.1               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 20         | 0.0                 | 1.8                 | 19.4               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 30         | 0.0                 | 1.9                 | 19.2               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 60         | 0.0                 | 1.6                 | 19.3               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 90         | 0.0                 | 1.3                 | 19.5               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 120        | 0.0                 | 1.0                 | 19.7               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 17/11/20 | 180        | 0.0                 | 0.7                 | 20.0               | 0.0         | 0.0       | 1008          | 0.60        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 0          | 0.0                 | 0.0                 | 20.4               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 10         | 0.0                 | 0.3                 | 20.5               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 20         | 0.0                 | 0.3                 | 20.4               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 30         | 0.0                 | 0.3                 | 20.4               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 60         | 0.0                 | 0.3                 | 20.3               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 90         | 0.0                 | 0.2                 | 20.4               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 120        | 0.0                 | 0.2                 | 20.4               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 17/11/20 | 180        | 0.0                 | 0.2                 | 20.4               | 0.0         | 0.0       | 1009          | 0.75        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 0          | 0.0                 | 0.0                 | 20.4               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 10         | 0.0                 | 1.5                 | 19.2               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 20         | 0.0                 | 2.1                 | 17.3               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 30         | 0.0                 | 2.1                 | 17.0               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 60         | 0.0                 | 2.2                 | 16.8               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 90         | 0.0                 | 2.3                 | 16.6               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 120        | 0.0                 | 2.3                 | 16.5               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 17/11/20 | 180        | 0.0                 | 2.4                 | 16.3               | 0.0         | 0.0       | 1009          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 0          | 0.0                 | 0.0                 | 20.3               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 10         | 0.0                 | 0.7                 | 20.2               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 20         | 0.0                 | 0.8                 | 19.6               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 30         | 0.0                 | 0.8                 | 19.5               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 60         | 0.0                 | 0.9                 | 19.4               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 90         | 0.0                 | 0.9                 | 19.4               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 120        | 0.0                 | 0.9                 | 19.4               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 17/11/20 | 180        | 0.0                 | 0.9                 | 19.5               | 0.0         | 0.0       | 1010          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 0          | 0.0                 | 0.0                 | 19.8               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 10         | 0.0                 | 2.4                 | 18.3               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 20         | 0.0                 | 3.2                 | 16.7               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 30         | 0.0                 | 3.3                 | 16.4               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 60         | 0.0                 | 3.4                 | 16.2               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 90         | 0.0                 | 3.5                 | 16.1               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 120        | 0.0                 | 2.4                 | 16.2               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS12     | 01/12/20 | 180        | 0.0                 | 3.3                 | 16.2               | 0.0         | 1.4       | 1015          | 1.20        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 01/12/20 | 0          | 0.0                 | 0.1                 | 20.0               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 01/12/20 | 10         | 0.0                 | 3.5                 | 16.8               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |

Project: Reading Golf Course  
 Ref: GE19428  
 Client: Vistry Group



| Location | Date     | Time (sec) | CH <sub>4</sub> (%) | CO <sub>2</sub> (%) | O <sub>2</sub> (%) | Flow (l/hr) | VOC (ppm) | Pressure (mb) | GWL (m bgl) | GSV/Qhgs        |                 | Characteristic Situation |                 | CS1 Limiting Value Check |                 |                 | NHBC            |       |                 |       |
|----------|----------|------------|---------------------|---------------------|--------------------|-------------|-----------|---------------|-------------|-----------------|-----------------|--------------------------|-----------------|--------------------------|-----------------|-----------------|-----------------|-------|-----------------|-------|
|          |          |            |                     |                     |                    |             |           |               |             | CH <sub>4</sub> | CO <sub>2</sub> | BS8485 & C665            |                 | Flow                     | CH <sub>4</sub> | CO <sub>2</sub> | CH <sub>4</sub> |       | CO <sub>2</sub> |       |
|          |          |            |                     |                     |                    |             |           |               |             |                 |                 | CH <sub>4</sub>          | CO <sub>2</sub> |                          |                 |                 | GSV             | Conc. | GSV             | Conc. |
| WS13     | 01/12/20 | 20         | 0.0                 | 4.5                 | 12.5               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 01/12/20 | 30         | 0.0                 | 4.6                 | 11.9               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 01/12/20 | 60         | 0.0                 | 4.6                 | 11.5               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 01/12/20 | 90         | 0.0                 | 4.6                 | 11.5               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 01/12/20 | 120        | 0.0                 | 4.6                 | 11.4               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS13     | 01/12/20 | 180        | 0.0                 | 4.6                 | 11.5               | 0.0         | 0.4       | 1016          | 2.25        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 0          | 0.0                 | 0.1                 | 19.9               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 10         | 0.0                 | 0.5                 | 20.2               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 20         | 0.0                 | 0.3                 | 19.9               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 30         | 0.0                 | 0.3                 | 20.0               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 60         | 0.0                 | 0.3                 | 20.0               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 90         | 0.0                 | 0.2                 | 20.1               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 120        | 0.0                 | 0.1                 | 20.1               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS07     | 01/12/20 | 180        | 0.0                 | 0.1                 | 20.1               | 0.0         | 0.5       | 1015          | 1.65        | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 0          | 0.0                 | 0.0                 | 20.0               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 10         | 0.0                 | 1.6                 | 19.1               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 20         | 0.0                 | 1.9                 | 18.2               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 30         | 0.0                 | 1.9                 | 18.1               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 60         | 0.0                 | 2.0                 | 18.0               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 90         | 0.0                 | 2.0                 | 18.0               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 120        | 0.0                 | 2.1                 | 17.9               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS03     | 01/12/20 | 180        | 0.0                 | 2.3                 | 17.5               | 0.0         | 0.0       | 1014          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 0          | 0.0                 | 0.1                 | 20.1               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 10         | 0.0                 | 2.1                 | 18.4               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 20         | 0.0                 | 2.1                 | 17.2               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 30         | 0.0                 | 2.5                 | 16.8               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 60         | 0.0                 | 2.2                 | 16.5               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 90         | 0.0                 | 2.2                 | 16.5               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 120        | 0.0                 | 2.2                 | 16.5               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| WS01     | 01/12/20 | 180        | 0.0                 | 2.3                 | 16.4               | 0.0         | 0.1       | 1016          | Dry         | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 0          |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 10         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 20         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 30         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 60         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 90         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 120        |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 180        |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 0          |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 10         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 20         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 30         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 60         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 90         |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |
| -        | -        | 120        |                     |                     |                    |             |           |               |             | 0.000           | 0.000           | CS1                      | CS1             | NO                       | NO              | NO              | GREEN           | GREEN | GREEN           | GREEN |



## **APPENDIX E**

### **CATWASTE Output**



|              |                                    |
|--------------|------------------------------------|
| Site Name    | Reading Golf Club                  |
| Location     | Kidmore End Road, Reading, RG4 8SQ |
| Site ID      | GE19428                            |
| Job Number   | GE19428                            |
| Date         | 12/4/2020                          |
| User Name    | laura.legate@gesl.net              |
| Company Name | Geo-Environmental Services Limited |

| Hole ID | Sample Depth | Hazardous Waste Y/N | HP1 | HP2 | HP3 | HP4 | HP5 | HP6 | HP7 | HP8 | HP9 |
|---------|--------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| C1      | 0.15         | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| C6      | 0.3          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS01    | 0.3          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS01    | 0.7          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS02    | 0.2          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS03    | 0.4          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS03    | 1.5          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS05    | 0.1          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS05    | 0.4          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS06    | 0.2          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS07    | 0.2          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS07    | 0.6          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS07    | 1.4          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS08    | 0.6          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS09    | 0.2          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS10    | 0.2          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS10    | 0.6          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS11    | 0.1          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS11    | 0.4          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS12    | 0.2          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS12    | 1.4          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS13    | 0.6          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS13    | 1.3          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS14    | 0.2          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS14    | 0.4          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
| WS14    | 1.6          | N                   | No  | No  | No  | No  | No  | No  | No  | No  | No  |
|         |              |                     |     |     |     |     |     |     |     |     |     |
|         |              |                     |     |     |     |     |     |     |     |     |     |

|              |                                    |
|--------------|------------------------------------|
| Site Name    | Reading Golf Club                  |
| Location     | Kidmore End Road, Reading, RG4 8SQ |
| Site ID      | GE19428                            |
| Job Number   | GE19428                            |
| Date         | 12/4/2020                          |
| User Name    | laura.legate@gesl.net              |
| Company Name | Geo-Environmental Services Limited |

| Hole ID | Sample Depth | Hazardous Waste Y/N | HP10 | HP11 | HP12 | HP13 | HP14 | HP15 | HP16 |
|---------|--------------|---------------------|------|------|------|------|------|------|------|
| C1      | 0.15         | N                   | No   | No   | No   | No   | No   | No   | No   |
| C6      | 0.3          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS01    | 0.3          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS01    | 0.7          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS02    | 0.2          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS03    | 0.4          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS03    | 1.5          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS05    | 0.1          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS05    | 0.4          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS06    | 0.2          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS07    | 0.2          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS07    | 0.6          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS07    | 1.4          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS08    | 0.6          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS09    | 0.2          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS10    | 0.2          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS10    | 0.6          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS11    | 0.1          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS11    | 0.4          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS12    | 0.2          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS12    | 1.4          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS13    | 0.6          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS13    | 1.3          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS14    | 0.2          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS14    | 0.4          | N                   | No   | No   | No   | No   | No   | No   | No   |
| WS14    | 1.6          | N                   | No   | No   | No   | No   | No   | No   | No   |
|         |              |                     |      |      |      |      |      |      |      |
|         |              |                     |      |      |      |      |      |      |      |



## **APPENDIX F**

### **Site Photographs**





Plate 1 : Known solution feature just off site to the north – Looking W



Plate 2: Known solution feature just off site to the north – Looking NW



Plate 3: Looking W from TP05



Plate 4: Looking S from TP05



Plate 5: Looking NW across site from southern area



Plate 6: Looking N from southern area



Plate 7: Looking E along southern portion of site – towards access road



Plate 8: Looking E along treeline towards clubhouse



Plate 9: Looking E towards clubhouse



Plate 10: Looking N along access road



Plate 11: Looking E along access road towards car park



Plate 12: Looking W from access road



Plate 13: Looking N along access road



Plate 14: Tracks from plant – Looking NW from WS01



Plate 15: Looking W from WS01



Plate 16: Looking S from WS01



Plate 17: Looking E from WS01



Plate 18: Looking SE from WS04



Plate 19 : Looking W from WS04



Plate 20: Looking NW from WS04



Plate 21 : Looking E from centre of northern area of the site



Plate 22: Looking NW along treeline – TP03 visible in distance



Plate 23: Looking SE from TP03



Plate 24: Tracks from plant. Looking S from centre of northern area. TP05 in left centre.



