



Providing Ground Solutions

Berkeley Homes (Western) Limited

Phase 6 – Green Park Village, Reading

*Geoenvironmental Interpretative
Report and Remediation Strategy*

August, 2018



Card Geotechnics Limited
4 Godalming Business Centre
Woolsack Way, Godalming GU7 1XW
Telephone: 01483 310600
www.cgl-uk.com

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Author(s)	Jessica McDermott, Senior Engineer <i>BSc (Hons) MEnvSc</i>				
	Naomi Curthoys, Engineer <i>MSc BSc (Hons) FGS</i>				
Checked	Sarah Key, Principal Engineer <i>MSc BSc CEnv FGS MEnvSc</i>				
Approved	Robin Slade, Associate Director <i>BSc CEnv MIEMA</i>				
	Dan Matthews, Director <i>BEng CSci CEnv MEnvSc MCMl</i>				
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EXECUTIVE SUMMARY

Card Geotechnics Limited (CGL) was commissioned by Gravity Consulting Ltd on behalf of Berkeley Homes (Western) Limited to undertake a supplementary ground investigation in the Phase 6 area of the Green Park Village development, Reading ('the site'). The site currently comprises a partially infilled lake, contractor parking, construction site office with welfare area and materials storage yards. It is understood that the proposed Phase 6 development will comprise seven mixed height residential blocks and a commercial block, with associated parking and areas of communal soft landscaping.

The site has been the subject of, and included within, a number of previous assessments and intrusive investigations, and copies of some of the associated reports have been provided to CGL for review. Desk study information for the site has been obtained from these reports and summarised. The earliest available historical maps indicate the wider Green Park site was undeveloped open land surrounded by marshes, with localised ground workings (suspected borrow pits) located in the western part of Phase 6, and the Reading-Basingstoke Railway line abutting the western boundary of the site. Phase 6 remained relatively unchanged until 1972, when large scale mineral extraction was taking place with the creation of four lakes and associated access tracks leading to an area of gravel extraction to the north of the site.

Within the Phase 6 area, one of the four lakes noted above was located in the south western section of the phase, the northern part of which has been partially infilled with unknown materials. The site is identified as being part of an authorised landfill referred to as *Burghfield Landfill Site A*, which extends off-site to the north and east, and also a historical landfill referred to as *Burghfield Area D*, which extends off-site to the east. Until 2007, the site was also used as a waste transfer station operated by Clembins Ltd.

Various forms of ground infilling and alteration of lake boundaries has occurred across the Phase 6 site, and in the surrounding areas.

Ground conditions encountered during the CGL supplementary investigation in May 2018 generally comprised between 1.25m and >5m of Made Ground, over superficial deposits (Lake Deposits, Alluvium and/or Beenham Grange Gravel Member), with soils of the Reading Formation encountered between depths of 2.8m below ground level (bgl) and 4.95m bgl.

Other than the presence of foreign objects (brick, concrete and coal) within the Made Ground, no visual or olfactory evidence of contamination was noted during the investigation. However, elevated concentrations of the polycyclic aromatic hydrocarbon benzo(a)pyrene and asbestos fibres (in eight

samples from across the site) were encountered within the Made Ground. However, due to the proposed raising of site levels to facilitate the development, the risks to future users of the site from these substances are considered to be low. Limited elevated concentrations of contaminants were encountered in the groundwater across the site and, based on the hydrological model of the area, a low risk is considered for controlled waters.

Ground gas monitoring undertaken by CGL, indicates elevated concentrations of both carbon dioxide and methane within monitoring locations across the site. The site has been zoned in terms of gas risk to assist with the design of protection measures. Across the majority of the site, the gas regime has been classified as Characteristic Situation (CS) 2 due to the maximum concentrations of carbon dioxide and methane recorded within the monitoring wells, and accordingly ground gas protection measures are required in the proposed blocks.

It is noted that in the north eastern section of the site, close to the off-site historical Burghfield landfill, higher flow rates and concentrations of methane have been recorded, than elsewhere on site, which are considered to present a higher risk to future residents and correspond to a CS4 gas regime in this area. Therefore, gas protection measures suitable to address a CS4 gas regime are required in the footprint of Block D.

Although it is understood that limited material is proposed for off-site disposal, a preliminary waste characterisation has been undertaken and indicates that the majority of the Made Ground is 'not hazardous' and, if required, may be disposed to suitably licensed inert or non-hazardous waste facilities, subject to Waste Acceptance Criteria (WAC) testing. However, seven samples recorded small quantities of asbestos (<0.001% to 0.05% by weight) below the hazardous waste threshold (<0.1% by weight) in the Made Ground, and this material will require disposal at a suitably licensed non-hazardous facility that can accept small quantities of asbestos. Additionally, two samples of the Made Ground, from WS04 and WS16, are considered to be hazardous due to concentrations of asbestos (>0.1%) and total petroleum hydrocarbons, respectively. These areas should be selectively excavated and segregated prior to off-site disposal. The earthworks Contractor will be responsible for the appropriate classification of the waste and it is recommended that soil stockpiles are regularly sampled to enable representative classification of the soils for off-site disposal.

Following the investigation of Phase 6 and the identified risks to receptors, remediation is required to facilitate the development. Gas protection measures will be required across the majority of the site, water supply pipes may need to be barrier pipes/metal pipes and capping layers/growth mediums will be required for all areas of soft landscaping across the site. Independent verification of these remedial measures will also be required to confirm acceptability within the development.

1. INTRODUCTION

Card Geotechnics Limited (CGL) was commissioned by Gravity Consulting Limited on behalf of Berkeley Homes (Western) Limited to undertake a supplementary ground investigation within Phase 6 of the Green Park Village (GPV) development in Reading. Phase 6 is herein referred to as ‘the site’.

The site is an area of former gravel workings and currently comprises a partially infilled former lake, contractor parking, construction site office and welfare area, and materials storage yards. It is understood that the proposed development will comprise seven mixed height residential blocks, with associated parking and areas of communal soft landscaping.

The objectives of this report are to:

-  Review previous ground investigation reports for the site, produced by others, and provide a summary of the environmental, historical and geological setting of the site, in conjunction with geotechnical and geoenvironmental risks based on available published data sources;
-  Provide information on the ground conditions encountered on site during the CGL supplementary ground investigation, and provide analysis and interpretation of chemical and geotechnical laboratory testing undertaken on representative soil and groundwater samples and results of ground gas monitoring;
-  Present a source-pathway-receptor risk assessment based on the findings of the intrusive investigation and results of chemical testing;
-  Provide geoenvironmental recommendations for soil and water contamination and ground gas; and
-  Provide a remediation strategy for the development including details of verification (where required).

It is noted that this report includes the presentation of factual geotechnical data from the CGL supplementary investigation; however, assessment and interpretation of geotechnical data has been reported separately in a letter report¹.

¹ CGL (2018). *Geotechnical Recommendations*. Phase 6 – Green Park Village, Reading. July 2018

2. SITE CONTEXT

2.1 Site Location

The site is located within the western area of the wider Green Park Village (GPV) development, which is accessed off Kirtons Farm Lane, Reading. The Ordnance Survey grid reference for the approximate centre of the site is 469650E, 170249N, and the nearest postcode is RG30 3UR.

A site location plan is attached as Figure 1.

2.2 Site Description

A site walkover was undertaken by CGL on 24 May 2018 as part of the supplementary ground investigation and the findings are incorporated into the description below. A site layout plan is included as Figure 2.

Phase 6 is irregular in shape, covering an area of approximately 3.1 hectares. The site can be broadly split into two areas; the northern and western section of the site comprise the contractor parking and the site offices/materials storage areas. The southern and eastern areas of the site comprise infilled and partially infilled former gravel pit lakes.

The site is bounded to the north by a drainage ditch, with the former Burghfield landfill 10m beyond, to the east by a flooded former gravel pit known as the Trout Lake, on the eastern edge of which is the GPV Phase 3c development boundary. To the south of Phase 6 is the access road into the site and ancillary development areas. The western boundary is formed by the Reading to Basingstoke railway line, and a proposed new station interchange development.

The site undulates with an overall fall in elevation from north to south. At the time of the walkover/CGL site works the level of the partially infilled lake was between 34.88mOD (above Ordnance Datum) and 36.7mOD. The remainder of the site levels ranged between 38.8mOD and 40mOD.

2.3 Proposed Development

The proposed development is understood to comprise the construction of 459 apartments, a covered parking area, retail space and a gymnasium. The apartment blocks comprise multi-storey buildings of between six and 12 storeys (to include the car park and podium deck levels). Blocks A to C, and the retail / gym block are constructed from ground level with no underlying parking arrangements. Block D is constructed in part from podium deck level and in part from ground level. Blocks F and G are both

constructed from podium level, and Block H is constructed from ground level but is linked to the podium. The development will also comprise areas of communal and public landscaping.

An indicative proposed ground floor layout is presented within Appendix A.

3. SUMMARY OF PREVIOUS GROUND INVESTIGATIONS

3.1 General

The wider Green Park Village development site has been the subject of a number of previous investigations by others. Peter Brett Associates (PBA) has undertaken geo-environmental desk-based studies and a number of intrusive ground investigations across various phases of the Green Park Village development. Ramboll UK Limited (Ramboll) has also produced Ground Contamination Interpretative Reports for the whole Green Park Village (based on the findings of the PBA investigations) and for Phase 6 only, following their own intrusive investigation.

This section provides a summary of the available data pertinent to the site (Phase 6). The reports used to obtain the summary information are outlined below.

-  Interim Report of Ground Investigation for Clembins Waste Transfer Station²;
-  Geo-environmental Investigation for Phase III ³;
-  Gas and Water Quality Monitoring Report⁴;
-  Ground Condition Assessment, Clembins Waste Transfer Station Site, Reading⁵;
-  Hydrogeological Risk Assessment⁶;
-  Phase 2 Supplementary Geoenvironmental Ground Condition Assessment for Pingemead Industrial Estate⁷;
-  Ground Condition Assessment – Phase 1 and 2, Green park Station⁸;
-  Supplementary Phase 2 Ground Investigations and Tier 2 Risk Assessment. Green Park Railway Station⁹;

² PBA (2001). *Report on Ground Investigation for Cable Laying at Clembins Waste Transfer Station, Reading, Berkshire*. September 2001. 10729/SNK/BN/RP/RA.

³ PBA (2002). *Geoenvironmental Investigation for Phase III, Green Park, Reading*. August 2002. 11321/300/SNK/KB/RP/LG.

⁴ PBA (2007). *Gas and Water Quality Monitoring Report, Green Park Village*. July 2007. 11321/133D/CBH/RHT/KB/HB.

⁵ PBA (2007). *Phase 1 and 2 Ground Condition Assessment, Clembins Waste Transfer Station Site, Reading*. September 2007. 19372/004/CBH/RHT/CC/RF.

⁶ PBA (2008). *Report on Hydrogeological Risk Assessment*. Green Park Village, Reading. January 2008. 1132/1023

⁷ PBA (2008). *Phase 2 Supplementary Geoenvironmental Ground Condition Assessment for the Pingemead Industrial Estate, Reading*. Green park Village, Reading. April 2008. 11321/1028.

⁸ PBA (2009). *Report on Ground Condition Assessment – Phase 1 and 2, Green Park Station – Temporary Access Road and Car Park*. February 2009. 11321/1035B.

⁹ PBA (2009). *Report on Supplementary Phase 2 Ground Investigation and Tier 2 Risk Assessment. Green Park Railway Station, Reading*. June 2009. 1132/1034.

-  Report on Targeted Ground Investigation (Contamination “Hotspots” WS8 and BHC)¹⁰;
-  Synopsis Geoenvironmental Report on Ground Conditions, Green Park Phase 3¹¹;
-  Ground Contamination Interpretative Report¹²;
-  Ground Contamination Interpretative Report – Phase 6¹³.

3.2 Site History

The Ramboll report¹³ indicates that from the early Ordnance Survey mapping (1883) Phase 6 was undeveloped open land surrounded by marshes with localised ground workings (suspected borrow pits) located in the western part of the Phase, and the Reading-Basingstoke Railway line abutting the western boundary of the site. The localised areas of ground workings had ceased to be shown by early 1900 mapping, suggesting infilling had taken place.

The site remained relatively unchanged in the subsequent maps, with some field boundary alterations. By 1972, large scale mineral extraction was taking place on the site with the creation of four lakes – north eastern, south eastern, south western and north western. An access road/track is indicated to be present running north to south between the four lakes, leading to an area of gravel extraction to the north of the site.

In 1992, following an earlier GPV construction phase the four lakes forming the current Trout Lake were re-configured into their current layout of one large lake formed through the merging of the north eastern, south eastern, and south western water bodies, and a smaller lake formed by the north western lake. It is noted that the northern section of the smaller lake was partially backfilled (the type of materials used is unknown). It was recorded by PBA, that the Trout Lakes were deepened in the mid-1990s to gain site won material from the Lambeth Group as an engineering fill for Phase 1 of the wider GPV commercial development.

Within the Phase 6 area, a historical waste transfer and treatment facility, known as Clembins Ltd, was present and was operated by Mr A. L. Clements under licence ref. 54/12/4/361. It was noted by PBA that mounds of stockpiled material, skips and site buildings were present until 2007, when operations at this facility ceased. Prior to the presence of Clembins on the site, Phase 6 was part of an authorised landfill referred to as *Burghfield Landfil Site A*, which extends off-site to the north and east, and also

¹⁰ PBA (2009). *Phase 2(d) – Report on Targeted Ground Investigation (Contamination “Hotspots” WS8 and BHC)*. Green Park Phase 3 – Railway Station. October 2009. 11321/1046 RPT 1 (SI) Rev 01.

¹¹ PBA (2010). *Synopsis Geoenvironmental Report on Ground Conditions*. Green Park Phase 3 – Green Park Village. July 2010. 11321/3003 Rev 01.

¹² Ramboll (2016). *Ground Contamination Interpretative Report*. Green Park Village. March 2010.

¹³ Ramboll (2017). *Ground Contamination Interpretative Report – Phase 6*. Green Park Village. June 2017.

part of a historical landfill referred to as *Burghfield Area D*, which extends off-site to the east, under licence reference 86253. Prior to the licensed landfilling, it is understood that a local farmer used the area to deposit materials of unknown origin.

3.2.1 Aerial Imagery

A review by CGL of available aerial imagery for the site indicates that from 2003 the site was in use as a waste transfer station along the western third of the site to the west of the access road. In the northern section of the site was an area of open space, it is unclear if this was in use as part of the waste transfer station, or if it had another purpose. To the east of the access road are three water bodies (see Figure 3). The largest within the site boundary is the north western Trout Lake (ref. 1, Figure 3), with two smaller water bodies (ref. 2 and 3, Figure 3) located to the south and bounded by the access road, and the larger Trout Lake off site.