Plate 25: Tracks from plant. Looking W from TP05



Plate 26: Tracks from plant. Looking NW from TP05



Plate 27: Looking NW along western site boundary



**Geo-Environmental**

**SUPPLEMENTARY GROUND INVESTIGATION REPORT**

**for the site at**

**READING GOLF CLUB,**

**KIDMORE END ROAD,**

**READING, RG4 8SQ**

**on behalf of**

**VISTRY THAMES VALLEY**



|                                                                                                                                                                                              |                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Report:                                                                                                                                                                                      | SUPPLEMENTARY GROUND INVESTIGATION REPORT                                                                                                                         |
| Site:                                                                                                                                                                                        | READING GOLF CLUB, KIDMORE END ROAD, READING, RG4 8SQ                                                                                                             |
| Client:                                                                                                                                                                                      | VISTRY THAMES VALLEY                                                                                                                                              |
| Date:                                                                                                                                                                                        | 14/10/2021                                                                                                                                                        |
| Reference:                                                                                                                                                                                   | GE20079/SGIR/OCT21                                                                                                                                                |
| Version:                                                                                                                                                                                     | 1.0                                                                                                                                                               |
| Prepared by:                                                                                                                                                                                 | <br>GAVIN ROBERTS CGeol, BEng (Hons), MSc, FGS<br>TECHNICAL DIRECTOR             |
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## AMENDMENT RECORD

| Revision ref. | Date       | Reasons for amendment | Author's initials | Reviewed by | Approved by |
|---------------|------------|-----------------------|-------------------|-------------|-------------|
| 1.0           | 14/10/2021 | First issue           | GR                | JT          | GE          |
|               |            |                       |                   |             |             |
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| EXECUTIVE SUMMARY           |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Site Details                | Site Address            | Reading Golf Club, Kidmore End Road, Reading, RG4 8SQ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                             | National Grid Reference | 471657, 176771                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                             | Site Area               | Total site c. 12ha, area covered in this report c. 7ha                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                             | Form of Development     | Proposed to be developed for a residential end use with private gardens, areas of soft landscaping, car parks, access roads, storm water attenuation basins and associated infrastructure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Encountered Conditions      | Scope of works          | A supplementary investigation incorporating remote sensing and intrusive ground investigation to clarify and update geotechnical assessments in relation to potential solution feature geohazards, drainage and foundation strategies for the proposed development                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                             | Ground Conditions       | The ground conditions encountered comprised Topsoil or Made Ground overlying sand, gravel and clay soils of the Black Park Gravel Member, clayey soils of Lambeth Group and Chalk of the Seaford Chalk Formation. The ground conditions varied within exploratory holes across the site, with Chalk only encountered in some exploratory holes. The depth to, and level of, the upper surface of the Chalk was variable. In addition, strata characteristic of Lambeth Group, were not always encountered between the Black Park Gravel Member and the Chalk, where Chalk was proven in exploratory holes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                             | Groundwater             | Water was encountered in BH01, TP307, TP309 and TP312 at depths of 3.6m bgl, 2.40m bgl, 1.57m bgl and 1.40m bgl, respectively. In each case, the water ingress appeared to be associated with more granular strata overlying clay or structureless Chalk and given the limited to sporadic presence, it was considered likely to be discontinuous perched water and not indicative of a single site wide groundwater body.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Geotechnical Considerations | Foundations             | <p>A net allowable bearing capacity of 90kPa is recommended to account for the presence of firm clay at varying depths in some exploratory holes. Total settlement should remain within tolerable limits for this bearing capacity assuming that foundations terminate in a uniform soil type.</p> <p>Geotechnical laboratory testing has shown the more clayey soils of the Black Park Gravel Member and the Lambeth Group to be of high volume change potential. As such, a minimum founding depth of 1.0m bgl is recommended for conventional foundations on this site remote from trees. Heave precautions may be required for foundations in excess of 1.5m deep.</p> <p>Foundation design should take account of lower strength soils at depth in some of the exploratory holes and this may result in shallow foundations being unsuitable due to overstressing or settlement issues.</p> <p>Foundations spanning multiple soil types should be avoided and the foundation deepened to terminate on a single soil type where possible.</p> <p>It is understood that an existing Thames Water sewer crosses beneath part of the northern limb (Zone 2) of the site at c. 1.7m bgl. No foundations are likely to be permitted over or within a set easement of this asset.</p> <p>For the purposes of foundation assessment, the site was divided into two zones, with Zone 1 located on the south-eastern limb of the site and Zone 2 located on the north-western limb of the site (see Figure 3).</p> |



| EXECUTIVE SUMMARY |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | Foundations (continued) | <p><i>Zone 1</i></p> <p>Based on the ground and groundwater conditions encountered within the exploratory holes in Zone 1, it is considered that conventional foundations could be suitable albeit with some deepening of foundations within the zone of influence of trees and hedgerows. Foundations should be taken below any Made Ground or disturbed ground, root zones, desiccated clay soils or the like and terminate wholly within the Black Park Gravel Member, or the Lambeth Group.</p> <p><i>Zone 2</i></p> <p>On the basis of the ground and groundwater conditions encountered in the exploratory holes within Zone 2, it is considered that conventional shallow foundations may be suitable within some areas on the northern portion of Zone 2, albeit with inclusion of sufficient reinforcement to be capable of spanning a void of c. 2-3m diameter in plan, should it form in due course. Conventional foundations as per Zone 1 may be suitable in the south-westernmost portion of Zone 2 (in the vicinity of trial pits TP309-312).</p> <p>Whilst it may be possible to consider the use of conventional foundations in the Medium and High risk areas of Zone 2, this would be anticipated to require plot specific probing at c. 2-5m linear intervals along foundation lines, inclusion of sufficient reinforcement to be capable of spanning a 2-3m void and construction phase inspection. It would also remain possible ultimately that, a piled foundation solution could be required for some or all of the plots in these areas. As such, it is recommended that a piled foundation solution is adopted for the Medium and High risk areas and plots in the vicinity of DP326. Further intrusive investigation will be required in due course to support the design of piled foundations.</p> |
|                   | Floor Slabs             | Given the presence of shrinkable soils, it is recommended that suspended floor slabs are constructed throughout the site. Preliminary modelling indicates a minimum void height of 300mm due to the presence of high volume change potential soils.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                   | Excavations             | Shallow excavations within the Topsoil, and clay soils of the Black Park Gravel Member and the Lambeth Group are likely to be stable in the short to medium term assuming the excavations remain dry. Excavations within the more sandy and gravelly Black Park Gravel Member are unlikely to be stable in the short term and some collapse was observed within trial pits during the intrusive investigation. Excavations taken below any water ingress are likely to collapse and will require shoring and dewatering to maintain stability.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                   | Buried Concrete         | Buried concrete should be designed to Class DS-1 (AC-1s).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                   | Buried Services         | Zone 2 has been identified as extending across areas of High and Medium risk for the presence of solution features and also known features have been identified on or close to the north-western portion of Zone 2. Whilst further geophysical surveys have not clearly identified the presence of solution features in this portion of the site, it is recommended that simple butt jointed services are not used in this portion of the site due to the potential for leakages to occur at connections. A flexible pipework and connection should be included. If water was to leak from mains supply, storm or foul water systems the leak could induce reactivation of any dormant solution features, creation of new dissolution features or saturate the overlying soils any of which could result in catastrophic collapse of the ground.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**EXECUTIVE SUMMARY****Storm water drainage**

On the basis of the results of soakage testing, it is considered that the rate of infiltration is unlikely to be sufficient for conventional soakaways to function satisfactorily and thus storage and attenuation is likely to be required.

The drainage strategy will need to minimise the risk of any infiltration solution exacerbating the status of existing solution features, causing dormant features to become active, or creation of new dissolution features. No infiltration device (basin/pond, swale, soakaway or the like) should be located within 20m of any structure due to the potential for infiltrating water to induce instability and ground collapse. In addition, wherever possible, drainage runs should be diverted away from any such feature.

Currently infiltration basins are shown in the medium and high risk solution feature zone as well as in the vicinity of the known solution feature on site and these would not be acceptable unless measures were included to prevent infiltration, e.g. inclusion of a permanent liner and discharge elsewhere.

It is understood that the existing Thames Water sewer which crosses the site is located beneath or close to one of the proposed storm water basins (based on the layout prepared for Fairfax). Consultation with Thames Water is recommended at the earliest opportunity to determine whether this is acceptable and what mitigation measures could be required.

An alternative development layout has been generated by the Client and includes a central basin and swales to store and transfer storm water, with a second basin located in the north-eastern corner of Zone 2. These basins were located outside of the Medium and High risk areas. Infiltration testing for the central basin was unsuccessful, suggesting that infiltration to the ground in this area might not be feasible and thus the basin would act as a shallow 'detention, storage and peak flow attenuation' device. Testing in the vicinity of the north-eastern basin indicated that storm water infiltration could be feasible. Deeper testing in cable percussion boreholes in both basin locations indicated the possibility of discharging storm water to the ground at depth, albeit subject to relevant regulatory consultation and approval. Discharge of storm water into the Chalk via borehole soakaways is likely to require a multiphase filtering and sediment capture process even if regulatory approval is granted.

**Earthworks**

Site won soils (clay, sand and gravel) and Chalk may be suitable for re-use as earthworks fill subject to testing in due course and may require treatment to bring them within acceptability limits for placement and compaction.

**Further Action:**

- Further ground investigation will be required on both Zone 1 and Zone 2. In Zone 1, it is likely to comprise investigation to inform design to account for tree influence on clay soils and the like. In Zone 2, the further investigation is likely to comprise some pitting/trenching through anomalies, albeit that this level of investigation might result in a need to pile due to causing significant ground disturbance, plot specific probing and provide information for pile design. If abnormal conditions are encountered, Geotechnical/Geo-Environmental advice should be sought to determine a suitable source of action.
- Further investigation and infiltration testing may be required to inform the design of any SUDS elements such as revised locations of basins, attenuation crates, permeable paving or the like.
- If earthworks are proposed then further testing would be required to inform an earthworks specification, with compliance testing undertaken during any such earthworks construction. In addition, an Earthworks Specification should be prepared which correlates with the earthworks strategy and

**EXECUTIVE SUMMARY**

construction strategy.

- A discovery strategy must be maintained during development such that any abnormal conditions (geotechnical or potential contamination) are identified and their potential impact on the proposed development assessed prior to determining any potential mitigation measures.

*This Executive Summary is intended to provide a brief summary of the main findings and conclusions of the investigation. For detailed information, the reader is referred to the main report ref. GE20079-SGIR-OCT21.*



## 1.0 INTRODUCTION

Geo-Environmental Services Limited, "Geo-Environmental", was instructed by Vistry Thames Valley, "the Client", to undertake a supplementary investigation of the geotechnical factors pertaining to Reading Golf Club, Kidmore End Road, Reading, RG4 8SQ, herein referred to as 'the site' (National Grid Reference at centre: 471120, 176760). The site's location is presented in Figure 1.

### 1.1 Form of Development

It is understood that the site is proposed to be developed for a residential usage comprising houses, private gardens, access roads and associated infrastructure. In addition, it is likely that public areas of soft landscaping would be proposed.

At the time of writing, a provisional development layout has been formulated and issued to Geo-Environmental. However, it is considered possible that this layout might change, or be refined in due course due to development constraints, planning/design requirements and to account for ground conditions and ground hazards.

### 1.2 Objectives

The data from the remote sensing and intrusive investigation was to form the basis of an interpretation with respect to foundation and drainage strategies for the proposed development. This assessment relates to the western portion of the wider development site.

### 1.3 Standards and References

Where practicable, the investigation was undertaken in accordance with the following documents and guidance:

- BS10175:2011+A2:2017 - Investigation of Potentially Contaminated Sites - Code of Practice, BSI 2017;
- BS5930:2015+A1:2020 - Code of Practice for Site Investigations, BSI 2020;
- EN ISO 14688 Geotechnical Investigation and Testing Part 1-2002 and Part 2-2004;
- BS1377: 1990 - Soils for Civil Engineering Purposes, BSI1990;
- NHBC Standards Chapter 4.1 Land Quality - Managing Ground Conditions;
- NHBC Standards Chapter 4.2 Building Near Trees;
- CIRIA C574 - Engineering in Chalk.

In addition to the above, the scope of investigation was discussed with representatives of the NHBC's Engineering Division to agree a strategy which would serve to provide a pragmatic approach to the ground investigation and address possible NHBC concerns at an early stage.

### 1.4 Conditions

This report does not purport to be a "Geotechnical Design Report" as defined in Clause 2.8 of Eurocode 7 (Geotechnical Design BS EN 1997-1:2004) and some of the data used to support this preliminary geotechnical assessment may not be fully compliant with that design code. It is considered possible that further detailed ground investigations could be required to facilitate the detailed geotechnical design process and should be carried out on a structure specific basis if necessary.

The data collected from the investigations have been used to provide an interpretation of the geotechnical and/or environmental conditions pertaining to the site. The recommendations and opinions expressed in this report are based on the data obtained. Geo-Environmental takes no responsibility for conditions that either have not been



revealed in the available records, or that occur between or under points of physical investigation. Whilst every effort has been made to interpret the conditions, such information is only indicative and liability cannot be accepted for its accuracy.

It should be noted that the engineering performance of the ground can change over time due to factors such as changes in soil moisture content, disturbance, reworking and the like. The assessment presented herein is based on the conditions as observed and/or measured at the time of the investigation. No liability can be accepted for changes in engineering performance of the ground due to factors outside of Geo-Environmental's control.