By 2004, the smaller water body (ref. 2) appears to have been infilled and become vegetated. The 2005 imagery indicates the northern section of the site to be actively used, likely as part of the Clembins waste transfer station. By 2010, the waste transfer station is no longer present, and the site is shown to be vegetated. The second smaller lake (ref. 3) has been infilled and it appears that infilling of a section of the adjacent large Trout Lake is also underway. The 2017 imagery shows the site to have construction compounds and material storage areas in the western and northern section as in its current layout, although the north western Trout Lake is still indicated to be present.

3.3 Ground Conditions

From published geological sources¹⁴, the ground conditions beneath Phase 6 of the GPV development are indicated to comprise Made Ground overlying superficial Alluvium deposits and the Beenham Grange Gravel Member (River Terrace Deposit of the Thames Group (drift)). In turn, the site is then underlain by the Reading Formation of the Lambeth Group, with the White Chalk at depth. A summary of the ground conditions encountered during the previous PBA and Ramboll ground investigations for Phase 6 is provided in Table 1, below.

Table 1. Summary of ground conditions from previous investigations

Geology	Thickness
Made Ground	0.7 to 4.7m
Alluvium	0.4m to 1.3m
Beenham Grange Gravel Member (referred to in PBA and Ramboll reports as River Terrace Deposits)	0.2m to 2.0m
Lambeth Group – Reading Formation	3.6m to 4.6m
White Chalk	Unproven

¹⁴ <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html> (accessed May 2018)

During monitoring visits undertaken as part of the previous investigations by PBA¹¹ and Ramboll¹³, resting groundwater was encountered within the River Terrace Deposits, the Reading Formation, and the Chalk as well as perched water within the Made Ground. The piezometric head differs between the different strata, which PBA has interpreted as indicating the strata are behaving as separate water bodies, Ramboll attributes this to cohesive beds within the Reading Formation. Both agree there may be some localised areas of hydraulic connectivity between the different strata.

3.4 Soil Contamination

Soil samples from across Phase 6, from various previous investigations have been analysed for a range of metals, metalloids, inorganics and organics. Relevant data from the two recent Ramboll reports^{12 13} has been reviewed as part of this summary.

The 2016 Ramboll report¹² assessed the soil contamination data against Generic Assessment Criteria (GAC) for a commercial development, as per the proposed use of the site. No contaminants were found to exceed the commercial GACs; however, hydrocarbon, chemical, and landfill odours were noted within the Made Ground at several locations during the investigation, and a black oily liquid was encountered within trial pit TP201 in the west-central portion of the site.

Based on the initial proposed commercial end use of the site, combined with the proposed raising of the site to enable the development to take place, Ramboll considered the risk to human health from direct contact to be low, as raising ground levels would inhibit potential pathways. However, there was considered to be a moderate risk to construction workers, due to direct contact with the soils.

The additional investigation undertaken by Ramboll in 2017¹³, noted that the proposed development plans had changed to comprise a residential-led end use. There is no mention within the report as to whether the previous data used within the 2016 report was re-assessed against a residential without plant uptake land use. Additional soil testing was undertaken, however, and contamination data from this phase of investigation was assessed against GACs for a residential (without homegrown produce) land use criteria.

Results showed concentrations of petroleum hydrocarbons were recorded above theoretical saturation limits for soils, indicating the presence of free phase hydrocarbons. This was only deemed significant where visual/olfactory evidence of hydrocarbons was noted (trial pits RTP613 in the south of phase 6B and RTP615 in the north of Phase 1C). These were identified to be localised with no free phase hydrocarbons present and, therefore, not significant. Asbestos containing soils (ACS) were identified across the site. The results were largely below the limit of detection (0.001%), however, loose fibres were encountered in borehole RBH606 and trial pit RTP608 in the north western section of the site and

window sample RWS637 in the north of Phase 1C. Asbestos containing material was also encountered in RTP608.

3.5 Leachate and Groundwater Contamination

3.5.1 Leachate

It is noted that leachate data was only collected during the 2009 investigation conducted by PBA and the 2017 investigation by Ramboll. The PBA investigation identified minor exceedances for cadmium, chromium, copper, lead and vanadium in excess of the Environmental Quality Standards (EQS) for freshwater. The Ramboll investigation¹³ identified minor exceedances for sulphate, arsenic and fluoranthene in excess of the guidance values from the Water Framework Directive (WFD), and EQS for freshwater.

Due to the marginal nature of the exceedances and taking into account the tendency of leachate analysis to overestimate leachability, these exceedances were not considered by PBA to pose a risk to controlled waters.

Marginal exceedances of leachable polycyclic aromatic hydrocarbons (PAHs) and petroleum hydrocarbons were identified across the site during the PBA investigation, however, these were not identified in the later Ramboll investigation.

3.5.2 Groundwater

Groundwater samples were obtained for laboratory chemical analysis as part of the PBA and Ramboll investigations. PBA compared groundwater samples to the EQS for freshwater or, where not available, against drinking water values (DWV), whereas Ramboll compared samples to the WFD Standards for General Quality of Groundwater and WFD thresholds for inland surface water bodies or where not available, environmental quality standards for freshwater.

PBA identified marginal exceedances of GAC for chromium, copper, mercury, and nickel. Elevated concentrations of iron, manganese, and ammonia were also encountered, although these are catchment wide elevations and were therefore attributed to an off-site source. There was also a single exceedance of nitrate in one borehole in the north of the site. There were exceedances of hydrocarbons in samples obtained from the Made Ground across the phase, between 33µg/l and 2000µg/l. Localised PAHs were identified in borehole WS8_2007, just outside the south eastern boundary, with concentrations recorded between 2.9µg/l and 5µg/l. Remediation of this area was recommended but no record of this has been seen by CGL to date.

Ramboll identified marginal exceedances of the GACs for sulphate, arsenic, and nickel. PAH contaminants were identified in localised areas around window sample RWS637 in the southern section of Phase 6B and borehole RBH601 in the centre of Phase 6A from within the superficial deposits and Reading Formation. RWS637 is in the same areas as PAHs identified by PBA. No source for this exceedance was identified, which Ramboll attributed to a historical source diminishing and degrading over time. Exceedances in RBH601 have been attributed to the thickness of Made Ground (5m).

Due to the presence of numerous landfills within the vicinity of the site, and the presence of a sewage treatment works to the west of the site, the presence of faecal bacteria within the groundwater was assessed as part of the PBA investigation, with additional assessment as part of the Ramboll investigation. Bacteria were identified in samples from each of the groundwater bodies, however, neither the PBA investigation nor Ramboll investigation identified the exact source of this bacteria. The Ramboll investigation concluded that the current depth to groundwater, and the absence of potable groundwater abstraction in the proposed development limited the pathway between source and receptor.

The risk to controlled waters has been classified as moderate/low by both PBA and Ramboll due to PAHs identified within groundwater within the superficial deposits groundwater and bacteria identified in all groundwater bodies.

3.6 Ground Gas

The previous PBA investigations identified the following potential sources of ground gas across the Phase 6 area:

-  Natural sources arising from the decay of organic material in Alluvium, typically around 0.5 m thick;
-  Natural sources arising from the dissolution of deep Chalk;
-  Decay of anthropogenic material and plant material in landfilled Made Ground which have been identified at thicknesses of up to 4.7 m;
-  Degradation of shallow hydrocarbon contamination in soil and/or groundwater; and
-  The historical landfills within and immediately to the north of Phase 6.

The previous most recent ground gas monitoring (by others) took place in April and May of 2017 and recorded a maximum flow rate of 1.1l/hr, maximum carbon dioxide (CO₂) concentration of 21.1%v/v, and a maximum methane (CH₄) concentration of 87.5%v/v. These values correspond to a Gas

Screening Value (GSV) of 0.23l/hr for CO₂, and 0.96l/hr for CH₄ and equate to a Characteristic Situation (CS) 3 gas regime, whereby gas protection measures would be required for proposed buildings.

It is noted that these readings and calculated GSVs from 2017 are similar to those from previous investigations monitoring data, and the CS3 classification is considered appropriate at this stage.

The risk to future site users, construction workers and buildings, from ground gases, has been classified as moderate to high, based on the previous reports.

3.7 Conclusions and Recommendations from Previous Reports

Ramboll concluded that although the site is of low sensitivity, a number of potential pollutant linkages have been observed that will require remediation and/or further investigation. The observations and recommendations for further investigation, outlined by Ramboll, are summarised below:

-  There has been limited testing for asbestos in the Made Ground.
-  Previous investigation by PBA recorded hydrocarbon/chemical odours within the Made Ground. Ramboll did not find any evidence of hydrocarbon/chemical odours and considers the source to have either been removed or naturally degraded. The potential for hydrocarbon/chemical odours should be considered and if found during further works and/or construction then localised remediation may be required.
-  The quantity and frequency of gas monitoring data is not sufficient to comply with current guidance and the available data is outdated. Further monitoring is required to determine whether lateral migration of gases is occurring through additional material brought to site and whether this material is a source of ground gas.

4. CGL SUPPLEMENTRY GROUND INVESTIGATION

4.1 Fieldwork

A supplementary ground investigation was undertaken by CGL between 24 and 30 May 2018 and comprised a total of 18 window sample (WS) boreholes to depths of between 1.0m bgl and 5m bgl, and five dynamic probes (DP) to depths of between 1.9m and 9.0m bgl in the partially infilled lake area.

In order to obtain samples for laboratory chemical testing and to characterise the near surface ground conditions across the site, the exploratory hole arisings were logged and representatively sampled by a suitably qualified engineer from CGL. In-situ Standard Penetration Tests (SPTs) were undertaken within each borehole during drilling.

The investigation was undertaken generally in accordance with the requirements set out within BS 5930:2015¹⁵; and BS 10175:2011¹⁶.

All exploratory logs are presented in Appendix B and an exploratory hole location plan is presented as Figure 4. The rationale for the location of each exploratory hole is indicated in Table 2 below.

Table 2. Rationale for Exploratory Hole Locations

Location	Target Depth (mbgl)	Actual depth (mbgl) [reason for variation]	Rational for location
WS01	5.0	5.0	Location of infilled lake
WS02	5.0	5.0	Location of infilled lake
WS03	5.0	5.0	Location of infilled lake
WS04	5.0	5.0	Location of infilled lake
WS05	5.0	5.0	Location of infilled lake
WS06	5.0	5.0	Location of infilled lake
WS07	5.0	5.0	Location of infilled lake
WS08	5.0	1.0 [obstruction in hand dug pit – relocated to WS08A]	Location of infilled lake
WS08A	5.0	5.0	Location of infilled lake
WS09	5.0	5.0	General site coverage
WS10	5.0	5.0	General site coverage
WS11	5.0	5.0	Northern boundary of Phase 6 with historical Landfill beyond.
WS12	5.0	5.0	General site coverage
WS13	5.0	3.9 [Terminated as gravels collapsing back to 3.0m bgl]	Northern boundary of Phase 6 with historical Landfill beyond.

¹⁵ British Standards Institution. (2015). *Code of practice for site investigations*. BS5930:2015

¹⁶ British Standards Institution. (2011). *Investigation of potentially contaminated sites: Code of practice*. BS10175:2011.

Location	Target Depth (mbgl)	Actual depth (mbgl) [reason for variation]	Rational for location
WS14	5.0	4.0 [Terminated as gravels collapsing back to 3.0m bgl]	General site coverage
WS15	5.0	5.0	General site coverage
WS16	5.0	4.0 [Terminated as gravels collapsing back to 3.0m bgl]	Within area of proposed basement
WS17	4.0	4.0	General site coverage
DP01	10	6.9 [Refusal]	Location of infilled lake
DP02	10	9.3 [Refusal]	Location of infilled lake
DP03	10	9.0 [Refusal]	Location of infilled lake
DP04	10	1.9 [Refusal]	Location of infilled lake
DP04A	6.0	6.0	Location of infilled lake

4.1.1 Sampling

Environmental samples were taken from the WS boreholes comprising representative samples from each stratum in line with the CGL internal Standard Operating Procedure (SOP). Samples were collected using appropriate amber glass jars for samples for hydrocarbon analysis, amber glass vials for volatiles analysis, and plastic tubs to collect samples for inorganics analysis. Samples were compacted/filled into the relevant containers to minimise headspace. Samples were stored in cool boxes with ice packs prior to dispatch to the UKAS and MCERTS accredited laboratory, and no nonconforming samples were reported by the laboratory.

4.1.2 Installations

Standpipes were installed in nine of the WS boreholes to allow ground gas and groundwater monitoring to be undertaken. The design and construction of the monitoring wells is indicated on the logs in Appendix B.

4.2 Monitoring

Six rounds of ground gas monitoring have been undertaken at the site using a GFM436 gas analyser to measure gas flow, oxygen, carbon dioxide, and methane concentrations (peak and steady), and a photoionisation detector (PID) was used to record volatile organic compound (VOC) concentrations.

Groundwater levels were recorded during each monitoring visit and groundwater samples were collected during the first monitoring visit only. The groundwater was monitored during purging and sampling for in-situ parameters including dissolved oxygen, redox potential, pH, temperature, electrical

conductivity and total dissolved solids. During the third monitoring visit, a surface water sample was obtained from the Trout Lake off-site.

Where encountered, monitoring has been undertaken from the available previous Ramboll investigation boreholes as well as the recent CGL boreholes. The included wells are indicated on the exploratory hole location plan (Figure 4).

Monitoring data is included within Appendix C, and an interim ground gas assessment is presented in Section 6.1 below.

4.3 Chemical Laboratory Testing

Representative soil and groundwater samples were sent to i2 Analytical Limited (a UKAS and MCERTS accredited laboratory) for chemical testing. The soil analysis included the following contaminants:

-  Soil Organic Matter (SOM);
-  Heavy metals including; arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc;
-  Total petroleum hydrocarbons (TPH CWG);
-  Polycyclic aromatic hydrocarbons (PAH);
-  BTEX compounds (benzene, toluene, ethylbenzene, xylenes);
-  Total monohydric phenols;
-  Total cyanide;
-  Asbestos screen with follow-on quantification if asbestos identified (Made Ground only).

Groundwater samples were taken from 15 boreholes on the first monitoring visit (from CGL installations and six previous Ramboll installations), and a surface water sample was collected on the third visit from the Trout Lake off-site. A similar suite to above, including hardness, was used to analyse the groundwater samples. The results of the chemical testing are presented in Appendix D.

5. GROUND AND GROUNDWATER CONDITIONS

5.1 Summary

The ground conditions encountered during the investigation were generally consistent with the published geology for the site, and the previous investigation reports. Conditions comprised Made Ground over superficial deposits of Alluvium and the Beenham Grange Gravel Member (BGGM). In the area of the former lakes, it is considered that thin layers of recent lake deposits have also been encountered. Underlying the superficial deposits, multi-coloured silty clays and silty sands of the Reading Formation were encountered. The Chalk known to be at depth underlying the site, was not encountered by CGL during this ground investigation. A summary of the ground conditions encountered is presented in Table 3 below and discussed in the following sections.