Information contained in this report is intended for the use of the Client and Geo-Environmental can take no responsibility for the use of this information by any party for uses other than that described in this report. Geo-Environmental makes no warranty or representation whatsoever express or implied with respect to the use of this information by any third party. Geo-Environmental does not indemnify the Client or any third parties against any dispute or claim arising from any finding or other result of this investigation report or any consequential losses.

This report remains the property of Geo-Environmental and the Client has no rights to, or reliance upon this document or supporting documents until such time as payment has been received in full for all invoices for works undertaken in connection with this report.



## 2.0 SITE CONTEXT

### 2.1 Site Description

At the time of the intrusive investigation, July 2021, the site comprised an approximately 'L' shaped parcel of land which had formerly been used as a golf course and included a clubhouse, tarmac surfaced car park and several holes (comprising tee-off, fairway, rough, bunkers and greens). The ground surface was variable with flat and undulating ground surfaces and a number of depressions and mounded surface features, some of which may be attributed to golf course landscaping, but also some features understood to be associated with natural topography and sub-surface features, including possible solution features.

A number of mature to semi mature trees were located across the site and along the site boundaries. Tracts and stands of trees were also present separating the holes and fairways on the golf course.

The site was accessed by an open driveway off Kidmore End Road, east of the site. The former golf course was accessed by a service track running along the north-eastern site boundary.

The site was bounded by residential land use to the east, south and west. Housing was also located to the north and east, i.e. beyond the inner quadrant to the 'L' shape. The golf course continued to the north of the western limb of the subject site. The site boundaries to adjacent land (excluding the continuation of the golf course) comprised wooden fences, wire fences, trees and hedges.

### 2.2 Anticipated Geology

With reference to British Geological Survey (BGS) mapping, the geology of the site was anticipated to comprise a succession of Black Park Gravel (generally anticipated to comprise sand and gravel with possible sub-ordinate clay content), Lambeth Group (interbedded sand and clay) and Seaford Chalk Formation. In addition, given the developed nature of the site it was considered likely that a thickness of Made Ground could be present at locations within the site.

BS5930:2015 defines **Made Ground** as anthropogenic ground in which the material has been placed without engineering control and/or manufactured by man in some way, such as through crushing or washing, or arising from an industrial process. Great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material. In addition, on sites which have undergone several phases of historic development it is not uncommon for asbestos to be present within Made Ground soils.

The **Black Park Gravel** is part of the **Thames Valley Formation** and generally comprises sand and gravel, with possible lenses of silt, clay or peat. The deposits are characterised as horizontally stratified, matrix-supported gravel with thin tabular cross-bedded sand channels.

The **Lambeth Group** comprises a mixture of stiff to hard red, blue/grey and brown mottled clays with basal beds of sand and gravel which vary greatly both laterally and vertically. Locally, these sediments are cemented with calcium carbonate, iron oxides and silica to form materials with relatively high strength. The Lambeth Group sits unconformably over the Chalk, i.e. the junction comprises a geological weathering/erosion boundary and the Lambeth Group soils close to the boundary are often green due to the presence of the mineral glauconite.

The **Seaford Chalk Formation** is part of the **White Chalk Subgroup** and comprises white chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large.

Geological hazards were identified on the wider golf course and comprised 4No. sinkholes and 43No. solution pipes. In addition, a further 33No. natural cavities were identified within 1km of the site. Whilst the hazard mapping did not indicate any of the solution features (sinkholes and solution pipes) to be within the extent of the proposed



development site, several were located close to the east, north and west, and hazard mapping also indicated a higher risk zone for solution features where the Black Park Gravel and/or Lambeth Group was anticipated, by the BGS, to thin out over the Chalk, such that a higher risk zone crossed the north-western portion of the site, see Section 2.3 for further information.

### 2.3 Third Party Information

The following documents have been provided for review and to assist in formulating a scope of works for a preliminary investigation. It should be noted that further investigation is likely to be required to support design in due course.

- Phase 1 Contamination Risk Assessment, prepared by Ground and Environmental Services Limited, ref. 12112 dated February 2019.
- Geophysical Survey Report, prepared by Magnitude Surveys, ref. MSSU661 dated May 2020.
- Flood Risk Assessment and Sustainable Drainage Systems (SuDS) Strategy, prepared by Stantec, ref 67058R1Rev1 dated 02/06/2020.
- Indicative Site Layout, prepared by Paul Hewitt, ref. 2036/PL.04 Rev. N dated July 2020.

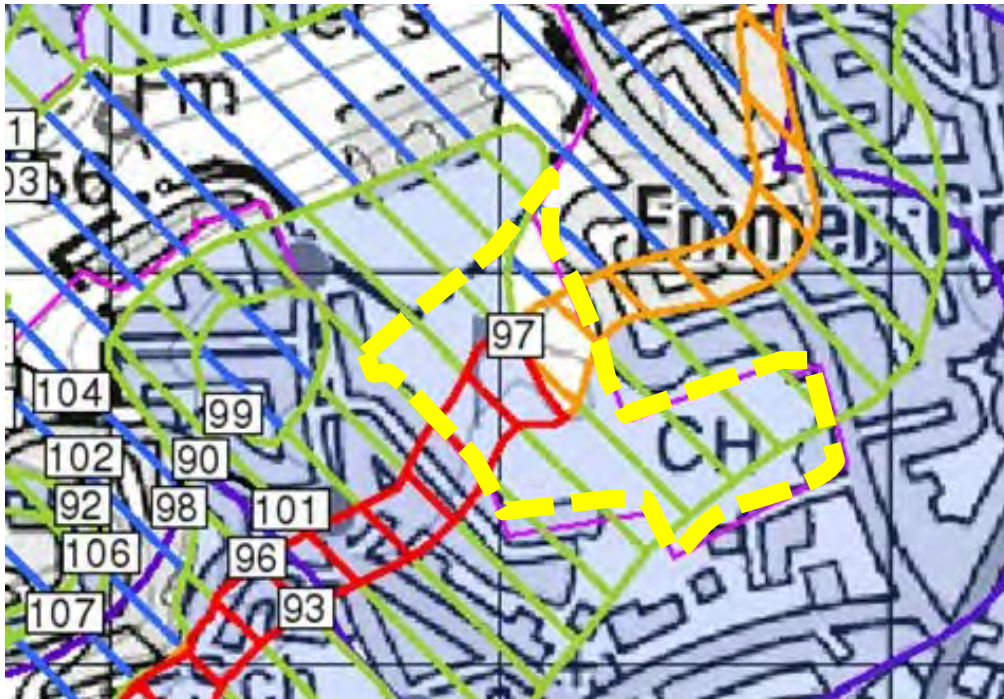
All of these documents were prepared for Fairfax Properties, the landowner, and thus it is assumed that Vistry Thames Valley would have formal reliance on these documents in due course. The factual correctness of third party information is assumed and no liability is accepted for errors or omissions in such information, or subsequent errors where assessment is based on this third party information.

Comments are presented in relation to these documents and where relevant, the Geophysical survey and Indicative Site Layout have been referred to under the review of the Phase 1 Contamination assessment and/or the Flood Risk Assessment.

#### *Phase 1 Contamination Risk Assessment*

This report identified the ground conditions underlying to site to comprise a mixture of Black Park Gravel (generally anticipated to comprise sand and gravel with possible sub-ordinate clay content) and Lambeth Group (interbedded sand and clay) and Seaford Chalk.

Geological hazards were identified on the wider golf course and comprised 4No. sinkholes and 43No. solution pipes. In addition, a further 33No. natural cavities were identified within 1km of the site. Whilst the hazard mapping did not indicate any of the solution features (sinkholes and solution pipes) to be within the extent of the proposed development site, several were located close to the east, north and west, and hazard mapping also indicated a higher risk zone for solution features where the Black Park Gravel and/or Lambeth Group thinned out over the Chalk, such that a higher risk zone crossed the north-western portion of the site.



Extract from Phase 1 Report showing ground stability risk associated with chalk dissolution (red hatching is high risk, orange- medium risk, green – low risk; yellow line is approximate site boundary)

The geophysical survey, whilst principally undertaken for archaeological purposes, also identified numerous anomalies within the site. Many of these were recorded as ‘ferrous spikes’ and thus may be metal fragments in the soil mass, but some anomalies could represent natural hazards and this should be considered further.

The assessment identified a risk of solution features being present beneath the site and set out proposals for an initial investigation to assess ground conditions further. In addition, the assessment recommended incorporation of reinforcement in conventional foundations (assuming they are a suitable option), and siting soakaways at a minimum offset of 20m from any structure. This latter point should be extended to attenuation basins which are designed to drain to the ground and thus have a similar potential to induce collapse of existing sub-surface features and potentially initiate new features. The Indicative Site Layout shows attenuation basins close to or straddling the high-risk solution feature zone (see extract map above).

The report identified potential contamination sources including the grounds keepers’ sheds/yard (not within the development site), a former chalk quarry (not within the development site), landfill which included deposition of domestic and trade wastes (off-site) and Made Ground (considered as a ground gas source but also a possible source of soil contamination). Whilst most of these potential sources were outside of the proposed development site, it is possible that they might impact the development site, e.g. gas from the off-site landfill, and thus should be considered as part of any investigation and further assessment. In addition to these sources, tarmac and hardstanding areas may be underlain by Made Ground soils and/or aggregates which have the potential to be contaminated by Asbestos.

#### *Flood Risk Assessment (FRA)*

The FRA sets out an initial drainage strategy whereby storm water is proposed to be discharged to the ground via a series of attenuation basins. Infiltration rates were estimated from small scale testing in boreholes, or based on reference to published values. Further testing in accordance with BRE DG365 will be required.

As noted above, the current drainage strategy and development layout show attenuation basins close to, or straddling zones where there is a high risk of solution features and associated ground stability hazards, as well as siting basins adjacent to or close to housing. A minimum offset of 20m should be used when refining the



development layout and the basin areas will need to be investigated to assess the potential for and actual presence and condition of solution features and implications this may have for infiltration.

## 2.4 Previous Investigations

Geo-Environmental has undertaken two phases of ground investigation prior to the July 2021 reported herein, where relevant, the findings of the previous investigations have been incorporated into this report. The two previous investigations were reported under the following three references:

- GE19428-GIR-DEC20 - A ground investigation report presenting the findings of a preliminary investigation comprising trial pitting (8No.), trial pit soakage testing (4No.), dynamic sampler boreholes (14No.), super heavy dynamic probing (10No.), monitoring well installation (5No.), laboratory testing and gas/groundwater monitoring (6No. from early November 2020 to late January 2021). The findings of the intrusive investigation and geotechnical test results from the 2020 investigation are incorporated into this report.
- GE19873-RG01-210428 – A letter report presenting the findings of investigation and testing to inform the emerging drainage and road design strategies. Whilst the investigation included the excavation of 31No. trial pits, these were primarily excavated to shallow depth for infiltration testing, sampling or plate load testing. The maximum depth of excavation was 1.8m bgl and all pits terminated in superficial strata. Soakage testing outcomes were variable, with infiltration rates generally in the range  $10^{-5}$  to  $10^{-7}$ m/s where infiltration occurred. Testing indicated that shallow infiltration might be possible, albeit with more favourable outcomes in some areas of the site. Winter groundwater monitoring results were presented in the report and showed the presence of water at relatively shallow depth in some of the monitoring wells. Whilst it is possible that this comprised perched water rather than a continuous groundwater body, the presence of water at relatively shallow depth could impair to effective operation of shallow infiltration systems. In-situ CBR values of 4.5-13% were reported from the Plate Load Tests and recommendations were presented for consideration of including geogrid reinforcement in road construction in areas of heightened risk of ground dissolution.
- GE19873-GR02-210507 - A letter report presenting updated findings in relation to soil contamination assessment of near surface soils in the car park at the eastern end of the site.

These reports should be referred to for greater detail.



### 3.0 REMOTE SENSING

#### 3.1 Aerial Survey

An aerial survey was commissioned as part of the agreed scope of works and comprised a drone based survey incorporating aerial photogrammetry and LIDAR techniques to create site specific aerial imagery and a point cloud dataset. The survey focussed on the western limb of the site, i.e. where the potential for presence of solution features was identified from previous studies of the site.

The results of the drone surveys are incorporated into Figures 3-7 presented within this report. It should be noted that for presentation purposes, vertical scaling may be exaggerated to show variation in ground surface levels across the site on 3D schematics.