Geological cross sections are presented as Figure 5 and Figure 6.

Table 3. Summary of Ground Conditions

Stratum	Depth to top of stratum (m bgl)	Thickness (m)
[MADE GROUND] or [POSSIBLE MADE GROUND] (Infilled North Western Trout Lake) Very soft to firm in places, brown and grey brown, slightly sandy, gravelly clay/silt. Gravel of fine to coarse, angular to subrounded, flint, brick, concrete, tarmac, and occasional plastic fragments, wood/timber debris, glass, and engineering block. (Car-parking/material storage areas) Dense, grey, sand and gravel of fine to coarse, angular to subangular, flint, roadstone, concrete, brick, and engineering block. <i>over</i> Soft to firm, grey and dark grey-black, clayey sand and gravel. Gravel of fine to coarse, angular to subrounded, flint, brick, concrete, ceramic, and occasional plastic fragments, wood/timber debris, and clinker. (Remainder of site) Soft-firm/stiff, brown and grey-brown, sandy gravelly clay, with gravel of fine to coarse, angular to subrounded, flint, brick, concrete, ceramic, and occasional plastic fragments, wood/timber debris, and clinker. <i>(Boreholes WS07, WS08A, WS09 and WS13 only - underlying the above)</i> Very soft to firm, dark grey, organic gravelly sandy clay/silt.	0	1.25 - >5
Very soft to firm, grey-black or black, very organic CLAY/SILT with flint gravel. [LAKE DEPOSITS] <i>(Boreholes WS02, WS04, WS05, WS06, and WS17 only)</i>	3.0 – 4.0	0.15 – 0.85

Stratum	Depth to top of stratum (m bgl)	Thickness (m)
Soft, dark grey to black, silty/sandy CLAY with organic inclusions and occasionally shells. or Firm dark grey, very sandy gravelly CLAY. Gravel is fine to coarse flint. [ALLUVIUM] (Boreholes WS10, WS11, WS13, WS14, WS15, and WS16 only)	1.25 – 3.7	0.1 - >1.4
Medium dense to dense, grey brown to grey or yellow brown, SAND and GRAVEL. Sand is coarse, gravel is fine to coarse rounded to subrounded flint. [BEENHAM GRANGE GRAVEL MEMBER] (Boreholes WS06, WS08A, WS11, WS12, WS13, WS14, WS16, and WS17 only)	1.6 – 4.7	0.05 – 2.25
Firm, light blue grey mottled red and dark yellow, becoming light blue grey and light grey, very sandy CLAY/SILT. (Boreholes WS01-WS05, WS07, WS08A, WS10-WS12 and WS16 only) or Medium dense to dense, light blue grey silty SAND. (WS02, WS05, WS07, WS13 and WS16 only) [READING FORMATION – LAMBETH GROUP]	2.8 – 4.95	>0.05 - >2.2 (Base not proven)

5.2 Made Ground and Possible Made Ground

Made Ground and areas of possible Made Ground was encountered in each exploratory hole between 1.25m and >5m in thickness. The Made Ground was variable in thickness across the site, but more consistent in descriptions in particular areas. It is noted that due to the various phases of infilling at the site, the Made Ground in some areas is indicated as ‘possible Made Ground’.

Within the partially infilled North Western Trout Lake, the Made Ground was typically described as ‘very soft to firm in places, brown and grey brown, slightly sandy, gravelly clay/silt with gravels of flint, brick, concrete, tarmac, and occasional plastic fragments, wood/timber debris, glass, and engineering block’.

In the contractor car-parking and the materials storage area, the surface Made Ground was described as ‘dense, grey, sand and gravel of flint, roadstone, concrete, brick, and engineering block’. Underlying this surface layer was ‘soft to firm, grey and dark grey-black, clayey sand and gravel of flint, brick, concrete, ceramic, and occasional plastic fragments, wood/timber debris, and clinker’.

Across the remainder of the site, the Made Ground and possible Made Ground (likely lake infill) comprised very similar soils to those beneath the car-parking area, although the soils were noted to be ‘soft-firm/stiff, brown and grey-brown, sandy gravelly clay, with gravel of flint, brick, concrete, ceramic, and occasional plastic fragments, wood/timber debris, and clinker’. In four boreholes (WS07, WS08A, WS09 and WS13) underlying the above layer was ‘very soft to firm, dark grey, organic gravelly sandy clay/silt with gravel of flint’. It is considered that these layers are recent basal lake deposits.

SPT 'N' values recorded within the infilled North Western Trout Lake were between 2 and 12, correlating to values of undrained shear strength (c_u) between 9kPa and 54kPa (where $f_1 = 4.5$), or a relative consistency of very soft to firm. SPT 'N' values in the Made Ground across the remainder of the site ranged between 1 and 20, although typically between 4 and 10. These 'N' values correlate to values of undrained shear strength (c_u) between 4.5kPa and 90kPa (where $f_1 = 4.5$), or a relative consistency of very soft to stiff.

5.3 Lake Deposits

Soils anticipated to be Lake Deposits were encountered within boreholes WS02, WS04, WS05, WS06 and WS17 which were located within or in close proximity to the infilled North Western Trout Lake. It is possible that thin layers of Lake Deposits were also recorded within other adjacent boreholes, however, due to the infilling and reworking of the site, it was not able to be distinguished from the Made Ground soils above.

The deposits typically comprised a very soft to firm, grey-black or black, very organic clay/silt with flint gravel, and ranged in thickness between 0.15m and 0.85m. Due to the limited thickness of the deposit only one SPT was undertaken, within borehole WS04, which recorded an 'N' value of 9, which corresponds to a relative consistency of stiff. It is noted that this SPT may have been influenced by a layer of granular material at 3.4 -3.45m and is not considered to be necessarily representative of the Lake Deposits.

5.4 Alluvium

Alluvium was recorded within six boreholes (ref. WS10 to WS16 inclusive) in the northern area of the site. The boreholes were located within relatively close proximity to the drainage ditch along the northern boundary of the site, although it is noted that historically the western area of the site was identified on historical maps as marsh land suggesting that the land was lower than the surrounding area and/or flooded often.

The deposits typically comprised 'soft, dark grey to black, silty/sandy clay with organic inclusions and occasionally shells', or 'firm dark grey, very sandy gravelly clay'. It is possible that some of these deposits have been reworked during the previous usage of the site, but it was not possible to determine further within the profile of the window sample boreholes. The deposits ranged in thickness between 0.1m and >1.4m, although were typically between 0.35m and 0.80m thick.

A total of four SPTs were undertaken within the Alluvium, and recorded 'N' values of between 4 and 10, correlating to values of undrained shear strength (c_u) between 18kPa and 45kPa (where $f_1 = 4.5$), or a relative consistency of soft to firm.

5.5 Beenham Grange Gravel Member

Sands and gravels of the Beenham Grange Gravel Member (BGGM) were encountered predominantly within the north western half of the site, with a single occurrence recorded in the south of Phase 6. The gravels were described as ‘medium dense to dense, grey brown to grey or yellow brown, sand and gravel’.

It is noted that in three boreholes (ref. WS13, WS14, and WS16), the gravels collapsed after 3m bgl as they were unable to be cased to depth. SPT ‘N’ values were generally recorded in the BGGM in the range of 5 to 29, corresponding to relative densities of loose to medium dense¹⁵.

5.6 Reading Formation (Lambeth Group)

The Reading Formation was encountered within boreholes WS01 to WS05, WS07, WS08A, WS10-WS12 and WS16, at depths of between 2.8m and 4.95m below ground level and as proven to a maximum depth of 5m bgl. Although the base of the Reading Formation was not proven during the investigation, based on geological records and previous investigations across the GPV development, the Reading Formation is anticipated to extend to between 16.2m and 18m bgl.

The Reading Formation was typically cohesive and described as ‘Firm, light blue grey mottled red and dark yellow, becoming light blue grey and light grey, very sandy clay/silt. SPT ‘N’ values recorded within the cohesive Reading Formation were between 16 and >50, generally increasing with depth, correlating to values of undrained shear strength (c_u) between 72kPa and >225kPa (where $f_1 = 4.5$), or a relative consistency of stiff to very stiff. Two SPT ‘N’ values of 4 and 5 were recorded within borehole WS10 at depths of 3m and 4m respectively and are not considered to be representative of the typical Reading Formation.

In four boreholes (ref. WS02, WS05, WS07 and WS16) granular layers were recorded and described as ‘medium dense to dense, light blue grey silty sand’. In boreholes WS02 and WS05, the granular soils were encountered below the cohesive material, and in boreholes WS07 and WS16, the granular deposits were encountered at the top of the Reading Formation. SPT ‘N’ values recorded within the granular Reading Formation were in the range of 14 and 44, corresponding to relative densities of medium dense to dense¹⁵.

5.7 Visual/Olfactory Evidence of Contamination

Other than the presence of foreign objects (brick, concrete and coal) within the Made Ground, no visual or olfactory evidence of contamination was noted during the ground investigation.

5.8 Summary of Ground Model

The CGL ground investigation encountered Made Ground across the site to depths ranging between 1.25m and greater than 5m bgl. The Made Ground was zoned in respect of the composition rather than the thickness i.e. infilled north western Trout Lake, car-parking/materials storage, remainder of the site. Alluvial deposits were encountered in the northern area of the site, and Lake Deposits were encountered, generally in the eastern and southern areas of the site. Thin bands of gravels, assumed to be the Beenham Grange Gravel Member, were encountered within the central and western areas of the site. In the central section of the site, the gravel is noted to be much thicker than the surrounding area and is indicative that less gravel extraction took place in this area. The presence and location of the Made Ground and superficial deposits in the various areas of the site appears to reflect the stages of previous use of the site in terms of gravel extraction and infilling of the lakes. The Reading Formation was encountered across the site and comprised cohesive soils with layers of silty sand. The formation was proven by CGL to a maximum depth of 4.95m bgl. Previous investigations by Ramboll recorded the Reading Formation to depths of between 16.0m and 18.0m, where the Chalk was encountered.

5.9 Groundwater

Groundwater strikes were noted during drilling at depths of between 2.0m and 4.2m bgl, within the Made Ground, Alluvium, and Beenham Grange Gravel Member. During subsequent monitoring visits, resting groundwater was recorded at depths between 0.4m and 3.80m bgl and the depths are summarised in Table 4 below.

A total of seven previous Ramboll investigation boreholes were located during the site works and, where possible, were monitored alongside the CGL installations to provide additional data.

Where borehole response zones were flooded during the monitoring visits, these have been identified in the table below. These boreholes are more likely to give inaccurate ground gas flow rates due to the piston effect within boreholes and may present higher ground gas concentrations due to the compression of air within the borehole, and the inability for gases within the surrounding ground to come into the borehole due to the flooded response zone. The ground gas monitoring is summarised in Section 5.9, below.

Table 4. Groundwater Level Data

Borehole	Well Response Zone (Stratum)	Groundwater Levels (m bgl) [mOD]					
		04/06/18	18/06/18	02/07/18	16/07/18	30/07/18	10/08/18
WS01	1.0 – 4.6m (MG & RF)	0.43*	1.23	0.83*	0.40*	0.64*	1.02
WS06	1.0m – 5.0m (MG, LAKE & BGGM)	2.02	2.29	2.06	2.18	2.68	2.72
WS08A	1.0m – 4.0m (MG & BGGM)	1.62	0.82*	1.59	1.59	2.70	Borehole not accessible
WS09	1.0m – 4.0m (MG)	3.65	3.80	2.98	2.77	3.04	2.92
WS11	1.0m – 4.0m (MG & ALL)	2.49	3.24	3.43	3.49	3.54	3.57
WS13	1.0m – 3.0m (MG, ALL & BGGM)	0.83*	1.55	1.70	1.90	1.98	2.03
WS14	1.0m – 3.0m (MG, ALL & BGGM)	1.50	2.23	2.37	2.54	2.61	2.67
WS16	1.0m – 3.0m (MG, ALL & BGGM)	2.39	2.12	1.86	2.02	2.50	2.55
WS17	1.0m – 4.0m (MG, LAKE & BGGM)	1.70	2.74	2.46	2.84	Borehole damaged – unable to monitor	
RBH601	6.6m – 11.6m (BGGM)	Borehole not located due to overgrown vegetation				3.74*	3.69*
RBH603	4.0m – 4.7m (BGGM)	1.41*	2.81*	2.86*	3.03*	3.71*	3.75*
RBH606	20m – 30m (CHALK)	2.63*	Borehole not accessible	2.26*	2.42*	Borehole buried by earthworks – unable to access	
RBH608	0.5m – 3.2m (MG)	1.18	Borehole buried by new pathway – unable to access				
RWS629	0.5m – 4.0m (MG & ALL)	2.33	3.34	2.97	1.90	3.40	3.21
RWS633	0.5m – 4.0m (MG & BGGM)	2.50	2.62	2.23	2.36	2.94	3.01
RWS634	0.5m – 2.0m (MG)	0.81	0.94	0.83	1.25	1.37	1.42

NOTES:

MG = Made Ground; ALL = Alluvium; LAKE = Lake Deposits; BGGM = Beenham Grange Gravel Member; CHALK = Chalk Formation.

NR = Not recorded

* = Response zone flooded

5.10 Ground Gas

A total of six ground gas monitoring visits have been undertaken at the site, the results of which are summarised in Table 5 below. The full monitoring records are included in Appendix C.

Table 5. Ground Gas Monitoring Summary

Borehole	Well Response Zone (Stratum)	Peak Flow (l/hr)	Sustained flow (l/hr)	Min O ₂ (% vol)	Max CO ₂ (% vol)	Max CH ₄ (% vol)	Max PID (ppm)
WS01	1.0 – 4.6m (MG & RF)	<0.1	<0.1	17.6	<0.1	<0.1	0.4
WS06	1.0m – 5.0m (MG, LAKE & BGGM)	<0.1	<0.1	1.1	12.4	6.2	1.7
WS08A	1.0m – 4.0m (MG & BGGM)	0.4	<0.1	12.1	4.8	<0.1	9.5
WS09	1.0m – 4.0m (MG)	0.1	<0.1	<0.1	30.4	31.7	<0.1
WS11	1.0m – 4.0m (MG & ALL)	21.3 ¹	<0.1	<0.1	39.9	64.8	<0.1
WS13	1.0m – 3.0m (MG, ALL & BGGM)	<0.1	<0.1	13.5	7.2	0.9	<0.1
WS14	1.0m – 3.0m (MG, ALL & BGGM)	0.1	<0.1	<0.1	7.2	8.5	2.3
WS16	1.0m – 3.0m (MG, ALL & BGGM)	1.5	1.1	0.3	12.2	39.5	<0.1
WS17	1.0m – 4.0m (MG, LAKE & BGGM)	<0.1	<0.1	<0.1	33.6	39.1	<0.1
RBH601	6.6m – 11.6m (BGGM)	<0.1	<0.1	8.3	11.6	3.6	<0.1
RBH603	4.0m – 4.7m (BGGM)	0.1	<0.1	5.8	17.7	0.9	<0.1
RBH606	20m – 30m (CHALK)	Unable to undertake ground gas monitoring as bung does not make good seal on the pipe					
RBH608	0.5m – 3.2m (MG)	<0.1	<0.1	13.1	6.1	8.2	<0.1
RWS629	0.5m – 4.0m (MG & ALL)	<0.1	<0.1	<0.1	18.6	78.7	<0.1
RWS633	0.5m – 4.0m (MG & BGGM)	<0.1	<0.1	18.5	2.5	<0.1	<0.1
RWS634	0.5m – 2.0m (MG)	0.3	<0.1	0.1	30.7	19.3	<0.1

NOTES:

O₂ = Oxygen, CO₂ = Carbon Dioxide, CH₄ = Methane, PID = Photoionisation Detector for volatile organic compounds.