#### 3.2 Geophysical Survey

In addition to the drone survey, a supplementary geophysical survey was commissioned from Magnitude Surveys as part of the agreed scope of works. The key objective of the geophysical survey was to assess the potential for the presence of potential geohazards, i.e. solution features, in the shallow subsurface strata, i.e. c. upper 6m of ground. The survey utilised an Electromagnetic (EM) survey method deployed across the accessible areas of the western limb followed by a Ground Penetrating Radar (GPR) survey targeted to areas where anomalies were identified from the EM survey. Magnitude Surveys also utilised the findings from their previous, archaeological focussed, geophysical surveys where relevant to this exercise. The findings of the geohazard geophysical survey are presented in Magnitude Survey's report, ref. MSSU986v1.0 FINAL dated 29<sup>th</sup> September 2021 and a copy of the report is presented in Appendix A herein.

Interpretation, by Magnitude Surveys, of the geophysical survey results identified several anomalies across the survey area and whilst the majority of these were considered to represent landscaping works associated with the site's former use as a golf course, buried services and the like, some anomalies were identified as possible dissolution features as discussed in Section 6 of the Magnitude report and summarised below:

- SU 71430 76905 – the feature is reported as c. 20m wide at 0.67m bgl and reduces in diameter to c. 6m at 1.07m bgl. A sloping, likely natural, profile was identified and was considered probably to comprise a shallow depression with natural infill. Further investigation of this area was recommended.
- SU 71565 76898 & SU71542 76928 – anomalies larger than others 'discussed as natural background' were detected at c.0.95m bgl and 1.56m bgl. Both exhibit bowl shaped profiles in the survey plots. They are reported not to exhibit morphology typical of large dissolution features, but their size was considered to indicate 'a larger variation in the bedrock or overlying deposits than others identified'. Further investigation was recommended.

The locations of these specific anomalies are transposed on Figure 7 presented herein. The Magnitude Surveys report should be referred to directly for further information.



## 4.0 INTRUSIVE INVESTIGATION

The intrusive investigation works were undertaken shortly after completion of the remote sensing surveys and where possible incorporated initial feedback for targeting of areas.

### 4.1 Scope of Works

The investigation strategy comprised construction of exploratory holes across the site to assess ground and groundwater conditions and to support the geotechnical assessment. The investigation included:

- Undertake a basic photographic drone survey to identify and record key visible features.
- Undertake specialist drone survey including high resolution photogrammetry and LiDAR techniques to develop a detailed surface terrain model of the site.
- Attendance of a specialist Geophysical Surveyor to undertake surface geophysical surveys comprising Electromagnetic (EM) surveying of the western portion of the site with a second phase of Ground Penetrating Radar (GPR) used to survey any anomalies identified from the EM survey. Provision, by the Specialist, of geophysical assessment report in relation to potential solution features.
- The construction of c. 10No. machine dug trial pits to provisional depths of 3m bgl. Approximately 6No. pits were to be located in the basin area and 4No. on the swale footprint. The aim of the pitting was to determine the presence of and depth to Chalk or other potentially permeable strata and undertake soakage testing in these strata.
- Construction of 2No. cable percussion boreholes to a provisional depth of 15m bgl together with in-situ testing and sampling at regular intervals. One borehole was to be located within the basin and the other in the swale location.
- Undertake infiltration tests within the cable percussion boreholes on completion of drilling.
- Super heavy dynamic probing at 16No. locations across the basin and swale footprints to inform the geotechnical assessment.
- Super heavy dynamic probing at c. 30No. locations in areas where solution feature anomalies were anticipated from initial geophysical survey feedback and targeting higher occurrence risk zones (from published mapping).
- Installation of a groundwater monitoring well within each cable percussion borehole to facilitate monitoring if required in due course. Winter monitoring may be required to support and inform the drainage strategy.
- Provision of a Ground Investigation Report.

### 4.2 Investigation Strategy

Table 4.1 sets out the investigation strategy adopted.

| Area of Concern               | Investigation                                                                                                        | Positions                                          |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| General ground conditions     | Exploratory holes located across the site.                                                                           | All                                                |
| Northern basin                | Trial pitting, soakage testing, cable percussion borehole, dynamic sampler borehole and super heavy dynamic probing. | WS01*, SHDP1*, TP201-TP206, TP301, BH01, DP01-DP06 |
| Central swale                 | Trial pitting, soakage testing, cable percussion borehole and super heavy dynamic probing                            | TP07*, TP102*, TP207-TP210, TP308, BH02, DP07-DP15 |
| Geophysical anomaly in Area 1 | Trial pitting and super heavy dynamic probing in the vicinity of the anomaly. <sup>+</sup>                           | TP322, TP320, DP317, DP321-DP323                   |
| Geophysical anomaly in Area 3 | Trial pitting and super heavy dynamic probing in the vicinity of the anomaly. <sup>+</sup>                           | TP03*, TP303, DP301                                |
| Geophysical anomaly in Area 4 | Trial pitting and super heavy dynamic probing in the vicinity of the anomaly. <sup>+</sup>                           | WS05*, TP305-TP306, DP303-DP306                    |



| Area of Concern                                                  | Investigation                                                                                                                                                                                         | Positions                                                                                                        |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Vicinity of solution feature close to the northern site boundary | Super heavy dynamic probing                                                                                                                                                                           | DP320                                                                                                            |
| Potential risk of solution features                              | Exploratory holes located to target the north-western limb of site, including area of higher hazard rating identified from the desk study and possible anomalies identified from geophysical surveys. | TP01 – TP07*, WS01 – WS10*, WS14*, SHDP01 – SHDP10*, DP1-DP15, DP301-DP330, BH01, BH02, TP201-TP210, TP301-TP324 |

**NOTE:** \* none of the positions targeted the specific grid references in the Magnitude Survey's report as these were confirmed after the planned intrusive investigation had been completed; \* exploratory holes from the previous phase of investigation.

**Table 4.1 Summary of the investigation strategy**



## 5.0 ENCOUNTERED CONDITIONS

A factual record of the conditions encountered during the physical investigation of the site is presented in the following sections. For further details of the ground conditions, reference should be made to the exploratory hole logs and in-situ testing presented in Appendix B and soakage test results in Appendix C.

The physical ground investigation works were undertaken in July 2021. Exploratory hole locations are shown on Figure 2, site zones on Figure 3, a two dimensional terrain model in Figure 4, a three dimensional terrain model (exaggerated vertical scale for illustrative purposes) in Figure 5 and an illustrative chalk contour plan in Figure 6.

Unless stated otherwise, all depths are reported as metres below ground level (m bgl).

### 5.1 Soils

The ground conditions encountered within the exploratory holes were broadly consistent with those anticipated, i.e. a succession of Topsoil or Made Ground, over sand, gravel and clay of Black Park Gravel Member, clay and sand strata of the Lambeth Group and Chalk encountered at depth in a number of exploratory holes. A generalised summary of the encountered conditions is presented in Table 5.1.

| Top<br>(m bgl) | Base<br>(m bgl)            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Positions                                                                                           |
|----------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 0.00           | 0.20 – 0.50                | <b>Topsoil:</b> Dark brown SILT with varying proportions of gravel, rootlets and roots (1-50mm); Brown fine SAND with varying proportions of gravel, rootlets and roots (1-20mm).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | All except WS05, WS07, WS09, WS14, C1-C8.                                                           |
| 0.00           | 0.20 – 0.40                | <b>Made Ground:</b> Dark brown CLAY with varying proportions of brick fragments, sand, gravel and rootlets; Brown SAND/SILT with varying proportions of clay, gravel, brick, clinker, rootlets and roots; Tarmacadam and Type 1 Subbase (C1-C8), Greyish brown/yellowish brown SAND and GRAVEL with brick fragments, concrete rubble and tarmacadam fragments (C1, C7); Dark brown gravelly SILT/SAND with a mild organic malodour and brick fragments (C2, C3)                                                                                                                                                                                                                                                                                                    | WS05, WS07, WS09, WS14 & C1-C8                                                                      |
| 0.20 – 0.40    | 0.90 – 5.00 (base of hole) | <b>Black Park Gravel Member:</b> Brown, dark brown, orangish brown and yellowish brown fine to medium SAND with varying proportions of gravel, cobbles, boulders, rootlets and roots; Orangish brown SAND and GRAVEL with varying proportions of clay, cobbles, boulders, black flecking, rootlets and roots; Soft to stiff orangish brown/pale grey and occasionally reddish brown mottled CLAY with varying proportions of sand, gravel, roots and rootlets and rotting roots and rootlets; Orangish brown/brown GRAVEL with varying proportions of clay, sand and cobbles.                                                                                                                                                                                      | All                                                                                                 |
| 0.40 – 2.90    | 2.30 (base of hole) – 5.80 | <b>Lambeth Group:</b> Stiff to very stiff thinly bedded (WS06) bluish grey/orangish brown/yellowish brown/greenish grey/reddish brown CLAY with varying proportions of silt, sand, black flecking, sand lenses (1-2mm thick) and rotting roots and rootlets; Orangish brown and grey fine to medium SAND with varying proportions of gravel; Firm or stiff brown sandy CLAY; Stiff brown and grey mottled CLAY with reddish staining; soft to firm brown and grey mottled sandy CLAY with occasional to frequent rootlets; Firm grey and orange sandy CLAY; Firm to stiff bluish grey and brown thinly bedded CLAY; Soft to firm-stiff greenish grey and occasionally reddish brown mottled sandy gravelly CLAY; loose yellowish brown clayey fine to medium SAND. | TP04, TP05, TP07, TP08, WS04, WS06, WS07, WS14, BH02, TP207, TP210, TP302-TP309, TP311-TP316, TP319 |



| Top<br>(m bgl) | Base<br>(m bgl)                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Positions                                                                                                              |
|----------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| 1.80 - 1.90    | 0.90 –<br>5.80 (base<br>of hole) | <b>Seaford Chalk Formation:</b> Recovered as off white to cream weathered CHALK composed of silty gravel sized clasts with flints of fine to coarse gravel size and brown clayey sandy chalk matrix. Where encountered in trial pits, the chalk was estimated to be CIRIA Grade Dm/Dc, the method of drilling for WS03 and WS04, and in the cable percussion boreholes BH01 and BH02, could destroy any structure and thus a CIRIA grading has not been estimated at this stage. | TP05, WS03,<br>WS04, BH01,<br>BH02, TP201-<br>TP204, TP206,<br>TP31, TP303-<br>TP307, TP315,<br>TP320, TP323,<br>TP324 |

**Table 5.1 Summary of encountered ground conditions**

Pocket penetrometer testing was undertaken on samples of clay soils recovered from the dynamic sampler boreholes. Zones of lower results were recorded in the sandy clay in WS01 at 2.5m bgl; around the junction between clay and wet sandy clay at 3.0m bgl in WS08; and silty clay in WS13 at 2.0-4.0m bgl. In addition, possible high result outliers were evident in the clay in WS08 at 2.5m bgl and silty clay in WS09 at 2.5-3.0m bgl.

As noted in Table 5.1, Chalk was only encountered within twenty exploratory holes, TP05, WS03 and WS04 (as part of the previous investigation) and BH01, BH02, TP201-204, TP206, TP301, TP303-307, TP315, TP320, TP323 and TP324 (as part of the July 2021 investigation). With reference to the respective exploratory hole logs, the chalk was encountered at varying elevations and this suggests a non-uniform depth to the Chalk where it was encountered. This is further supported by the fact that the Black Park Gravel Member and Lambeth Group strata were encountered elsewhere to elevations below where Chalk was encountered in these exploratory holes. Whilst Figure 6 presents an estimated contour plot for the upper surface of the Chalk, this is based on the conditions encountered within the exploratory holes referred to above and the modelling makes various assumptions to interpolate levels between these positions. As such, Figure 6 should be considered as a schematic representation and not an absolute contour profile. Extreme caution should be adopted wherever any estimate or interpolation of Chalk depth or level is attempted between exploratory hole positions and any such estimate or interpolation would require further investigation to verify/clarify conditions. It is anticipated that whilst the weathering profile for the upper surface of the Chalk is likely to be uneven, changes would be highly variable. If, or where any solution features are present, changes in depth to the Chalk are likely to be sudden and can vary from bowl shaped surfaces such as associated with suffusion to vertical or near-vertical 'plunging' surface associated with conical to cylindrical solution features and solution pipes. To date, non-intrusive and intrusive investigation have identified various anomalies, most of which were non-cylindrical and more bowl-shaped in profile.