NR = Not recorded.

¹ = During first visit only. Flow dropped to a maximum of 3.7l/hr on second visit, and by third visit onwards flow rate was 0.1l/hr

6. CONTAMINATION ASSESSMENT

6.1 Introduction

This section evaluates risks to potential receptors at the site from identified chemical contamination. Potential receptors have been determined with reference to the Part 2A regime and associated DEFRA guidance¹⁷. As with the Part 2A regime, under the planning regime all receptors (humans, controlled waters, ecology, crops/livestock and buildings) have been considered if there is the potential for them to be adversely affected by exposure to contamination. CGL's approach and rationale to assessment criteria adoption for this site is presented in Table E1 within Appendix E.

6.2 Risks to Human health (Long-Term Chronic Risks)

A total of 25 samples have been analysed for potential contamination; 22 from the Made Ground, and three from the Lake Deposits/Alluvium.

The laboratory test results have been compared against the Generic Assessment Criteria (GAC) derived in-house by CGL for a "*Residential without plant uptake*" land use category to assess the risk to human health from contamination in soils.

6.2.1 Made Ground

The results for the Made Ground are summarised in Table E2 in Appendix E. A review of the data indicates that the calculated US₉₅ value for benzo(a)pyrene is above the respective GAC. The elevated concentrations of benzo(a)pyrene were recorded within three locations across the site – at 0.6m in borehole WS03, at 1.9m in borehole WS06, and at 0.9m in borehole WS15. This suggests localised hotspots of PAH contamination within the Made Ground.

Asbestos was identified by laboratory microscopy in eight of the 22 samples of the Made Ground, and the details are presented within Table 6 below.

Table 6. Asbestos in Soil Summary

Borehole	Depth	Asbestos Type (Matrix)	Total % asbestos in sample
WS01	0.6	Amosite (Loose fibres)	<0.001
WS04	0.7	Chrysotile (Hard/Cement type material)	0.130
WS07	1.5	Chrysotile and Amosite (Bitumen & loose fibres)	0.002
WS08	0.3	Chrysotile (Loose fibrous debris)	0.052
WS12	0.8	Chrysotile (Loose fibres)	<0.001
WS13	0.3	Chrysotile and Amosite (Loose fibres & loose fibrous debris)	0.004

¹⁷ DEFRA (2012). *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*.

Borehole	Depth	Asbestos Type (Matrix)	Total % asbestos in sample
WS14	0.8	Chrysotile and Amosite (Loose fibres)	<0.001
WS15	0.9	Amosite (Loose fibres)	<0.001

No other contaminants were recorded to exceed the respective GAC values.

Based on the above, the risks to construction workers due to the presence of asbestos and localised PAH hotspots are considered to be medium. However, the risks to future users of the site are considered to be low as the site levels are to be raised by approximately 0.3m to 1.7m with clean infill materials, which will act as a barrier layer to the contaminated soils beneath. Additionally, in landscaping areas, the fill material will need to incorporate a suitable growth medium.

6.2.2 Natural Soils

The results for the samples of the natural soils are summarised in Table E3 in Appendix E, with contaminant concentrations compared directly against the GACs. The results indicate that concentrations of the analysed contaminants in the natural soils are less than the GACs.

On this basis, the risks to long-term human health due to contaminant concentrations in the natural soils are considered to be negligible.

6.1 Ground Gas Assessment

Based on the six ground gas monitoring visits undertaken (see Section 5.10), Gas Screening Values (GSVs) have been calculated in accordance with CIRIA 665¹⁸. The initial calculations are based on the worst recorded flow rate of 21.3l/hr, although it is noted that flow rates across the site were typically <0.1l/hr. The maximum concentrations of carbon dioxide (39.9%) and methane (78.7%) recorded across the site over the monitoring periods were also used for the initial calculation.

The calculated GSVs presented in Table 7 are considered to be 'worst case'. It is noted, however, that the maximum concentrations of carbon dioxide and methane are typically recorded in conjunction across the northern section of the site (boreholes WS06, WS09, WS11, WS16, WS17, RWS629, and RWS634), indicating that the GSVs in Table 7 are conservative and are not necessarily representative of the ground gas monitoring undertaken at the site.

¹⁸ CIRIA. (2007). *Assessing risks posed by hazardous ground gases to buildings*, CIRIA Report C665, London

Table 7. Worst-case Gas Screening Value Calculation Table

Ground Gas	Maximum Site Concentration (%)	Peak Flow Rate (l/hr)	Worst case calculated GSV (l/hr)	Corresponding Characteristic Situation
Methane	78.7	21.3	16.76	CS4
Carbon dioxide	39.9		8.49	CS4

Notes: GSV Calculation = max recorded value/100 x max flow rate = GSV

As the monitoring has shown that not all boreholes produce similar flow rates and/or ground gas concentrations, it is considered appropriate to consider the ground gas regime on an individual borehole basis. Table 8 below presents a ‘worst credible’ case GSV and corresponding Characteristic Situation for each monitoring well, based on the maximum flow rates and gas concentrations at each location.

Table 8. Borehole Specific Gas Screening Value Calculation Table

Monitoring Well	Maximum Peak Flow Rate (l/hr)	Maximum Carbon Dioxide Concentration (%)	Maximum Methane Concentration (%)	Carbon Dioxide Gas Screening Value (l/hr)	Methane Gas Screening Value (l/hr)	Characteristic Situation (CS)
WS01	<0.1	0.1	0.1	0.0001	0.0001	CS1
WS06	<0.1	12.4	6.2	0.0124	0.0062	CS2 ²
WS08A	<0.1	4.8	0.1	0.0192	0.0004	CS1
WS09	<0.1	30.4	31.7	0.0304	0.0317	CS2 ²
WS11	21.3	39.9	64.8	1.4763	2.3976	CS4
WS13	<0.1	7.2	0.9	0.0072	0.0009	CS2 ²
WS14	<0.1	7.2	8.5	0.0072	0.0085	CS2 ²
WS16	1.5	12.2	39.5	0.183	0.5925	CS2
WS17	<0.1	33.6	39.1	0.0336	0.0391	CS2 ²
RBH601	0.1	11.6	3.6	0.0177	0.0009	CS2 ²
RBH603	<0.1	17.7	0.9	0.0061	0.0082	CS2 ²
RBH608 ¹	<0.1	6.1	8.2	0.0186	0.0787	CS2 ²
RWS629	<0.1	18.6	78.7	0.0025	0.0001	CS2
RWS633	<0.1	2.5	0.1	0.0921	0.0579	CS1
RWS634	<0.1	30.7	19.3	0.0177	0.0009	CS2

NOTES:

¹ = Readings based on single visit only as borehole became inaccessible due to redevelopment works.

² = Higher classification based on maximum gas concentration rather than GSV

The calculated GSVs in Table 8 above indicate that the Characteristic Situations for individual boreholes range from Characteristic Situation 1 (CS1) to CS4. As concentrations of carbon dioxide have been recorded in excess of 5% in numerous boreholes, in line with the guidance¹⁸, consideration has been given to increasing the Characteristic Situation to CS2 in the majority of the boreholes. It is noted that the CS classifications calculated above, which are based on the CGL monitoring data only, generally coincide with the CS classifications previously calculated by Ramboll based on their data.

Based on the monitoring visits undertaken by CGL, and previously by Ramboll, the risks to future residents and buildings from accumulation and inhalation of ground gases is considered to be medium to high and, therefore, ground gas protection measures will be required in all proposed buildings across the site.

In light of the classifications above, the site has been zoned in respect of the gas regime; the majority of the site has been zoned as CS2, while the north eastern section of the site has been classified as CS4. Although three boreholes were classified as CS1, these are all on the edge of the development and therefore not representative of the site conditions in the locations of the proposed blocks.

Due to the time of year and the weather patterns, all six CGL monitoring visits were undertaken during periods of higher pressure. Although two visits were undertaken during overall falling pressure trends, the pressures did not drop lower than 1000mb. Typically, the highest flow rates and ground gas concentrations were recorded during overall falling pressure trends, and when the atmospheric pressure was less than 1000mb. Therefore, it is possible that the monitoring visits undertaken do not represent the worst-case conditions for the site, and there is the potential that, during optimal atmospheric conditions in the future, higher ground gas concentrations and/or higher flow rates may be recorded, which may present higher risks to future residents. It is considered that the classification of the site as CS2 and CS4, and the corresponding protection measures, are appropriate to mitigate potential future risks to future residents of the site, from ground gases.

Figure 8 shows the characteristic situation zoning for the site, based on the ground gas monitoring data collected by CGL, and the gas protection measures required across the site are discussed further in Section 7.2.

6.2 Risks to Vegetation and Plants

The risk to vegetation and plants from phytotoxic contaminants present within the Made Ground has been assessed and is presented within Table E4 of Appendix E. The US₉₅ concentrations of copper, zinc, nickel, and water soluble boron are all less than their respective assessment criteria values. Therefore, the risks to vegetation and plants across the site, from these phytotoxic contaminants, are considered to be negligible. Furthermore, imported clean fill is to be used to raise site levels and this will incorporate a clean growth medium in areas of soft landscaping.

6.3 Controlled Waters Assessment

6.3.1 Risks from Dissolved Contaminants

A total of 15 samples of groundwater were obtained and scheduled for chemical laboratory analysis during the first monitoring visit. Of the 15 samples, one was obtained from the deep groundwater within the Chalk, and the remaining 14 were from the shallow groundwater.

As the site is not within a Source Protection Zone and the nearest controlled water source is the River Kennet some 800m north of the site, it is considered appropriate to assess the shallow groundwater to the freshwater Environmental Quality Standards (EQS), and the single sample from the deeper aquifer against the Drinking Water Values (DWV) as it is classified as a Principal Aquifer. The results are summarised in Tables E5 and E6 of Appendix E.

It is noted that the off-site Trout Lake was previously tested during a previous investigation (as reported by Ramboll¹²), and no elevated concentrations of contaminants were recorded.

The shallow groundwater recorded on the site, i.e. within the Made Ground, Alluvium, and Beenham Grange Gravel Member, is assumed to be in continuity with the Reading Formation acting as an aquitard overlying the Chalk at depth.

There appears to be no particular pattern to the elevated contaminants recorded within the groundwater across the site. Elevated copper concentrations have been recorded around the edges of Phase 6, and the elevated concentrations of nickel and zinc have been recorded across the site. With the exception of a single concentration of phenol above the EQS value, the metals recorded in excess of the EQS values were only marginal exceedances.

It is noted that the Ramboll borehole RBH606 in the west of Phase 6, was installed into the Chalk at depth. Concentrations of copper and zinc within the groundwater were elevated above the EQS values, although no contaminants were elevated above the DWV.

All other potential contaminants within the shallow and deep groundwater are within the appropriate acceptability criteria range (EQS or DWV).

The site is not situated within or near a groundwater Source Protection Zone, and there are no groundwater, surface water, or potable water abstraction licences in the nearby area. Additionally, no elevated concentrations of metals were recorded within the Made Ground across the site, and it is considered that the recorded concentrations of metals within the groundwater are background concentrations due to the history of the site and surrounding area, which included waste transfer stations and landfilling operations.

Based on the assessment of the deeper groundwater and comparison against the DWV, there are no elevated contaminants of concern.

The risk to the deeper groundwater is considered to be negligible, and the risk to the shallow groundwater is considered to be low.

6.3.2 Risks to Surface Water

It is noted that the water in the off-site Trout Lake was tested during a previous investigation (as reported by Ramboll¹²), and no elevated concentrations of contaminants were recorded.

However, due to the presence of marginal exceedances of contaminants within the shallow groundwater across the site, CGL collected a surface water sample from the Trout Lake during the third monitoring round, which was submitted for laboratory analysis.

A copy of the results is included within Appendix D. The results recorded no elevated contaminant concentrations, and therefore the risk to the lake is considered to be low.

6.4 Risks to Buildings and Structures

6.4.1 Buried concrete

There is considered to be a low to medium risk to concrete due to the concentrations of sulfate identified within the Made Ground and Alluvium during the previous investigations, although the risks may be mitigated with appropriate concrete mix design.

6.4.2 Water Supply Pipes

The available chemical test data from the soils has been compared against the UKWIR¹⁹ values for water supply pipe assessment. With reference to Table E6 in Appendix E, the concentrations of contaminants recorded at typical water pipe depths exceed the threshold for standard plastic water pipes (84mg/kg of TPH C10 – C16 against threshold of 10mg/kg) indicating that protective water pipes may be required for the development.

¹⁹ UK Water Industry Research. (2010). *Guidance for the selection of water pipes to be used in brownfield sites*. Ref 10/WM/03/21.

6.5 Conceptual Site Model

The conceptual site model is based on the findings of the intrusive investigations, potential pollutant linkages identified at the site and the quantitative risk assessment, in accordance with Contaminated Land Report (CLR) 11²⁰. The CSM is presented in Table 9, below, and diagrammatically as Figure 7.

Table 9. Revised Conceptual Site Model.

Source/Medium	Receptor	Potential Exposure Route	Risk Rating	Comment
Organic/inorganic contaminants (e.g. heavy metals, inorganic and organic compounds, asbestos) in Made Ground associated with historical site uses as landfill and waste transfer station, infilling of former lakes/gravel pits, and imported fill materials.	Future site occupiers	Direct ingestion of soil & dust, inhalation of particulates & vapours and dermal contact	Low	Site to be raised by clean fill – will act as barrier to future users, but capping may be required in some areas depending on levels
	Construction workers	Direct ingestion of soil & dust, inhalation of particulates & vapours and dermal contact	Medium	Higher potential for contact with contamination during development
	Vegetation and plants	Root uptake	Negligible	Growth medium required in landscaping
	Buildings & services	Direct contact with soils	Low to medium	Appropriate pipe and concrete design required
	Controlled waters	Lateral migration of contaminants Vertical migration of contaminants Migration to surface water	Low	Deep groundwater not impacted by contaminants. Marginal exceedances of contamination within the shallow groundwater but considered to be background concentrations given history of site and surrounding area
Explosive / asphyxiating gases from Made Ground and/or Off-site Landfill	Internal building spaces & future site occupiers	Migration of gases through the surface and via permeable soils, and accumulation within building spaces	Medium to high	Ground gas protection measures required in all proposed buildings. Site has been zoned and generally CS2 protection measures are required. In the north eastern area of the site (Block D) protection to CS4 is required.
	Construction Workers	Exposure to ground gases during ground works	Low	Appropriate PPE and H&S practices

²⁰ M.J. Carter Associates, (1995). Prioritisation and Categorisation Procedures for Sites Which may be Contaminated, CLR 6. Department for the Environment.