Investigation was undertaken in the vicinity of the reported (by others) solution feature close to the north-western site boundary and recorded the presence of strata considered to be of the Black Park Gravel Member to the full depth of excavation at 2.6m bgl. Whilst the nearest dynamic probe position (DP319) indicated that presence of strata of medium dense relative density, TP321 was terminated due to instability of pit sides.

### *Geophysical Anomalies*

The geophysical anomaly identified in 'Area 1' (refer to the geophysical survey report) being reported by the Geophysical Specialist as being c. 20m in diameter at c. 0.67m bgl reducing to c. 6m diameter at c. 1.07m bgl. The nearest exploratory hole to this location (TP320) encountered soils considered representative of the Black Park Gravel Member at this depth range, with Chalk not encountered until a depth of 2.95m bgl. As such, it is possible that this geophysical anomaly might be due to composition variations and erosion surfaces within superficial strata. It would be prudent to excavate a trench in due course through the co-ordinate position of this anomaly.

The two geophysical anomalies identified in Areas 3 and 4 were considered by the Geophysical Specialist not to be typical of large scale solution features and may be indicative of a relatively large variation in the bedrock, or overlying deposits. The strata encountered in the nearest exploratory holes comprised Black Park Gravel Member over Lambeth Group (clay and a basal sand bed) with chalk at a relatively consistent level (where encountered). The encountered conditions correlate with a thinning out (feather edge) of Lambeth Group strata, including the basal



bed of glauconitic clayey sand, over weathered Chalk. Variations in the Chalk surface profile could be associated with the erosion surface at the time the Lambeth Group strata were deposited as well as periglacial and post glacial weathering. It would be prudent to excavate a trench in due course through the co-ordinate positions of these anomalies.

The ground conditions encountered in the exploratory holes did not provide clear evidence of the presence of solution features. However, such features are known to exist in proximity to the north-western corner of the site and a High and Medium hazard rating was identified by the BGS across the north-western limb and thus the presence of solution features below or away from exploratory hole locations could not be ruled out. Geophysical surveying has identified three particular anomalies which might be associated with dissolution of the Chalk, albeit that the anomalies also appeared to reflect observed variations in composition of the Black Park Gravel Member and Lambeth Group, based on nearest exploratory hole findings. Nonetheless, the foundation strategy accounts these specific anomalies as well as the mapped geohazard zones.

It is noted that the LiDAR and photogrammetry surveys did not reveal obvious topographic features at the locations of the geophysical anomalies. Nonetheless, it is possible that landscaping undertaken as part of golf course construction and maintenance could mask naturally occurring topographic indicators.

For more detailed descriptions at specific locations, reference should be made to the exploratory hole logs presented in Appendix A.

## 5.2 Groundwater

Water was encountered during the intrusive investigation works within eight of the exploratory hole positions on site, details of which are presented in Table 5.2.

| Location | Depth of strike (m bgl) | Strike level (m AOD) | Water rose to (m bgl) | Standing level (m AOD) | Time elapsed (min) |
|----------|-------------------------|----------------------|-----------------------|------------------------|--------------------|
| TP07*    | 2.70                    | 79.55                | 2.90                  | -                      | Seepage            |
| TP08*    | 2.90                    | 79.78                | 3.00                  | -                      | Seepage            |
| WS06*    | 3.00                    | 77.40                | 3.00                  | 77.40                  | 20                 |
| WS13*    | 3.00                    | 78.19                | 3.00                  | 78.19                  | 20                 |
| BH01*    | 3.60                    | 74.24                | 3.40                  | 74.44                  | 20                 |
| TP307*   | 2.40                    | 77.92                | 2.40                  | -                      | Seepage            |
| TP309*   | 1.57                    | 80.19                | 1.57                  | -                      | Seepage            |
| TP312*   | 1.40                    | 80.21                | 1.40                  | -                      | Seepage            |

**NOTE:** \* anticipated to be perched/discontinuous water within Black Park Gravel Member or Lambeth Group

**Table 5.2 Water strikes within exploratory hole positions**

In addition to encountering water strikes as summarised in Table 5.2, some soil layers were recorded to have had a notable water content, i.e. visibly wet, details of which are outlined in Table 5.3. Each of these observations relate to soils inferred to comprise Black Park Gravel Member. It is noted that all of the observations listed in Table 5.3 relate to the initial phase of investigation undertaken in late October 2020 and that the observations from the more recent investigation, July 2021, might indicate some seasonal or weather dependent variations in the presence of water within the soils beneath this site.

| Location | Water content  | Depth range (m bgl) | Geology             |
|----------|----------------|---------------------|---------------------|
| TP04     | 'slightly wet' | 0.40 – 0.90         | Gravelly sandy CLAY |
| TP08     | 'wet'          | 1.80 – 2.90         | SAND and GRAVEL     |
| WS06     | 'slightly wet' | 2.00 – 2.60         | Medium SAND         |
| WS08     | 'wet'          | 3.10 – 3.70         | Gravelly sandy CLAY |
| WS12     | 'slightly wet' | 2.60 – 4.00         | Gravelly SAND       |
| WS13     | 'wet'          | 3.60 – 4.00         | Sandy CLAY          |

**Table 5.3 Details of visible water content in encountered soils**



Combined ground gas and groundwater monitoring wells were installed within WS01, WS03, WS07, WS12 and WS13 on site. These locations were chosen to provide general coverage of the site. Details of water encountered within the monitoring wells are presented in Table 5.4. A plot of groundwater depths is also presented below as Chart 1, albeit where wells were dry these are not shown on the plot.

| Location       | Date     | GWL (m bgl) |
|----------------|----------|-------------|
| WS01<br>[3.85] | 06/11/20 | Dry         |
|                | 17/11/20 | Dry         |
|                | 01/12/20 | Dry         |
|                | 21/12/20 | Dry         |
|                | 04/01/21 | Dry         |
|                | 26/01/21 | Dry         |
| WS03<br>[3.70] | 06/11/20 | Dry         |
|                | 17/11/20 | Dry         |
|                | 01/12/20 | Dry         |
|                | 21/12/20 | 3.70        |
|                | 04/01/21 | 3.70        |
|                | 26/01/21 | 3.69        |
| WS07<br>[3.60] | 06/11/20 | 1.95        |
|                | 17/11/20 | 0.75        |
|                | 01/12/20 | 1.65        |
|                | 21/12/20 | 1.00        |
|                | 04/01/21 | 1.45        |
|                | 26/01/21 | 1.20        |
| WS12<br>[3.70] | 06/11/20 | 0.90        |
|                | 17/11/20 | 0.75        |
|                | 01/12/20 | 1.20        |
|                | 21/12/20 | 0.90        |
|                | 04/01/21 | 1.90        |
|                | 26/01/21 | 0.60        |
| WS13<br>[3.90] | 06/11/20 | 0.70        |
|                | 17/11/20 | 0.60        |
|                | 01/12/20 | 2.25        |
|                | 21/12/20 | 0.55        |
|                | 04/01/21 | 0.85        |
|                | 26/01/21 | 1.90        |

**NOTE:** The value in brackets is the depth to which the monitoring well was installed

**Table 5.4 Summary of groundwater monitoring records**

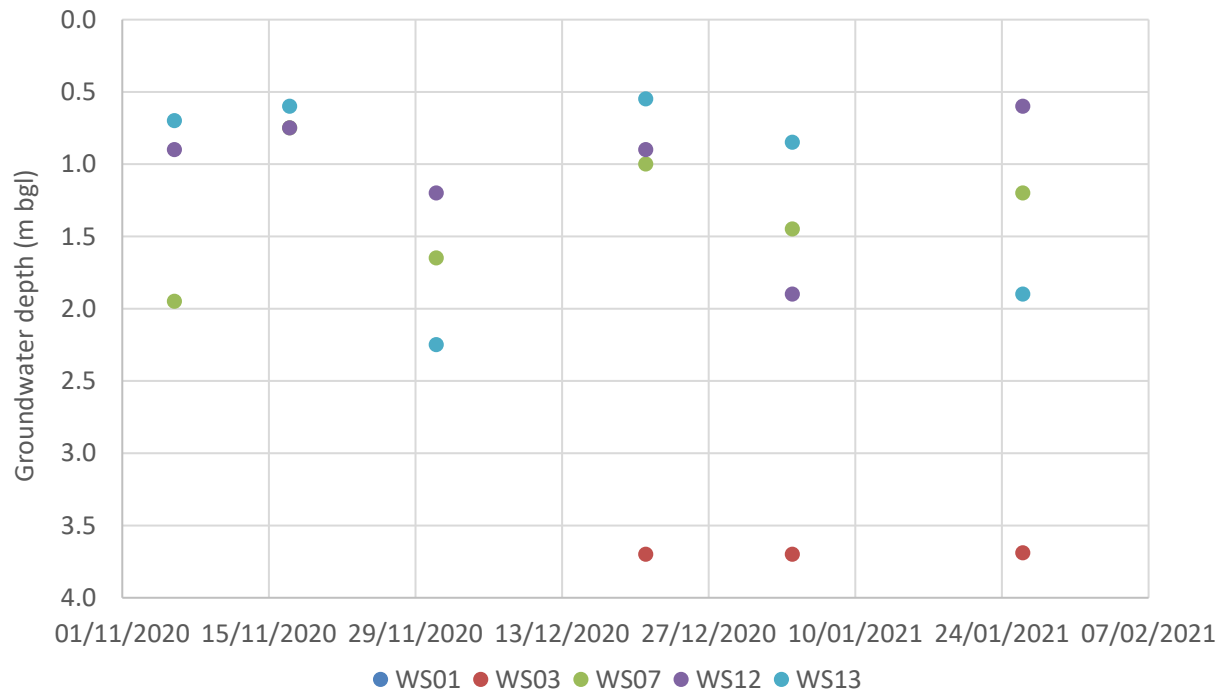


**Chart 1 Plot of groundwater depths recorded in monitoring wells from November 2020 to end of January 2021**

Given the varying ground conditions encountered across the exploratory holes on site, the absence of water within the majority of exploratory holes during the intrusive investigation and also within two of the five monitoring wells for at least some of the monitored period, it is considered likely that the water encountered on site is a perched or discontinuous body of water. Nonetheless the potential to encounter water during construction and possible requirement for mitigation/control measures to be required is considered likely. With reference to Table 5.3, several of the 'wet' records relate to granular soil layers which could be prone to running sand, slumping or the like if exposed in excavations.

The groundwater monitoring data indicates that, in some areas of the site, there could be limited unsaturated zone during wetter periods into which any soakaway, or similar infiltration device could drain and this could limit the operability of infiltration solutions within the site.

It should also be noted that changes in groundwater levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a series of standpipes or piezometers installed with appropriate response zones.

### 5.3 Obstructions

With the exception of refusal on naturally occurring hard layers within the soil (likely flint gravel, dense sands or stiff clays), no natural or artificial obstructions were encountered during the intrusive investigation works undertaken. The presence of natural and/or manmade obstructions elsewhere on site cannot be discounted and any ground works could encounter hard bands or rock layers.

It is understood that a Thames Water sewer crosses beneath the site, the location (depth and alignment) of which will need to be confirmed. This will represent an obstruction for any intrusive investigation, construction or similar activities and must be accounted for, and mitigated, as part of any planning and execution of such works.

### 5.4 Geotechnical Testing

10No. dynamic probe (DP) tests were undertaken, as a super heavy 'SHDP' method, at depths of up to 8m bgl across the site as part of the initial phase of investigation, with a further 45No. undertaken as part of the more recent (July



2021) phase of investigation. The initial 10No. DPs were conducted in order to investigate potential 'soft', loose or voided zones which could be indicative of suspected solution features across the site, as highlighted within a previous third party report. The additional 45No. DPs were undertaken to target locations for potential infiltration/attenuation basins for storm water (15No. DPs) and to target areas at higher risk potential for chalk dissolution, target areas of geophysical anomalies and to support the description of superficial strata.

Recordings of no (zero) blows per 100mm increment were recorded in a number of locations, details of which are outlined in Table 5.5. Given the presence of water seemingly sporadically across the site, it is considered possible that zones of lower penetration resistance encountered within the Black Park Gravel could represent soft clays and/or loose wet sands.

| Location | Depth of 'soft' zones recorded (m bgl) | Geology (estimated based on nearby exploratory holes) |
|----------|----------------------------------------|-------------------------------------------------------|
| SHDP03   | 0.2 – 0.3                              | Black Park Gravel Member                              |
|          | 0.4 – 0.6                              | Black Park Gravel Member                              |
|          | 0.7 – 0.8                              | Black Park Gravel Member                              |
| SHDP04   | 1.2 – 1.3                              | Black Park Gravel Member                              |
| SHDP09   | 0.1 – 0.3                              | Black Park Gravel Member                              |
|          | 0.4 – 0.6                              | Black Park Gravel Member                              |
| DP1      | 0.3 – 0.7                              | Black Park Gravel Member                              |
| DP4      | 0.6 – 0.8                              | Black Park Gravel Member                              |
| DP8      | 4.4                                    | Possibly Lambeth Group or Chalk                       |
| DP9      | 1.1 – 1.3                              | Black Park Gravel Member                              |
| DP10     | 0.6 – 0.8                              | Lambeth Group (soft to firm sandy CLAY – TP210)       |
| DP303    | 0.4 – 0.6                              | Black Park Gravel Member                              |
| DP304    | 0.4 – 0.6                              | Black Park Gravel Member                              |
|          | 1.2 – 1.6                              | Lambeth Group (firm or stiff sandy CLAY – TP304/305)  |
| DP305    | 0.6                                    | Black Park Gravel Member                              |
| DP309    | 0.6                                    | Black Park Gravel Member                              |
| DP315    | 0.3 – 0.6                              | Black Park Gravel Member                              |
| DP316    | 0.3 – 0.6                              | Lambeth Group (stiff slightly gravelly CLAY – TP319)  |
|          | 1.4                                    |                                                       |
| DP323    | 0.6                                    | Black Park Gravel Member                              |
| DP324    | 0.5 – 0.7                              | Black Park Gravel Member (assumed)                    |
| DP325    | 0.4 – 0.6                              | Black Park Gravel Member (assumed)                    |
| DP326    | 0.6 – 0.7                              | Black Park Gravel Member                              |
|          | 1.0                                    | Black Park Gravel Member                              |
|          | 1.8                                    | Lambeth Group                                         |
|          | 3.2 – 3.6                              | Chalk                                                 |
|          | 3.9 – 4.0                              | Chalk                                                 |
|          | 4.2 – 4.6                              | Chalk                                                 |
|          | 5.0                                    | Chalk                                                 |
|          | 5.2 – 5.6                              | Chalk                                                 |
| DP328    | 0.3 – 0.5                              | Black Park Gravel Member                              |
| DP329    | 0.5 – 0.6                              | Black Park Gravel Member                              |
|          | 1.5                                    |                                                       |

**Table 5.5 Summary of 'soft/loose' zones recorded within dynamic probes**

The majority of the 'soft/loose' zones encountered were located within the Black Park Gravel Member (clay, sand and gravel) or Lambeth Group (soft to stiff sandy clay) and for limited depth ranges. It is considered unlikely that they represent solution features, i.e. for which zero or low blows over a greater depth range would be anticipated. These 'soft/loose' depth zones were underlain by strata of the Black Park Gravel, Lambeth Group and/or Chalk to the base of the nearest exploratory holes and no clear evidence of possible solution features was identified within these exploratory holes. These pockets or zones of weak strata may be more susceptible to internal erosion or wash out of fine soil particles if water infiltrates through these soils and this could cause subsidence in these soils.

Whilst soft/loose zones were identified from shallow probe results at DP326, a series of zero blows were recorded between 3.2m and 5.6m bgl, these being within Chalk based on the ground conditions encountered in the closest trial pit (TP315). These zero blow counts might reflect the presence of a zone of highly weathered, very weak Chalk, but could also possibly indicate the presence of a weak zone populated by open fractured rock, voids, or possible dissolution within the Chalk. Probe DP327 was also located in proximity to DP326 and TP315 but did not record any zero blows within any strata. In addition, DP326 was located outside of any area where the geophysical survey identified any anomalies. Thus, the information available is not considered to indicate the presence of large scale dissolution, but does indicate the presence of variable ground conditions, including seemingly localised weak ground. DP326 was located within the BGS High risk area for solution feature hazards.

Soakage testing in accordance with BRE DG365 was attempted within four trial pits (TP01, TP02, TP04 and TP05) as part of the initial investigation. The results are presented in Table 5.6 below. In addition, soakage testing was undertaken in nine trial pits (TP201-204 and TP206-210) along with falling head tests in both cable percussion boreholes (BH01 & BH02) as part of the July 2021 investigation as summarised in Tables 5.7 and 5.8. Results sheets are presented in Appendix C. Trial pits TP201-204 and TP206 together with borehole BH01 were located in the proposed basin area located at the northern end of the site and TP207-210 and BH02 were located in the vicinity of the central swale (as indicated on the Client's development layout at the time of investigation).

| Trial pit | Infiltration rate (m/s) |                      |                      | Notes                                 |
|-----------|-------------------------|----------------------|----------------------|---------------------------------------|
|           | Test cycle 1            | Test cycle 2         | Test cycle 3         |                                       |
| TP01      | $1.1 \times 10^{-5}$    | $5.7 \times 10^{-6}$ | $7.4 \times 10^{-6}$ | -                                     |
| TP02      | $2.1 \times 10^{-6}$    | $1.9 \times 10^{-6}$ | $1.9 \times 10^{-6}$ | -                                     |
| TP04      | -                       | -                    | -                    | Testing aborted due to collapsing pit |
| TP05      | $4.7 \times 10^{-6}$    | $3.4 \times 10^{-5}$ | $3.2 \times 10^{-5}$ | Partial collapse during test          |

Table 5.6 Summary of soakage test results

| Trial pit | Infiltration rate (m/s) |                      |                      | Notes                                                                  |
|-----------|-------------------------|----------------------|----------------------|------------------------------------------------------------------------|
|           | Test cycle 1            | Test cycle 2         | Test cycle 3         |                                                                        |
| TP201     | $5.0 \times 10^{-5}$    | $5.2 \times 10^{-5}$ | $3.3 \times 10^{-5}$ | -                                                                      |
| TP202     | $2.4 \times 10^{-4}$    | $1.8 \times 10^{-4}$ | $1.8 \times 10^{-4}$ | -                                                                      |
| TP203     | $1.4 \times 10^{-4}$    | $2.6 \times 10^{-4}$ | $4.2 \times 10^{-4}$ | -                                                                      |
| TP204     | $2.3 \times 10^{-5}$    | $2.4 \times 10^{-5}$ | $2.1 \times 10^{-5}$ | -                                                                      |
| TP206     | $2.8 \times 10^{-6}$    | $2.8 \times 10^{-6}$ | -                    | Third test cycle not completed due to time constraints                 |
| TP207     | -                       | -                    | -                    | Insufficient fall in water in Test 1 to determine an infiltration rate |
| TP208     | -                       | -                    | -                    | Insufficient fall in water in Test 1 to determine an infiltration rate |
| TP209     | -                       | -                    | -                    | Insufficient fall in water in Test 1 to determine an infiltration rate |
| TP210     | -                       | -                    | -                    | Insufficient fall in water in Test 1 to determine an infiltration rate |

Table 5.7 Summary of soakage test results

| Borehole | Infiltration rate (m/s) | Notes                                                                     |
|----------|-------------------------|---------------------------------------------------------------------------|
| BH01     | $6.2 \times 10^{-5}$    | Test undertaken at 15m bgl. Cased GL to 6m bgl. Test undertaken in Chalk. |
| BH02     | $4.1 \times 10^{-5}$    | Test undertaken at 15m bgl. Cased GL to 6m bgl. Test undertaken in Chalk. |

Table 5.8 Infiltration rates from falling head tests in boreholes

Geotechnical laboratory tests were undertaken on selected samples of the key strata encountered from the initial



phase of investigation. The results are summarised in Table 5.9.

| Parameter                                   |                 | Black Park Gravel Member                                                                            | Lambeth Group                                            | Seaford Chalk Formation            |
|---------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------|
| Natural Water content (%)                   |                 | 8 – 40                                                                                              | 19 – 34                                                  | 26 – 29                            |
| Liquid Limit (%)                            |                 | 23 – 74                                                                                             | 40 – 80                                                  | -                                  |
| Plastic Limit (%)                           |                 | 12 – 28                                                                                             | 21 – 29                                                  | -                                  |
| Plasticity Index Ip (%)                     |                 | 9 – 46                                                                                              | 19 – 58                                                  | -                                  |
| Modified Plasticity Index Ip' (%)           |                 | 4.4 – 46                                                                                            | 19 – 57                                                  | -                                  |
| Classification (A-Line Plot)                |                 | CL – CV                                                                                             | CI – CV                                                  | -                                  |
| Soil grading                                |                 | Silty CLAY; sandy silty CLAY; sandy silty gravelly CLAY, clayey gravelly SAND, clayey sandy GRAVEL. | CLAY; silty CLAY; sandy silty CLAY; gravelly silty CLAY. | 'Putty' CHALK with chalk fragments |
| Particle Size Distribution                  | Very coarse (%) | 0.0                                                                                                 | -                                                        | -                                  |
|                                             | Gravel (%)      | 6.0 – 49.7                                                                                          | -                                                        | -                                  |
|                                             | Sand (%)        | 32.3 – 69.9                                                                                         | -                                                        | -                                  |
|                                             | Fines (%)       | 18.0 – 24.1                                                                                         | -                                                        | -                                  |
| pH                                          |                 | 6.3 – 7.4                                                                                           | 6.8                                                      | -                                  |
| Water soluble sulphate (g/l)                |                 | <0.02                                                                                               | <0.02                                                    | -                                  |
| Total Sulphur (%)                           |                 | <0.01 – 0.01                                                                                        | 0.01                                                     | -                                  |
| Acid Soluble Sulphate (SO <sub>4</sub> , %) |                 | <0.02 – 0.03                                                                                        | <0.02                                                    | -                                  |
| Saturation Moisture Content (%)             |                 | -                                                                                                   | -                                                        | 26 – 28                            |
| Bulk Density (Mg/m <sup>3</sup> )           |                 | -                                                                                                   | -                                                        | 1.94 – 2.04                        |
| Dry Density (Mg/m <sup>3</sup> )            |                 | -                                                                                                   | -                                                        | 1.54 – 1.58                        |

**Table 5.9 Summary of geotechnical laboratory test results (from GE19428)**

Variation in moisture content and possible tree influence was considered within report GE19428-GIR-DEC20, to which the reader is referred for further information.

Standard Penetration Tests (SPTs) were undertaken in the cable percussion boreholes, the results of which are presented on the respective borehole logs presented in Appendix B.



## 6.0 ENGINEERING CONSIDERATIONS

Subsequent to intrusive investigation of the site and receipt of the laboratory test results, the following geotechnical assessments have been made.

### 6.1 Foundations

Given the risk of solution features on site, foundation recommendations are presented based on zones as outlined within Figure 3. Zone 1 comprises the south-east portion of the site and is located outside of any known or encountered evidence of solution features. Zone 2 is in the north, central and south-western area of the site, and includes an area of high and medium hazard rating (rating by BGS) in relation to solution features as presented in the third party Phase 1 report, the area of known solution features and surrounding areas of this limb of the site.

#### *Zone 1*

On the basis of the ground and groundwater conditions encountered in the exploratory holes within Zone 1, it is considered that conventional foundations may be suitable for the proposed development within Zone 1, albeit with some deepening of foundations within the zone of influence of trees and hedgerows.

It is considered that the soils of the Black Park Gravel Member and the Lambeth Group should be classified 'en-masse' as high volume change potential. In line with NHBC Standards Chapter 4.2 a minimum founding depth of 1.0m bgl is recommended. Heave protection should be installed for any foundations extending deeper than 1.5m bgl, as required in NHBC Standards.