7. REMEDIATION STRATEGY

7.1 Overview

The investigation undertaken to date indicates that contaminant concentrations within the Made Ground across the site present a low to medium risk to long-term human health. Additionally, ground gas monitoring has indicated elevated concentrations of carbon dioxide and methane, which present a low to medium potential risk to human health. There is considered to be a negligible to low risk to controlled waters and no remediation is considered to be required.

A remediation strategy is presented below based on the current conceptual site model and risk assessment.

1. Provision of gas protection measures in accordance with CS2 and CS4 classification;
2. Provision of a capping layer / growth medium in areas of soft landscaping;
3. Protection of underground services by specification of suitable materials;
4. Watching brief and discovery strategy during construction; and
5. Implementation of environmental controls and health and safety procedures to protect construction workers and adjacent site users from potential risks associated with dust, vapours and nuisance odours.

Further details for the outline remediation strategy are provided in the following sections of this report.

7.2 Ground Gas Protection Measures

Based on the assessment undertaken, as provided within Section 6.1 above, it is considered that ground gas protection measures are required within all of the buildings within the proposed development. Given the proposed development comprises eight blocks, in respect of the borehole specific GSV calculations, the buildings have been classified as either CS2 or CS4, both of which require gas protection measures to be installed in accordance with CIRIA C665¹⁸.

Figure 8 shows the characteristic situation zoning for the site, based on the ground gas monitoring data collected by CGL.

7.2.1 Characteristic Situation 2 (Buildings A, B, C, F, G, H, and the Café/Gym)

The level of gas protection necessary for residential and commercial properties with central building management control and multiple occupancy (Type B building) on a site with CS2 conditions requires a gas score of 3.5, based on BS 8485:2015²¹.

To achieve the required gas risk score of at least 3.5 and mitigate the potential risks presented by ground gases, the protective measures may include:

Barriers (Floor slabs):

- Reinforced cast in situ suspended floor slab (score = 1.5 points).

Note; to achieve a score of 1.5 the slab should be well reinforced to control cracking and have minimal penetrations.

Membrane:

- Taped and sealed proprietary gas resistant membrane of virgin polymer or more robust material, installed to reasonable levels of workmanship/in line with current good practice with validation. The membrane needs to meet the specific requirements in Table 7 of BS 8485:2015²¹ (score = 2 points).

The membrane should be installed in line with current good practice with all overlaps and service penetrations sealed. Installation will also require inspection and verification by a suitably qualified geoenvironmental engineer.

7.2.2 Characteristic Situation 4 (Building D)

The level of gas protection necessary for residential and commercial properties with central building management control and multiple occupancy (Type B building) with CS4 gas regime requires a gas score of 5.5, based on BS8485:2015²¹. It is noted that the guidance does not recommend residential use of a building located in a CS4 classified area, unless the type of construction or site circumstances allow additional levels of protection to be incorporated. Although there are five ground floor residential units proposed for Block D, additional levels of gas protection to CS4 requirements can be incorporated into the building design to mitigate the risks from ground gases to future residents.

Therefore, it is considered that this section of the site is acceptable to be developed for residential land use.

²¹ British Standards Institute. (2015). *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*. BS 8485:2015.

To achieve the required gas risk score of at least 5.5 and mitigate the potential risks presented by ground gases, the protective measures may include:

 Barriers (Floor slabs):

- Reinforced cast in situ suspended floor slab (score = 1 or 1.5 points).

Note; to achieve a score of 1.5, the slab should be well reinforced to control cracking and have minimal penetrations.

 Ventilation:

- Passive sub floor dispersal layer. Recommended that this is achieved by the use of either a clear void, or a polystyrene void former blanket (to achieve the total required points for CS4 classification, the ventilation must be designed to a 'very good' performance which gives a score = 2.5).

OR

- Active dispersal layer, usually comprising fans with active abstraction i.e. suction, from a subfloor dilution layer with roof level vents. The dilution layer may comprise either a clear void or be formed of geocomposite, or polystyrene void formers. This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents (score = 2.5 points)

 Membrane:

- Taped and sealed proprietary gas resistant membrane of virgin polymer or more robust material to reasonable levels of workmanship/in line with current good practice with validation. The membrane needs to meet the specific requirements in Table 7 of BS8485:2015²¹ (score = 2 points).

The membrane should be installed in line with current good practice with all overlaps and service penetrations sealed. Membrane installation will require both independent inspection by qualified geoenvironmental engineer and integrity testing by a suitably qualified specialist.

7.3 Capping Layers / Growth Medium

Proposed landscaping at the site is understood to comprise communal landscaping at ground floor level around buildings A, B, and C and up to the Trout Lake (off site). Buildings D, F, G, and H, located

within the northern half of the site, will have car-parking situated at the ground floor level and, therefore, the communal landscaping associated with these buildings will be situated on a first floor podium.

Although Made Ground containing asbestos fibres and localised areas of elevated PAHs are present across the site, it is noted that the existing ground levels are to be raised by between 0.3m and 1.7m with imported material. The placement of imported material will act as a barrier between the identified contamination and future users and residents of the site. With reference to the Ramboll Earthworks Specification²², the materials imported to raise the levels should be 'clean and uncontaminated'.

Given there is no topsoil present on site it is assumed that, as a minimum, clean topsoil will need to be imported to form a growth medium in areas of landscaping. As the landscaping for Buildings A, B, and C is at ground level, there may be a requirement for a capping layer, although the design for a capping layer is dependent on final site levels.

In areas of communal landscaping at ground level, it is recommended that testing of the formation level is taken place to confirm the suitability of the underlying soil as subsoil, such that the requirements of either a capping layer or a growth medium can be confirmed.

Where communal landscaping is at podium level, the requirements for the growth medium should be determined by the landscape architect.

It is assumed that the imported material to be used as fill at the site will be suitable for use as subsoil (as it needs to comply with the import criteria in the Ramboll specification²¹) and therefore, generally, only topsoil will be required, depending on the final levels. Where a minimum of 450mm of imported fill has been placed below the landscaping then only 150mm topsoil will be required. However, if the fill is less than 450mm, or the fill is noted to not comprise acceptable material (from formation level testing), then a capping layer would be required and this would need to comprise a total of 600mm over the current ground level, with a minimum 150mm topsoil at the surface. The 600mm total capping layer could be reduced to 450mm with the inclusion of a geotextile separator layer at the base.

The capping layer / growth medium options are presented within Table 10 below.

²² Ramboll (2017). *Green Park Village*. Specification for Earthworks. Revision 7. Ref. 1620000492/SP/001. July 2017

Table 10. Capping Layer requirements for Communal Landscaping for buildings A, B, and C

Scenario	Minimum Topsoil Thickness (mm)	Minimum Subsoil Thickness (mm)	Minimum Total Thickness (mm)	Geotextile separator required at base?
Materials imported to site to raise levels are chemically acceptable and placed at a thickness of greater than 450mm above current ground level	150	Not required if imported material suitable for use as subsoil	150	No
Materials imported to site to raise levels are chemically acceptable, but placed at a thickness of less than 450mm above current ground	150	450	600	No
	150	300	450	Yes
Materials imported to site to raise levels are chemically unacceptable	150	450	600	No

The podium communal landscaping for Buildings D, F, G and H is to be constructed at first floor level and therefore clean imported soils will be required to create a suitable growth medium.

All imported subsoil and topsoil materials for the capping layers and growth mediums should be clean soil, from a known and reputable source. Chemical certification of the source material and details of source should be provided by the Contractor, prior to material being brought to site. The results will be inspected by a qualified geoenvironmental engineer to confirm that the material can be accepted at the site. Topsoil should conform to the requirements of BS3882²³.

Once imported to site, representative samples should be taken by the geoenvironmental engineer for chemical laboratory analysis, for each type/source of material imported, at a minimum frequency of one test per 250m³ of imported material, or a minimum of three per source. The results should be compared against the maximum permissible concentrations presented as Appendix F.

Once placed, the growth medium or capping layer (if required) construction should be verified by the geoenvironmental engineer at a minimum frequency of 1 pit per 200m² area of placed soil.

7.4 Buried Services

Based on the available soil analysis and with reference to the UK Water Industry Research Guidance, protective pipe material may be required for the development, although it may be possible to negotiate the use of standard polyethylene pipes with the relevant water company.

The assessment (see Section 6.4.2) is based on water supply pipes being installed within the Made Ground at the level as it is currently. It is understood that ground level will be increased by between

²³ British Standards (2015) BS 3882. *Specification for topsoil and requirements for use.*

0.3m and 1.7m of fill material to mitigate future flood risk. The exact water pipe specification should be confirmed with the local water supply company prior to the commencement of the development.

7.5 Material Management

It should be noted that the management of construction waste should be carried out in accordance with Waste (England and Wales) Regulations 2011. This places an emphasis on the Waste Hierarchy, which requires an avoidance of waste in the first instance followed by recycling, reuse or reducing the volume that requires disposal after it has been generated.

7.5.1 Re-use, Recycling and Recovery

In order to minimise the volumes of waste being disposed to landfill facilities, it may be prudent to consider material management options in addition to waste disposal. Screening of uncontaminated natural arisings may permit recycling/reuse of the material for other sites under the CL:AIRE protocol²⁴ or under a waste exemption/permit and would lead to a reduction in disposal requirements.

The CL:AIRE protocol allows for the re-use of materials on the site of origin providing they meet certain criteria.



Factor 1: Protection of human health and protection of environment – if the material creates unacceptable risk to human health or the environment it likely to be considered as waste and therefore cannot be used.



Factor 2 Suitability for use without further treatment – material must be suitable for its intended purpose in all respects otherwise it is deemed as waste. This includes chemical composition of the material.



Factor 3 Certainty of use – the holder of the material must be able to demonstrate that the material will definitely be used. Intention of use is not considered satisfactory.



Factor 4 Quantity of material – only a required amount of material should be used. Use of excessive amount of materials indicates that the material is being “disposed off”.

This approach sets out best practice in dealing with excavated materials and their re-use in order to minimise surplus soils being sent to landfill. Providing that a Design Statement, including a Materials Management Plan (MMP), is produced separately or included in the Remediation Strategy, and includes details where materials will arise and how they will be used within the limits of the Code of Practice, there is no requirement to seek an environmental permit to re-use materials. The process

²⁴ CL:AIRE.(2011). *The Definition of Waste: Development Industry Code of Practice*. Version 2.

would require a final validation report and sign off by a Qualified Person and is not applicable to soils that pose harm to human health or the environment.

If off-site disposal of excavated soils is unavoidable, the Contractor will be responsible for the appropriate classification of the waste.

7.5.2 Waste Disposal

The chemical results from the sample with the most elevated concentrations of contaminants, from boreholes WS15 at 0.9m and WS16 at 0.85m, have been assessed against the WM3²⁵ criteria in order to undertake a preliminary waste classification for soils should off-site disposal be required. Based on the results from the sample at WS15 indicating a 'not hazardous' classification, the remaining samples are also considered to be 'not hazardous'. The sample from borehole, WS16, however, has been classed as hazardous due to the concentrations of total petroleum hydrocarbons.

A total of eight samples of Made Ground recorded asbestos at concentrations ranging between <0.001% and 0.13%. Seven of the samples recorded asbestos at concentrations below the hazardous waste limit of 0.1%, and therefore are permitted to be disposed of at a non-hazardous landfill which accepts asbestos waste, subject to the segregation and removal of visual fragments of asbestos containing materials (ACMs), if present. If ACMs are present and not removed, then the material would require disposal at a hazardous licensed landfill that accepts asbestos waste as the assumption is made that ACMs contain asbestos at >0.1% by weight.

One sample from borehole WS04, at a depth of 0.7m, was found to contain asbestos at a concentration of 0.130%, which is above the hazardous waste limit of 0.1%. On this basis, the Made Ground from this area should be disposed of at a landfill which accepts hazardous asbestos waste.

On this basis, should disposal of soils be required as part of the development, the majority of the soils may be disposed off-site at a suitably licensed inert or non-hazardous facility, subject to Waste Acceptance Criteria (WAC) testing. The soils impacted with asbestos will require disposal at either non-hazardous or hazardous facilities (depending on the concentration of asbestos) permitted to accept asbestos containing materials. The Contractor will be responsible for the appropriate classification of the waste, and it is recommended that soil stockpiles are regularly sampled to representatively classify the soils for off-site disposal. A summary of the results is indicated in Table 11, below.

²⁵ Environment Agency. (2015). *Waste Classification: Guidance on the classification and assessment of waste. Technical Note for WM3*. May 2015.

Table 11. Preliminary Waste Characterisation

Sample location and depth	Preliminary waste assessment	Asbestos identification	Asbestos quantification	Likely suitable disposal site – Dependant on WAC analysis
WS01 – 0.6m	Not-hazardous*	Amosite (Loose fibres)	<0.001	Non-hazardous facility permitted to accept asbestos containing materials
WS02 – 1.8m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS02 – 2.7m	Not-hazardous*	Not detected	-	Inert (natural soils)
WS03 – 0.6m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS03 – 1.45m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS03 – 2.6m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS04 – 0.7m	Not-hazardous*	Chrysotile (Hard/Cement type material)	0.130	Hazardous facility due to concentration of asbestos (>0.1%)
WS05 – 0.5m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS06 – 0.8m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS06 – 1.9m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS07 – 1.5m	Not-hazardous*	Chrysotile and Amosite (Bitumen & loose fibres)	0.002	Non-hazardous facility permitted to accept asbestos containing materials
WS08 – 0.3m	Not-hazardous*	Chrysotile (Loose fibrous debris)	0.052	Non-hazardous facility permitted to accept asbestos containing materials
WS09 – 0.8m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS10 – 0.5m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS11 – 0.4m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS12 – 0.8m	Not-hazardous*	Chrysotile (Loose fibres)	<0.001	Non-hazardous facility permitted to accept asbestos containing materials
WS12 – 1.35m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS13 – 0.3m	Not-hazardous*	Chrysotile and Amosite (Loose fibres & loose fibrous debris)	0.004	Non-hazardous facility permitted to accept asbestos containing materials
WS14 – 0.8m	Not-hazardous*	Chrysotile and Amosite (Loose fibres)	<0.001	Non-hazardous facility permitted to accept asbestos containing materials
WS14 – 1.6m	Not-hazardous*	Not detected		Inert (natural soils)
WS15 – 0.9m	Not-hazardous	Amosite (Loose fibres)	<0.001	Non-hazardous facility permitted to accept asbestos containing materials
WS15 – 3.8m	Not-hazardous*	Not detected	-	Inert (natural soils)
WS16 – 0.4m	Not-hazardous*	Not detected	-	Non-hazardous facility
WS16 – 0.85m	Hazardous	Not detected	-	Hazardous facility due to concentration of total TPH
WS17 – 0.2m	Not-hazardous*	Not detected	-	Non-hazardous facility

Uncontaminated natural materials can be classified as listed inert for waste disposal purposes and may be reused on-site, or off-site subject to appropriate waste management controls, i.e. Materials Management Plan, Waste Exemptions, as appropriate (see section 7.5.1).

It should be noted that in May/June 2012 HMR&C issued Briefs 15/12 and 18/12 clarifying how construction spoil and excess soils will be assessed for landfill tax purposes. Detailed accurate descriptions of waste are required for all wastes to support the landfill tax assessment.

Uncontaminated naturally occurring soils will remain inert by default and eligible for the lower rate of landfill tax. Similarly, 'reworked soils' and demolition 'stone' comprising ONLY materials listed in the Schedule of the Landfill Tax (Qualifying Material) Order 2011 (SI 2011/1017) will also be eligible for the lower rate of landfill tax.

However, Made Ground containing soil and foreign objects such as timber, plastic, rubber, metal, paper, plasterboard, asbestos, etc., regardless of the results of chemical analysis for waste classification purposes, will be eligible for the standard (higher) rate of landfill tax. Therefore, to maximise eligibility for lower rate landfill tax on waste construction spoil/ reworked ground, careful waste segregation and controls are necessary.

All material intended for off-site disposal should be transported and disposed in accordance with the Environmental Protection (Duty of Care) Regulations, 1991 and the Landfill (England and Wales) Regulations, 2002 (as amended). Waste legislation stipulates that *hazardous* and *not hazardous* waste should be pre-treated prior to disposal. Pre-treatment can be undertaken either at the site of origin or may be carried out at a licensed off-site facility and can include selective segregation of soils conducted on site.

7.6 Watching Brief and Discovery Strategy

It is recommended that a watching brief is maintained by the Main Contractor. Where unexpected gross contamination, such as oily material or material of an unusual colour or odour, is encountered, the following discovery strategy is recommended:

1. Work to cease in that area.
2. Notify geoenvironmental engineer, to attend site and sample material for appropriate analysis.
Notify Contaminated Land Officer of the Local Authority as appropriate.
3. Geoenvironmental engineer to supervise the excavation of contaminated material, which should be placed in a bunded area and covered to prevent rainwater infiltration.
4. Soil samples should be obtained by the geoenvironmental engineer from both the excavated material, and the soils in the sides and base of the excavation to demonstrate that the full area of contamination has been excavated. In-situ testing should be undertaken on the sides and base of the excavation, as appropriate, to assess the presence of residual contamination in the soils.
5. On receipt of chemical test results, the soils may be appropriately classified for disposal, or treatment if appropriate, and dealt with accordingly.

6. Detailed records of the stockpile sizes, source and location should be kept and regularly updated to allow materials to be easily tracked from excavation until leaving the site.
7. Records of excavated areas and the results of chemical testing should be incorporated within the final verification report for the site.

To facilitate appropriate waste disposal and potential re-use of materials all excavated soils should be segregated and stockpiled depending on their soil classification.

If no unexpected gross contamination is encountered during the watching brief, it should be noted that a confirmation statement will be required by the main contractor to that effect and to confirm the watching brief was carried out explain this.

7.7 Health and Safety

All site works should be undertaken in accordance with the guidelines prepared by the Health and Safety Executive (HSE, 1991)²⁶ and CIRIA Reports 132²⁷ and C650²⁸. All work should also be carried out in accordance with the Contractor's Construction Health and Safety Plan.

During the redevelopment, precautions should be taken to minimise exposure of workers and the general public to potentially harmful substances. Attention should also be paid to restricting possible off-site nuisance such as dust and odour emissions. Such precautions should include, but not be limited to:

1. Personal hygiene, washing and changing procedures.
2. Adequate personal protective equipment, including disposable overalls, gloves and particulate filter masks/vapour respirators, where required.
3. Measures to avoid surface water ponding and positive collection and disposal of all on-site run-off.
4. Regular cleaning of all site roads, access roads and the public highway including dust suppressions methods (e.g. water spraying), if necessary.
5. All waste haulage vehicles should be covered when leaving the site to minimise the release of airborne particulates.

²⁶ HSE (1991). Protection of Workers and the General Public during the development of contaminated land. Guidance Note HS(G)66, Health and Safety Executive, HMSO, 1991.

²⁷ CIRIA (1996). A guide for safe working on contaminated sites. Steeds JE, Shepherd E & Barry DL. CIRIA Report 132.

²⁸ CIRIA (2005). Environmental good practice – Site guide, 2nd Edition. CIRIA Report C650.

Excavations should be planned and inspected regularly by a competent person. No operatives should be permitted to enter unshored or otherwise protected excavations identified as unstable by a competent person, however shallow they are.

7.7.1 Asbestos

It is noted that asbestos fibres have been locally encountered within the Made Ground during the site investigation. Where excavated, asbestos containing soils will be removed in accordance with current regulations and guidance^{29,30,31,32}. Asbestos containing materials (ACMs), if encountered, should be segregated by hand picking by a trained person utilising appropriate PPE and implementing necessary precautionary measures to minimise exposure to construction workers and the general public during earthworks.

Site staff undertaking groundworks should be advised of the potential for asbestos to be present and should be trained in basic visual recognition of asbestos. Soils being handled should be dampened, taking care that damping is carried out at the appropriate time and with appropriate amounts of water to suppress dust but not saturate the soils. Soil movement should be minimised, and double handling avoided.

7.8 Post Remediation Verification Requirements

To confirm that the measures and procedures detailed in this document have been implemented, a *Verification Plan* has been produced and is presented in Appendix G. Site inspections and compliance testing should be carried out during the works by a qualified geoenvironmental engineer for the various elements of the remediation works as follows:

-  Inspection of installed gas protection measures;
-  Verification of capping layer / growth medium thickness and imported soil chemical acceptability; and
-  Site inspection records, photographs and testing where unexpected contamination is encountered.

Documentation will also be required to be provided by the Contractors including:

²⁹ HSE 247. (2006). *Asbestos: The licensed contactors' guide*.

³⁰ HSE. (2006). *Work with materials containing asbestos – Control of Asbestos Regulations 2006 – Approved Code of practice and guidance*. HSE 2006.

³¹ Health and Safety Executive. (2012). *The Control of Asbestos Regulations*.

³² Health and Safety Executive. (2010). *Asbestos: The Survey Guide*. HSG 264.

-  Confirmation of water supply pipework material and acceptance of material choice by water supply company;
-  Photographs of the earthworks undertaken;
-  As built drawings;
-  Duty of Care records for the disposal of soils;
-  Source data and pre-import laboratory data of any imported soil; and
-  Material management procedures (i.e. permits, exemption, material trackers etc.), as appropriate.

FIGURES

[1:50,000 OS map]



Phase 6, Green
Park Village,
Reading

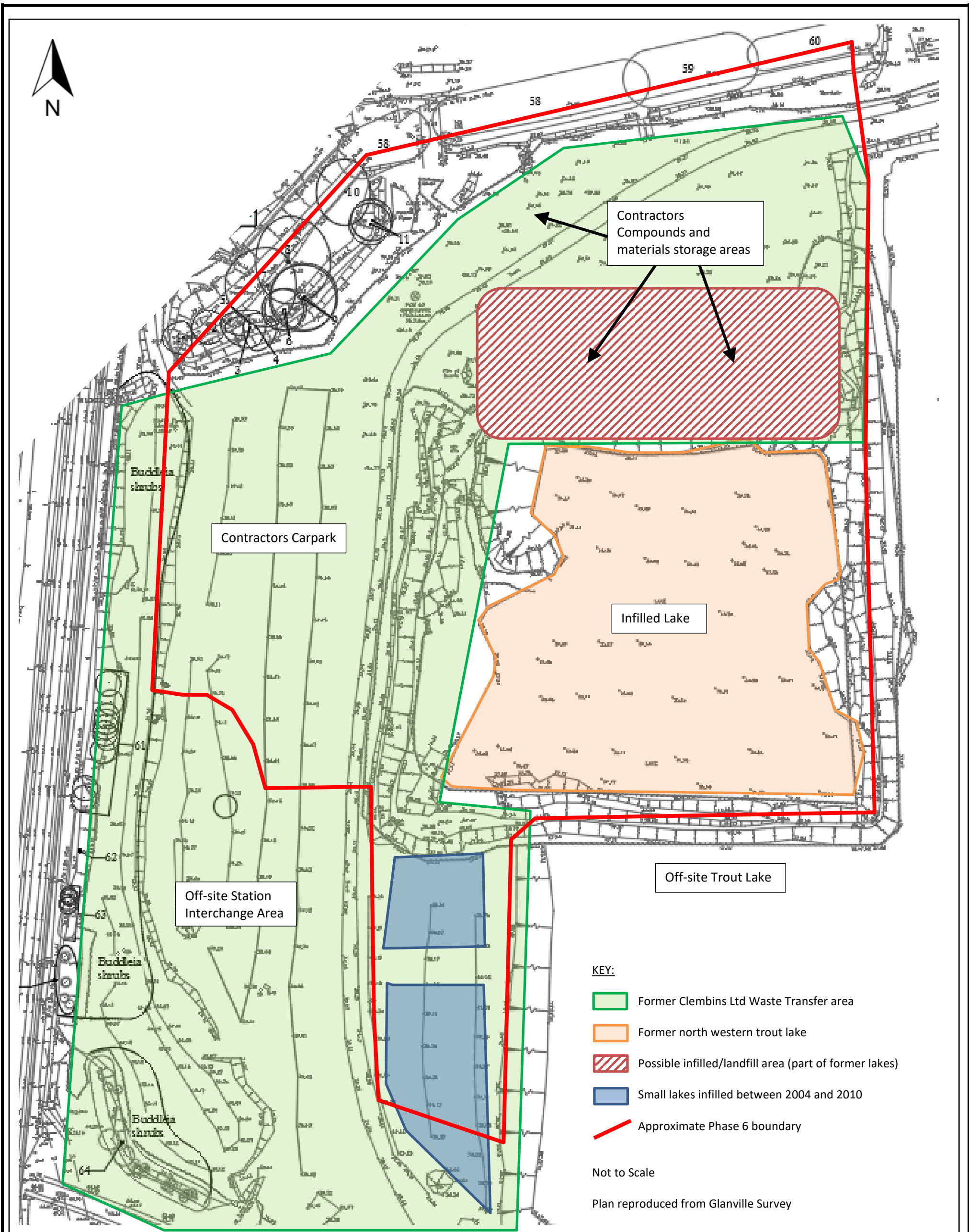
[smaller scale OS map]



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Client	Project	Job No
Berkeley Homes (Western) Limited	Phase 6 – Green Park Village, Reading	CG/28390
	Title	
	Site Location Plan	Figure 1



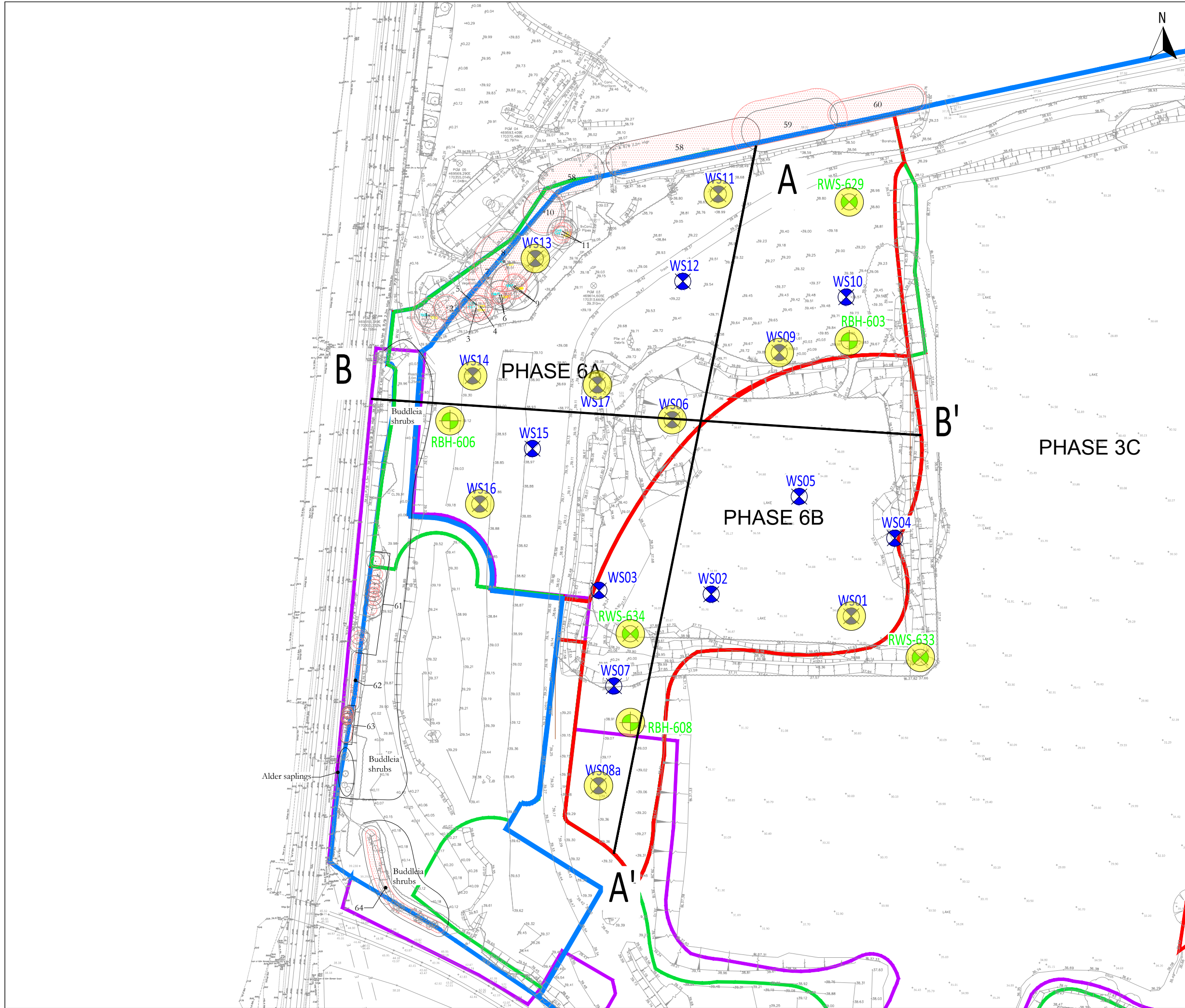
Client	Project	Job No
Berkeley Homes (Western) Limited	Phase 6 – Green Park Village, Reading	CG/28390
	Title	
	Site Layout Plan	Figure 2



Key:
 Approximate site boundary
 Edge of water body

Image obtained from Google Earth - dated 2013
Not to Scale

Client Berkeley Homes (Western) Limited	Project Phase 6 – Green Park Village, Reading	Job No CG/28390
	Title Aerial Imagery - 2013	Figure 3



Window sample (CGL 2018)

Borehole (Ramboll 2017)

Window Sample (Ramboll 2017)

Exploratory hole has install

0

31/05/18

Rev

Date

Comments



Card Geotechnics Ltd
4 Godalming Business Centre
Woolsack Way
Godalming
Surrey
GU7 1XW
T: 01483 310600

Project

Phase 6 - Green Park Village, Reading

Client

Berkeley Homes (Western) Limited

Drawing title

Figure 4 - Exploratory Hole Location Plan

Scale(s)

NTS

Job No.