Foundations should pass through any desiccated soils, root zones, Topsoil, Made Ground, disturbed ground, loose ground, fill material, soft and weathered ground and terminate wholly within the firm or stiff clay, or sand and gravel of the Black Park Gravel Member or the Lambeth Group. Due consideration is required during plot specific foundation design in relation to the reported presence of lower strength soils at depth in some of the exploratory holes, e.g. WS13, as this could have an adverse impact on bearing capacity and subsequent settlement.

A net allowable bearing capacity of 90kPa is recommended for the firm to stiff clay and sand/gravel soils of the Black Park Gravel and stiff clay soils of the Lambeth Group. This value has been limited to account for the reported presence of firm clay in some exploratory holes and thus could be conservative where higher strength soils are present. Total settlement should remain within tolerable limits for this bearing capacity.

Where foundations are proposed to be constructed within the zone of influence of trees, it is possible that foundations would need to be deepened to account for the presence and influence of trees. It is possible that foundation bases would require to be stepped and as such, it is recommended that steps do not exceed 0.50m in height at any point and are at least 1.0m (lateral distance) away from any corner or node point on the foundations, unless otherwise specified by an approved plot specific detailed foundation design. Where this cannot be accommodated, the foundation should be formed at the greater depth. Where the depth of foundations requires deepening beyond 2.50m bgl on account of trees, the use of a piled foundation solution on site may be more appropriate. Further investigation would be required to inform the pile design and would be likely to require the construction of a number of boreholes to 20-25m bgl.

Foundations which are proposed in proximity to trees and hedgerows (remaining, removed or proposed) should be designed in accordance with NHBC Standards Chapter 4.2, and relevant design approaches such as 4.2B and 4.2C, which incorporate the water demand of trees and the distance of the tree from the nearest portion of foundation.

It is recommended that foundation excavations be concreted or blinded as soon after excavation as possible. Where concreting could take place the following day it is recommended that excavations are not taken to full depth overnight and that the final 0.5m of cover is only removed immediately prior to concreting. Long, deep excavations should be avoided in order to mitigate the risk of trench side collapse prior to concrete pour.



The foundation designer should also take account of constructability of conventional foundations and additional measures which may be required to support excavations and/or control groundwater ingress into foundation excavations during construction.

## Zone 2

On the basis of the ground and groundwater conditions encountered in the exploratory holes within Zone 2, it is considered that a mixture of conventional and piled foundations may be a feasible solution for plots located within Zone 2. The requirement for piled foundations is anticipated to be driven by the risk of solution features being present beneath specific plots, tree influence and the like.

The geophysical survey identified numerous in-ground anomalies, most of which were considered by the Geophysical Specialist to relate to golf course features, services and the like; historic features; and natural variation in the composition of the ground. Three anomalies were identified by the Geophysical Specialist as potential indicators of chalk related geohazards. Each was described as a bowl-shaped feature or possible variation in the weathering of, and depth to the Chalk, but not indicative of localised cylindrical anomalies commonly associated with chalk dissolution, e.g. solution features, solution pipes and the like. Co-ordinated positions were provided for each of these three anomalies as discussed in Section 5.1 and shown in Figure 7. 'Area' references discussed below are as defined in the geophysical survey report.

The ground conditions encountered in exploratory holes located in proximity to the geophysical anomaly in 'Area 1' (NGR SU 71430 76905) comprised soils of the Black Park Gravel Member to depths in excess of the bowl-shaped feature described and it would appear, at this stage, that the anomaly is within the Black Park Gravel Member and thus not a solution feature within the Chalk. This anomaly was located close to the northern fringe of the 'High Risk' area as mapped by BGS. Whilst trenching and possibly further probing across this feature is recommended in due course, at this stage it is considered that conventional foundations terminating in the soils of the Black Park Gravel Member could be suitable, albeit that allowance should be included for reinforcement within the foundation to enable it to span a void of c. 2-3m diameter. This should be included for any plots in the immediate vicinity of this anomaly. It is possible that further intrusive investigation and/or construction inspection may be required depending on the final foundation solution adopted.

The geophysical anomalies identified in 'Area 3' and 'Area 4' (NGR 71542 76928 & SU 71565 76898) were located within the 'Medium Risk' area as mapped by BGS. The Geophysical Specialist's assessment of these anomalies was that they were not indicative of cylindrical anomalies typically associated with solution features, but that they were suggestive of variable weathering of, and depth to the Chalk coupled with possible variation in composition of overlying strata. Reference to the exploratory holes in the vicinity of these anomalies indicates that the Chalk was overlain by strata typical of the basal beds of the Lambeth Group, e.g. glauconitic sandy clay and clayey sand with variable gravel content. In addition, the erosion surface on which these basal beds were deposited is often uneven, this irregularity being contemporaneous with the depositional environment, i.e. not necessarily associated with geologically more recent chalk dissolution activity. If plots in this portion of the site were to be constructed using conventional foundations terminating in the soils of the Black Park Gravel Member, or Lambeth Group, these foundations must include sufficient reinforcement to be capable of spanning a void of c. 2-3m diameter and it is possible that plot specific investigation and construction phase geotechnical inspection might be required. It is possible that reinforcement and inspection might be required for foundations terminating wholly within Chalk. Thus on balance, given the presence of these anomalies, the BGS Medium Risk rating and potential complexities and costs associated with enhanced conventional foundations, it is considered that a piled foundation solution would serve to mitigate potential geotechnical risks for plots located within this portion of the site.

Whilst not identified as a geophysical anomaly, dynamic probing at DP326 encountered numerous depth zones where zero blow counts were recorded. These zero blow count zones were present within Black Park Gravel Member, Lambeth Ground and Chalk, based on correlation with encountered conditions in trial pit TP315. DP326 was located within the 'High Risk' area mapped by BGS. The remainder of the zero blow counts in other probe locations (see Table 5.5) were at shallow depth within the Black Park Gravel Member where gravel might have caused the probe to 'jump' as it penetrated through and around gravel; within firm to stiff clay of the Lambeth



Group (based on strata encountered in pits adjacent to probes), or in Chalk. Critically, these zero blow zones were all generally of limited thickness and were considered unlikely to influence foundation performance due to their shallow depth, assuming that ground levels remain relatively similar to the current levels and that ground and groundwater regimes do not change significantly. With respect to the multiple zero blow count zones identified in DP326, it is considered that these could present a geotechnical risk to long term foundation performance for any plots in proximity to this location and thus a piled foundation solution would be recommended at this stage. It must also be noted that storm water infiltration to the ground must be avoided in this area in order to mitigate a potential risk of inundation collapse settlement, internal erosion or the like within the extant soil profile.

It remains possible that some plots where conventional foundations might be possible will require plot specific probing and foundations should be designed to span a cavity of 2-3m diameter (sub-circular in plan beneath any part of the foundation). In addition, where conventional foundations are deemed suitable, deepening of foundations within the zone of influence of trees and hedgerows may be required.

It is understood from initial discussions and consideration of the development layout that reinforced cruciform foundations would not be suitable due to constraints of the layout, proximity of structures to each other, requirement for services routing and the like.

It is recommended that plots located within the 'High' and 'Medium' risk areas (BGS assessment) are assumed to require piling. As discussed above, this would serve to mitigate likely requirements for plot specific investigation, reinforced foundations (akin to reinforced beams), construction phase inspection and the associated risk that a piled foundation may ultimately be recommended.

Further investigation would be required to inform the pile design and would be likely to require the construction of a number of boreholes to depths of at least 25m bgl. In addition, probing may be required on some plots spanning the edge, or close to the higher risk zone boundaries which are approximations and not absolute or defined boundaries. It may also be necessary to construct boreholes using rotary drilling techniques to enable detailed logging of the Chalk (condition, strength, fractures and the like), if required. Piled foundations are considered further in Section 6.2.

Irrespective of final foundation solution for any given plot, it is considered that the soils of the Black Park Gravel Member and the Lambeth Group should be classified 'en-masse' as high volume change potential. In line with NHBC Standards Chapter 4.2 a minimum founding depth of 1.0m bgl is recommended. Heave protection should be installed for any foundations extending deeper than 1.5m bgl, as required in NHBC Standards.

Foundations should pass through any desiccated soils, root zones, Topsoil, Made Ground, disturbed ground, loose ground, fill material, soft and weathered ground and terminate wholly within the natural soils of the Black Park Gravel Member, Lambeth Group or Chalk. Founding across multiple strata should be avoided in Zone 2 and thus foundations should be deepened where feasible.

A net allowable bearing capacity of 90kPa is recommended for the firm to stiff clay and sand/gravel soils of the Black Park Gravel, stiff clay soils of the Lambeth Group and Chalk. This value has been limited to account for the reported presence of firm clay in some exploratory holes and thus could be conservative where higher strength soils are present. Total settlement should remain within tolerable limits for this bearing capacity.

Where foundations are proposed to be constructed within the zone of influence of trees, it is possible that foundations would need to be deepened to account for the presence and influence of trees. It is possible that foundation bases would require to be stepped and as such, it is recommended that steps do not exceed 0.50m in height at any point and are at least 1.0m (lateral distance) away from any corner or node point on the foundations, unless otherwise specified by an approved plot specific detailed foundation design. Where this cannot be accommodated, the foundation should be formed at the greater depth. Where the depth of foundations requires deepening beyond 2.50m bgl on account of trees, the use of a piled foundation solution on site may be more appropriate. Further investigation would be required to inform the pile design and would be likely to require the construction of a number of boreholes to 20-25m bgl.



Foundations which are proposed in proximity to trees and hedgerows (remaining, removed or proposed) should be designed in accordance with NHBC Standards Chapter 4.2, and relevant design approaches such as 4.2B and 4.2C, which incorporate the water demand of trees and the distance of the tree from the nearest portion of foundation.

It is recommended that excavations for any conventional foundations be concreted or blinded as soon after excavation as possible. Where concreting could take place the following day it is recommended that excavations are not taken to full depth overnight and that the final 0.5m of cover is only removed immediately prior to concreting. Long, deep excavations should be avoided in order to mitigate the risk of trench side collapse prior to concrete pour.

The foundation designer should also take account of constructability of conventional foundations and additional measures which may be required to support excavations and/or control groundwater ingress into foundation excavations during construction.

## 6.2 Preliminary Pile Assessment

As discussed above, it is recommended that piled foundations are used for plots located within the Medium and High risk areas (including around DP326) in relation to mitigating potential geotechnical risks associated with chalk dissolution. In addition, piled foundations may also be required for plots located with the zone of influence of trees (existing, removed or proposed) and this should be assessed further as part of the foundation strategy with the structural engineering package of works.

The construction of a piled foundation is a specialist job and the advice of a reputable local contractor familiar with the type of ground and groundwater conditions encountered on this site should be sought prior to finalising the design.

Preliminary load capacities calculated for varying depths of CFA piles taken through any Made Ground/disturbed ground, Black Park Gravel Member, Lambeth Group and into the Chalk are given in Table 6.1. The information should be used for preliminary purposes only as the actual working load is dependent on the type of pile and method of installation. It must also be noted that the values presented in Table 6.1 are based on boreholes which were constructed in potential infiltration basin areas and thus are not specific to the areas of the site where piled foundations are likely to be required. These values are for preliminary purposes only and further investigation will be required in due course to target plots/areas of the site where piled foundations are required. Pile working loads are therefore likely to change depending on the ground conditions encountered at specific locations yet to be investigated.

| Pile Type | Diameter (mm) | Depth (m bgl) | Working Load (kN) |
|-----------|---------------|---------------|-------------------|
| CFA       | 0.30          | 8.0           | 140               |
|           |               | 10.0          | 200               |
|           |               | 12.0          | 240               |

**Table 6.1 Preliminary Pile Working Loads**

For pile depths of c.13m or greater, the preliminary load capacity calculations indicate that the overburden pressure exceeds the recommended maximum of 150kN/m<sup>2</sup>, and therefore CIRIA recommends pile testing to establish skin friction.

These working loads have been calculated on the basis of the ground and groundwater conditions encountered within the borehole, SPT results and assume the following parameters:

- The contribution to the working load on the upper 3m has been ignored.
- A groundwater depth of 3.60m bgl has been assumed.
- A factor of safety of 5 and 3 was used on end bearing and skin friction working loads respectively.