CG/28390

Drawn

TBP

09/07/18

Dwg No.

CG/28390-001

Rev.

0

Checked

SMK

09/07/18

Approved

RNS

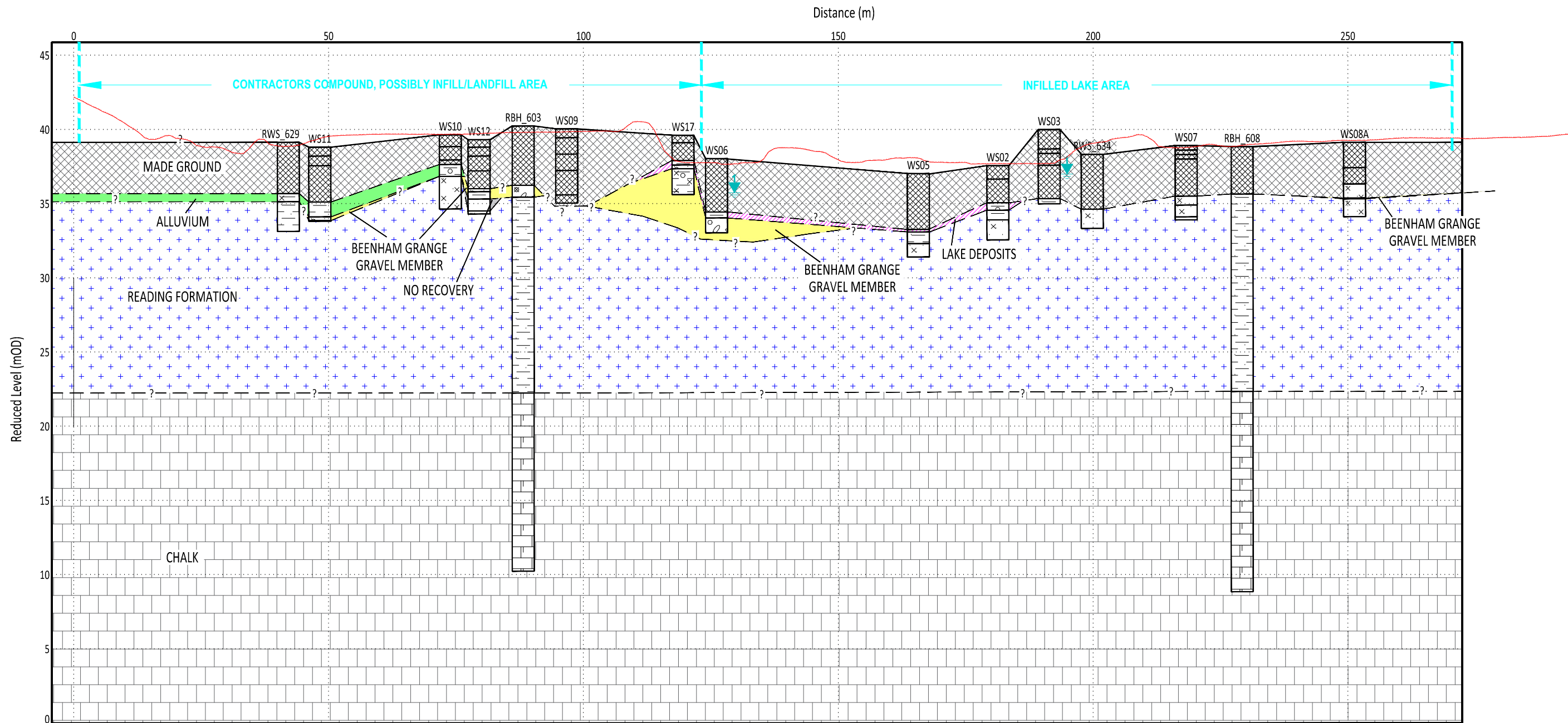
09/07/18

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A

A'

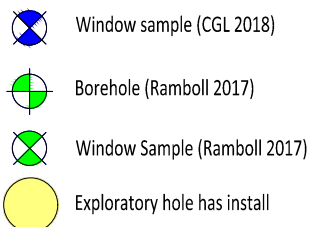


KEY



? Inferred geology

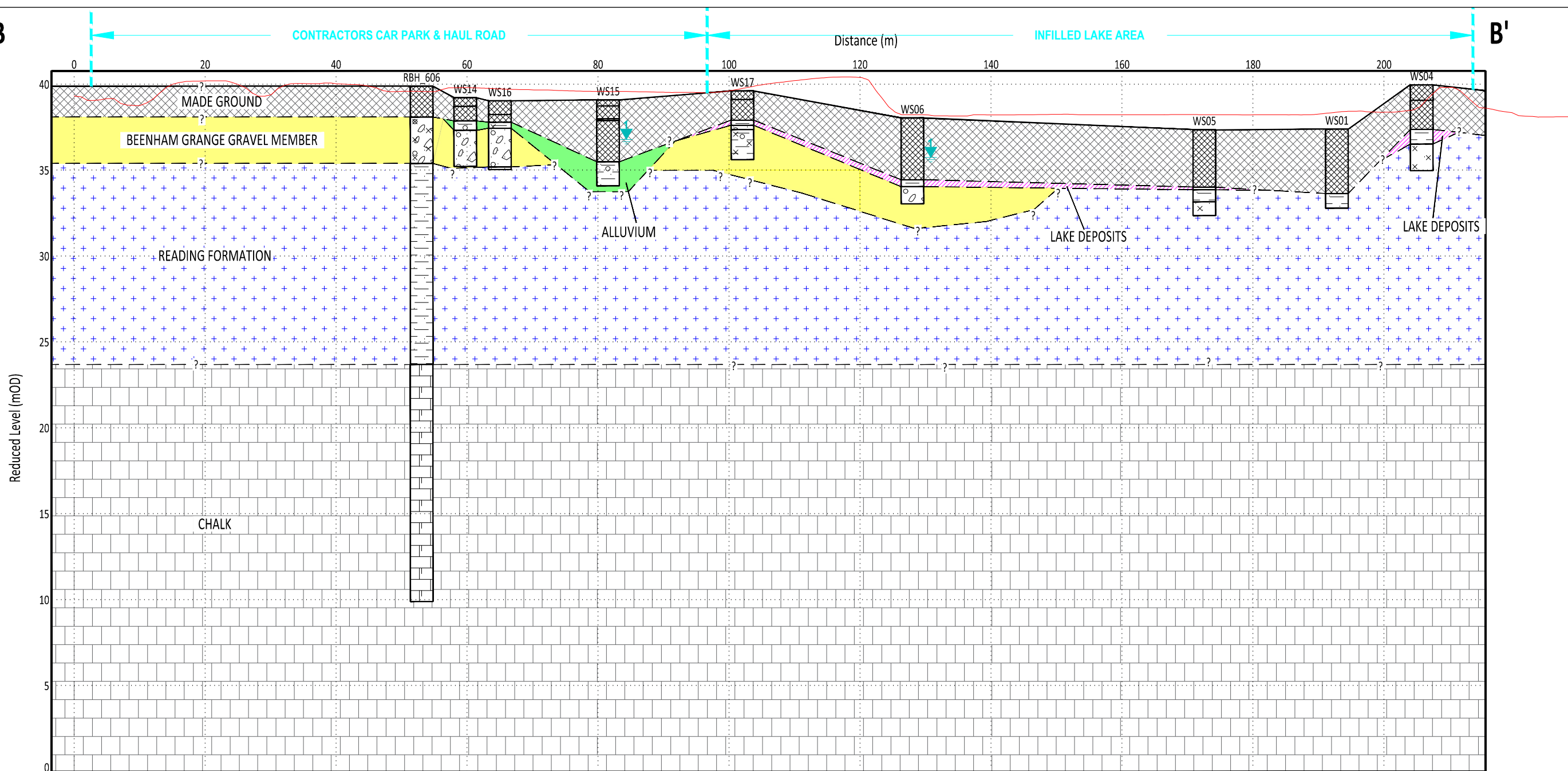
— LIDAR elevation profile



0	18/06/18	
Rev	Date	Comments
 Card Geotechnics Ltd 4 Godalming Business Centre Woolsack Way Godalming Surrey GU7 1XW T: 01483 310600		
Project	Phase 6 - Green Park Village, Reading	
Client	Berkeley Homes (Western) Limited	
Drawing title	Figure 5 - Geological Cross-Section A-A'	
Scale(s)	NTS	Job No. CG/28390
Drawn	TBP 09/07/18	Dwg No. CG/28390-002
Checked	SMK 09/07/18	Rev. 0
Approved	RNS 09/07/18	
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B

B'



KEY

- MADE GROUND
- ALLUVIUM
- BEENHAM GRANGE GRAVEL MEMBER
- LAKE DEPOSITS
- NO RECOVERY
- READING FORMATION
- CHALK
- Inferred geology
- LIDAR elevation profile
- Window sample (CGL 2018)
- Borehole (Ramboll 2017)
- Window Sample (Ramboll 2017)
- Exploratory hole has install

PHASE 6 - Green Park Village, Reading

PHASE 6B

PHASE 3

PHASE 4

PHASE 5

PHASE 6A

PHASE 6C

PHASE 6D

PHASE 6E

PHASE 6F

PHASE 6G

PHASE 6H

PHASE 6I

PHASE 6J

PHASE 6K

PHASE 6L

PHASE 6M

PHASE 6N

PHASE 6O

PHASE 6P

PHASE 6Q

PHASE 6R

PHASE 6S

PHASE 6T

PHASE 6U

PHASE 6V

PHASE 6W

PHASE 6X

PHASE 6Y

PHASE 6Z

PHASE 6AA

PHASE 6AB

PHASE 6AC

PHASE 6AD

PHASE 6AE

PHASE 6AF

PHASE 6AG

PHASE 6AH

PHASE 6AI

PHASE 6AJ

PHASE 6AK

PHASE 6AL

PHASE 6AM

PHASE 6AN

PHASE 6AO

PHASE 6AP

PHASE 6AQ

PHASE 6AR

PHASE 6AS

PHASE 6AT

PHASE 6AU

PHASE 6AV

PHASE 6AW

PHASE 6AX

PHASE 6AY

PHASE 6AZ

PHASE 6BA

PHASE 6BB

PHASE 6BC

PHASE 6BD

PHASE 6BE

PHASE 6BF

PHASE 6BG

PHASE 6BH

PHASE 6BI

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PHASE 6BK

PHASE 6BL

PHASE 6BM

PHASE 6BN

PHASE 6BO

PHASE 6BP

PHASE 6BQ

PHASE 6BR

PHASE 6BS

PHASE 6BT

PHASE 6BU

PHASE 6BV

PHASE 6BW

PHASE 6BX

PHASE 6BY

PHASE 6BZ

PHASE 6CA

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PHASE 6IL

PHASE 6IM

PHASE 6IN

PHASE 6IO

PHASE 6IP

PHASE 6IQ

PHASE 6IR

PHASE 6IS

PHASE 6IT

PHASE 6IU

PHASE 6IV

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PHASE 6NQ

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PHASE 6OZ

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PHASE 6PC

PHASE 6PD

PHASE 6PE

PHASE 6PF

PHASE 6PG

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PHASE 6PI

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PHASE 6PU

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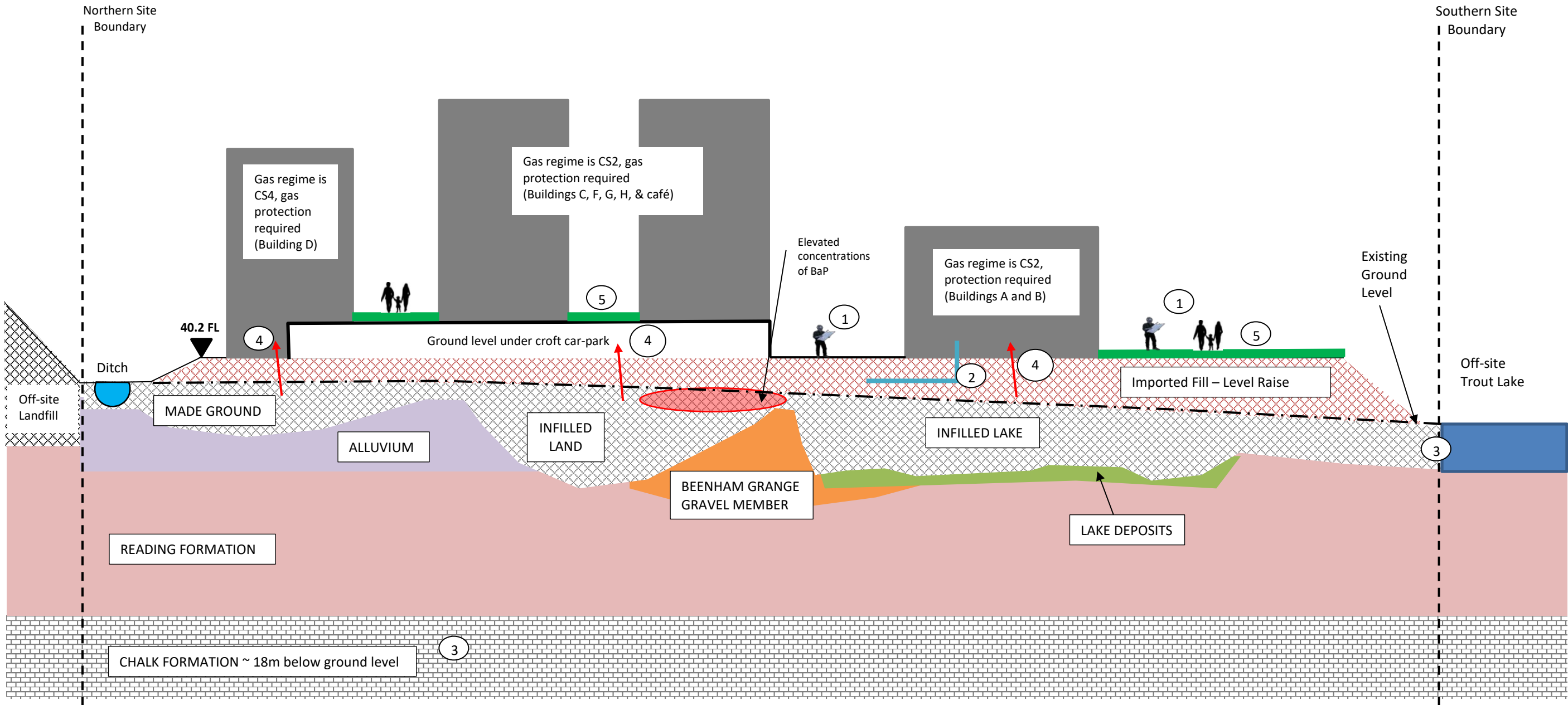
PHASE 6ZY