- No allowance has been made for additional forces acting on the pile shaft, such as negative skin friction, loading due to desiccation, heave forces or raising of ground levels.

The bearing values given are applicable to single vertically loaded piles. Where groups of piles are to be constructed, the bearing value of each individual pile should be reduced by a factor of 0.8 and a calculation made to check for the factor of safety against block failure.

Where required, heave protection measures for ground beams and pile caps should be designed in accordance with the NHBC Standards, Chapter 4.2 and should assume clay rich soils to be of High Volume Change Potential.

### **6.3 Floor Slabs**

Given the presence of shrinkable soils encountered at shallow depth across the site within the Black Park Gravel Member and the Lambeth Group, it is recommended that suspended floor slabs are constructed throughout the site. Preliminary modelling indicates a minimum void height of 300mm due to the presence of high volume change potential soils. Consideration should also be given to heave associated with the presence of any seasonal desiccation and ongoing influence of trees.

### **6.4 Excavations**

Shallow excavations within the Topsoil and clay soils of the Black Park Gravel Member and Lambeth Group are likely be stable in the short to medium term above any water ingress. Excavations within the sands and gravels of the Black Park Gravel Member are likely to become unstable in the short term. Large scale excavations and those taken below any water ingress are likely to collapse and will require shoring and dewatering to maintain stability. Where Chalk is encountered in excavations, it may be possible for the excavation to remain stable at relatively steep angle, subject to Chalk condition, fracturing and the like, albeit that some overbreak and spalling should be expected. Excavations in structureless Chalk are unlikely to remain stable in the medium to long term.

Ground works should be designed in such a manner to avoid any requirement for construction or maintenance personnel to enter into or work within excavations. If such work cannot be avoided, then it should only be permitted once a safe system of work, supported by a robust risk assessment, has been determined and implemented.

### **6.5 Sulphates**

The results of the water soluble sulphate and pH analyses of soil and groundwater samples indicate that buried concrete, i.e. shallow foundations within the Black Park Gravel Member or Lambeth Group, should be designed in accordance with Class DS-1 of BRE Special Digest 1, with an ACEC class of AC-1s. Whilst this might also be applicable to foundations cast into the Chalk, further testing to verify this would be recommended.

### **6.6 Soakaways**

Soakage test and infiltration test results are presented in Tables 5.6, 5.7 and 5.8. On the basis of the results of soakage testing, it is considered that whilst infiltration of storm water into the ground may be achievable, the rate of infiltration is unlikely to be sufficient for conventional soakaways to function satisfactorily and thus storage and attenuation is likely to be required. It is understood that the emerging drainage strategy includes infiltration basins. Additional measures such as swales, reed beds and the like may also be required to provide sufficient filtration to protect underlying groundwater resources.

As mentioned above, the third party desk study identified the presence of solution features on the wider golf course, a high risk zone crossing through the subject site and also that there are active solution features within the subject site which require infilling by the site maintenance staff periodically. The drainage strategy will need to minimise the risk of any infiltration system adversely impacting the status of existing solution features, causing dormant features to become active, or creation of new dissolution features.



At the time of writing, the development layout is not fixed and options seen to date have included basins within, or close to the High and Medium risk areas (for potential solution features and chalk dissolution), and an option for permeable paving, swales a central basin and basin in the north-west of the site (basins located outside of the Medium and High risk areas). It is imperative that infiltration to the ground in proximity (within 20m) to house plots is avoided in Zone 2 and any basins located in Zone 2 must be lined and would thus serve as detention basins and not allow storm water to infiltrate the ground. The requirement for including an impermeable liner is to prevent concentration infiltration of storm water from causing internal erosion of shallow strata, inundation collapse settlement of loose/voided ground and activation/creation of solution features in the Chalk. Discharge from these basins to an alternative discharge point or medium would be required. Positioning of basins outside the Medium and High risk areas would help to mitigate the risk of damage to property.

In accordance with guidance in CIRIA C574 Engineering in Chalk, for all dissolution features, whether backfilled or infilled, and for deneholes (none suspected on this site), all possible steps should be taken to prevent the ingress of surface water that might destabilise any void and/or cause further dissolution. No infiltration device (pond, swale, soakaway or the like) should be located within 20m of any structure due to the potential for infiltrating water to induce instability and ground collapse. In addition, wherever possible, drainage runs should be diverted away from any known feature (known from investigation or discovered during development). If this is not feasible, it is preferable for drains to be sealed flexible jointed pipes or to be provided with concrete bedding and haunching.

Care will also be required during construction ensure that drainage connections are robust and resilient to slight movement, otherwise leakage from drains could result in washing out of shallow soils, activation of solution features and collapse back to ground surface.

## 6.7 Earthworks

It is anticipated that any development on this site could include the reprofiling of site levels to accommodate the proposed development.

On the basis of the ground conditions encountered, it is anticipated that site won clay soils might be suitable for retention and re-use as earthworks fill, subject to meeting likely acceptability requirements. At this stage, it is anticipated that the sand and gravel soils might comprises Class 1 granular fill for use as general bulk fill, clay soils could be classified as Class 2A wet cohesive soil and/or Class 2C stony cohesive soils for use as general bulk fill, i.e. not specialist fill to structures or the like, and any Chalk would comprise Class 3 fill. The suitability of clay fill is often governed by factors such as moisture content and shear strength. BS6031 Code of Practice for Earthworks states that a Moisture Condition Value (MCV) range of 8-12 is common for wet cohesive fill and 8-16 for stony cohesive fill such as may be generated from this site.

Many clay soils have moisture contents which are outside of the acceptability range for immediate use as earthworks fill, i.e. based on MCV, or optimum moisture content (OMC) as derived from compaction tests. As such, if site won clay soils are proposed to be re-used for earthworks fill on this site, further testing for classification, acceptability and compliance would be required in due course. In addition, treatment may be required to bring clay fill into the required acceptability range, e.g. setting aside to dry out, wetting if dry, additional of lime:cement to dry out or stabilise the fill, or the like.

Any earthworks should be undertaken in accordance with an earthworks specification and accompanying earthworks strategy prepared for the proposed development and to reflect the required end use of the earthworks construction.



## 7.0 DISCOVERY STRATEGY

Whilst several phases of intrusive investigation have been undertaken on the site, it remains possible that unexpected soil conditions may be encountered during the process of construction.

### *Geotechnical*

Solution features are known to be present on the site and mapping indicates a high and medium hazard rating for solution features across part of the site. Geophysical surveying has detected several anomalies, albeit that these might relate to natural variations in composition rather than irrefutable evidence of chalk dissolution. As such, it is possible that abnormal ground conditions, loose/voided ground, sudden changes or the like could be encountered during construction activities on the site. Therefore, a discovery strategy should be maintained in relation to potential geotechnical hazards. Any such discovery should be reported to the Geotechnical Engineer and wider design team, e.g. Structural Engineer and Civil Engineer, at the earliest opportunity such that the discovery can be investigated and possible remedial solutions be determined.

### *Contamination*

Should previously undiscovered contamination or unforeseen ground conditions be encountered during construction by the ground workers, this must be reported to the Site Manager immediately in order that the Consultant is notified. Where deemed necessary, the Consultant shall attend the site to inspect the discovery and provide recommendations on the further actions required, if any. Where necessary the regulatory authority shall be informed. Post any additional investigation or laboratory testing the results and any proposed remedial measures shall be reported to the regulatory authority or other appropriate organisation for consent, before proceeding or implementing the remedial measures.

A copy of the discovery strategy must be lodged on site, and provisions made to ensure that all workers are made aware of their responsibility to observe, report, and act on any potentially suspicious, abnormal, unforeseen or contaminated ground and/or groundwater conditions they may encounter.

Depending on the type, nature and extent of any such 'discovery', it may be necessary to halt works in that location until such time as the assessment has been completed. This shall be reviewed on a 'discovery' specific basis and in conjunction with consultation with the client, other technical personnel and/or regulatory/approval organisations.

As a general guide, where such unexpected conditions are encountered the following approach is required as a minimum:

- All discoveries are to be reported to the Site Manager immediately and works at that location are to halt until further notice;
- The Site Manager is to report any such discoveries to the Client and the Consultant;
- Following notification from the Site Manager, the Consultant shall discuss the discovery with the Local Authority and/or other relevant parties and if considered necessary, arrange to meet on site to view the discovery;
- The Consultant shall attend the site to record the location, extent and nature of the discovery and implement an appropriate sampling and analysis regime, taking due account of the type and nature of the discovery, known and probable land uses in that area of the site;
- Where remedial action is required, regulatory consultation and approval will be sought;
- A record will be produced by the Consultant and held on site (with copies held by the Consultant, Client and Local Authority/other relevant organisation), detailing the discovery, assessment works undertaken, findings thereof, confirmation either of no action required or detailing the remedial action taken and validation thereof.

The process is shown below.

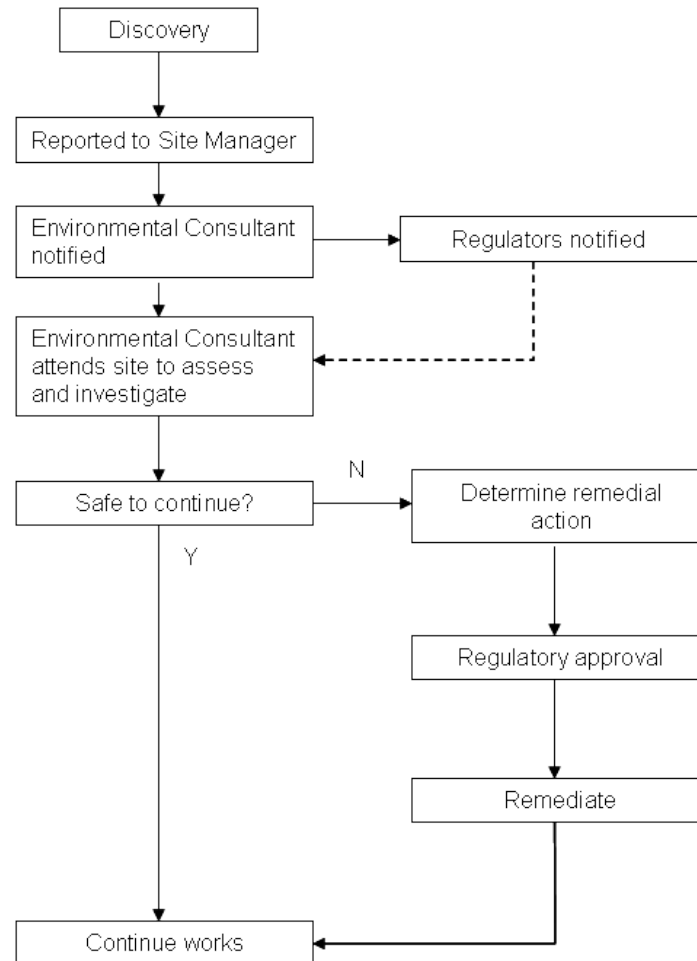


Chart 1: Discovery Strategy Process

## FIGURES





|                 |                      |                  |              |                                                                                                                                                                                                                                                                                                                                                   |                    |  |
|-----------------|----------------------|------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--|
| <b>Project:</b> | Reading Golf Course  |                  |              | <b>Title</b>                                                                                                                                                                                                                                                                                                                                      | Site Location Plan |  |
| <b>Client:</b>  | Vistry Thames Valley |                  |              | <div>Geo-Environmental Services Ltd</div> <div>Unit 7 Danworth Farm, Cuckfield Road</div> <div>Hurstpierpoint, West Sussex BN6 9GL</div> <div>+44(0)1273 832972 <a href="http://www.gesl.net">www.gesl.net</a></div> <div><div>Geo-Environmental</div></div> |                    |  |
| <b>Ref No:</b>  | GE20079              | <b>Revision:</b> | 1.0          |                                                                                                                                                                                                                                                                                                                                                   |                    |  |
| <b>Drawn:</b>   | GR                   | <b>Date:</b>     | 28/09/2021   |                                                                                                                                                                                                                                                                                                                                                   |                    |  |
| <b>Figure:</b>  | 1                    | <b>Scale:</b>    | Not To Scale |                                                                                                                                                                                                                                                                                                                                                   |                    |  |