PHASE 6ZZ

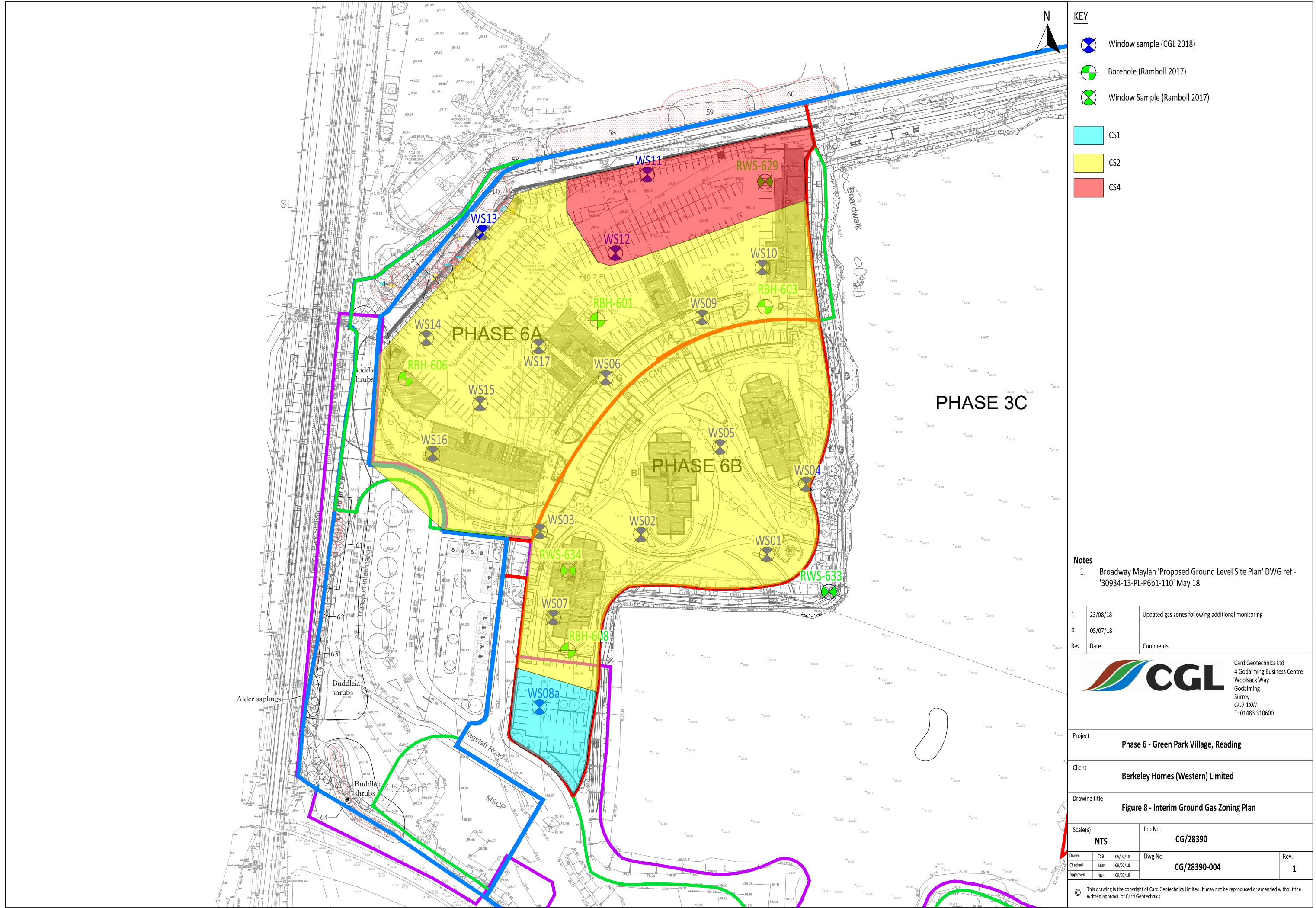
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Rev	Date	Comments
Card Geotechnics Ltd 4 Godalming Business Centre Woolsack Way Godalming Surrey GU7 1XW T: 01483 310600		
Project	Phase 6 - Green Park Village, Reading	
Client	Berkeley Homes (Western) Limited	
Drawing title	Figure 6 - Geological Cross-Section B-B'	
Scale(s)	NTS	Job No. CG/28390
Drawn	TBP 09/07/18	Dwg No. CG/28390-003
Checked	SMK 09/07/18	Rev. 0
Approved	RKS 09/07/18	
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Relevant pollutant linkages and associated risks:

- 1. Outdoor ingestion, skin contact and inhalation of soil, metals, and dust → Low risk to future site users, medium risk to construction workers → Benzo(a)pyrene and asbestos in Made Ground; however ground levels to be raised to facilitate the development and hardstanding/buildings mitigate risks to future site users. PPE required to mitigate risk to construction workers. Capping layers / Growth Mediums to be incorporated within the development to protect future users.
- 2. Direct contact with water supply pipes and underground concrete structures → Low to medium risk → Low contaminant concentrations in Made Ground, ground levels to be raised, pipes likely to be laid in engineered fill, protective pipes may be required for water supply. Appropriate concrete design required to mitigate against concrete attack from sulfate.
- 3. Lateral migration and leaching of contaminants to controlled waters → Low risk → Deep groundwater not impacted by contaminants. Marginal exceedances of contamination within the shallow groundwater but considered to be background concentrations given history of site and surrounding area. Site is not situated within or near a groundwater Source Protection Zone, and there are no groundwater, surface water, or potable water abstraction licences in the nearby area.
- 4. Ingress of soil gas and vapour into buildings and subsequent inhalation, and/or explosive risk → Low risk to construction workers, low to high risk to future residents → Combination of CS1, CS2, and CS4 gas classification across the site (based on interim data set). Specific ground gas protection measures required in certain blocks.
- 5. Plant uptake → Negligible risk → No mitigation measures required, but growth medium required in areas of landscaping to facilitate vegetation growth.



Client	Project	Job No
Berkeley Homes (Western) Limited	Phase 6 – Green Park Village, Reading	CG/28390
	Title	Figure 7
	Conceptual Site Model	



KEY

- Window sample (CGL 2018)
- Borehole (Ramboll 2017)
- Window Sample (Ramboll 2017)

- CS1
- CS2
- CS4

Notes

- Broadway Maylan 'Proposed Ground Level Site Plan' DWG ref - '30934-13-PL-P6b1-110' May 18

1	23/08/18	Updated gas zones following additional monitoring
0	05/07/18	
Rev	Date	Comments
 Card Geotechnics Ltd 4 Godalming Business Centre Woolsack Way Godalming Surrey GU7 1XW T: 01483 310600		
Project Phase 6 - Green Park Village, Reading		
Client Berkeley Homes (Western) Limited		
Drawing title Figure 8 - Interim Ground Gas Zoning Plan		
Scale(s) NTS		Job No. CG/28390
Drawn TSB 05/07/18	Dwg No. CG/28390-004	Rev. 1
Checked SMK 09/07/18		
Approved RNS 09/07/18		

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APPENDIX A

Proposed Development Plans

Green Park Village | Phase 6 - 1:50 Apartment Layout Design Review

Reading, Berkshire



APPENDIX B

CGL Exploratory Borehole Logs

WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS01
Job No CG/28390	Date 24-05-18	Ground Level (m) 37.40	Co-Ordinates (m) E 469,701.7 N 170,202.0	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	
0.60	ES1						
1.00	SPT	N6					
2.00	SPT	N5	↓			(3.75)	
3.00	SPT	N4					
4.00	SPT	N19		33.65		3.75	
4.60	SPT	N50/230 mm		32.80		4.60	
(Window sample terminated at 4.6m)							

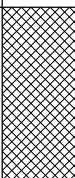
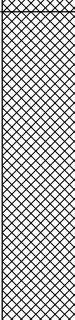
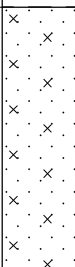
Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
	2	3.00				1. ES - Environmental Sample. D - Disturbed Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater encountered at 2.0mbgl. Window sample cased to 3mbgl. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl - plain pipe with bentonite seal. From 1.0mbgl to 5.0mbgl - slotted pipe with gravel filter. Monitoring installation fitted with end cap and gas bung tap. Fitted with raised cover. 5. Terminated at 4.60mbgl due to refusal.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS02
Job No CG/28390	Date 24-05-18	Ground Level (m) 37.57	Co-Ordinates (m) E 469,654.4 N 170,209.4	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Instrument / Backfill	
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)		DESCRIPTION
1.00	SPT	N4		36.67		0.90	Very soft to soft, grey brown slightly sandy gravelly clay. Gravel is fine to coarse subangular to subrounded of flint and brick. [MADE GROUND] 0.20 Firm dark grey with flint brick, concrete, tarmac and glass.	
						(1.60)	Very soft to soft grey brown dark grey black mottled sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of flint, brick and possible concrete. Organic inclusions noted. [MADE GROUND]	
1.80	ES1							
2.00	SPT	N2		35.07		2.50		
						(0.50)	Very soft black very organic CLAY with occasional fine to coarse sub rounded to rounded flint gravel. Plant/organic matter throughout. [LAKE DEPOSITS]	
2.70	ES2			34.57		3.00		
3.00	SPT	N17				(0.65)	Firm red and yellow mottled light blue grey CLAY. [READING FORMATION]	
				33.92		3.65		
4.00	SPT	N26				(1.35)	Medium dense to dense light blue grey silty SAND. Sand is fine to medium. [READING FORMATION]	
							4.60 Becoming sandy SILT. 4.70 Mottled with yellow grey and blue grey sandy SILT.	
5.00	SPT	N41		32.57		5.00	(Window sample terminated at 5m)	
				</				

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS03
Job No CG/28390	Date 24-05-18	Ground Level (m) 40.00	Co-Ordinates (m) E 469,638.5 N 170,197.8	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.60	ES1					(1.30)	Brown to grey brown very sandy very gravelly clay. Gravel is fine to coarse, angular to subrounded of flint, concrete, brick, tarmac and occasional glass. sand is fine to coarse. [MADE GROUND]	
1.00	SPT	N7		38.70		1.30		
1.45	ES2			38.40		(0.30) 1.60	White firm chalk putty with occasional fine clinker and brick gravel. [MADE GROUND]	
2.00	SPT	N9				(0.80)	Soft to firm grey brown gravelly sandy CLAY. Gravel is fine to coarse, subangular to subrounded of flint. Sand is fine to coarse. [POSSIBLE MADE GROUND]	
2.60	ES3							
3.00	SPT	N4		37.60		2.40		
4.00	SPT	N5				(2.25)	Soft to firm dark grey brown black very sandy slightly gravelly CLAY. Gravel is fine to coarse, rounded to subrounded of flint. Sand is fine to coarse. [POSSIBLE MADE GROUND]	
5.00	SPT	N20		35.35		4.65		
				35.00		(0.35) 5.00	Firm, light blue grey mottled light grey, red and yellow very sandy CLAY. Sand is fine to coarse. [READING FORMATION]	
							(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
	3					1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater encountered at 3.0m. however soils at 1.6m were moist. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS04
Job No CG/28390	Date 24-05-18	Ground Level (m) 39.98	Co-Ordinates (m) E 469,716.4 N 170,228.3	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	DESCRIPTION	
0.70	ES1			39.08		Brown to grey brown very sandy very gravelly clay with cobbles of concrete. Gravel is fine to coarse, angular to subrounded of flint, concrete, brick, tarmac and occasional glass. Sand is fine to coarse. [MADE GROUND]	
1.00	SPT	N5				Soft to firm red, yellow and light blue grey mottled clay with occasional fine to medium flint gravel. [MADE GROUND]	
2.00	SPT	N5		37.38		1.50 Organic matter occurring.	
3.00	SPT	N9		36.53		Soft to firm grey black gravelly organic CLAY. Gravel is fine to coarse, subangular to rounded of flint. [LAKE DEPOSITS] 2.80 Wood and plant debris	
4.00	SPT	N19				3.40 band of medium to coarse sub angular to sub rounded flint gravel. Firm light blue grey with red and yellow mottled slightly sandy SILT. [READING FORMATION]	
5.00	SPT	N36		34.98		4.00 - 4.70 Flint gravel pushed down from SPT test above.	
						(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS05
Job No CG/28390	Date 25-05-18	Ground Level (m) 37.37	Co-Ordinates (m) E 469,684.1 N 170,242.4	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.50	ES1						Soft to firm yellow brown gravelly slightly sandy silt. Gravel is fine to coarse, angular to subrounded of flint, brick, concrete, plastic fragments, engineering block and occasional tarmac. sand is fine to coarse. [MADE GROUND]	
1.00-2.00	B1 SPT	N5				(3.35)		
2.00	SPT	N12						
3.00	SPT	N5						
				34.02		3.35		
				33.87	x x x	3.50	Soft to firm dark grey black organic SILT with organic debris. [LAKE DEPOSITS]	
4.00	SPT	N31				(0.70)	Firm light blue, red and yellow mottled sandy CLAY. Sand is fine to medium. [READING FORMATION]	
				33.17		4.20		
					x x x	(0.80)	Medium dense blue grey and yellow brown mottled silty SAND. sand is fine to medium. [READING FORMATION]	
5.00	SPT	N29		32.37	x	5.00		
							(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. B - Bulk Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS06
Job No CG/28390	Date 25-05-18	Ground Level (m) 38.05	Co-Ordinates (m) E 469,641.1 N 170,268.4	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	DESCRIPTION	
0.80	ES1					Soft to firm yellow brown gravelly slightly sandy silt. Gravel is fine to coarse, angular to subrounded of flint, brick, concrete, plastic fragments, engineering block and occasional tarmac. Sand is fine to coarse. Occasional wood fragments. [MADE GROUND]	
1.00	SPT	N4					
1.90	ES2					1.80 Becoming dark grey	
2.00	SPT	N8	↓				
3.00	SPT	N5					
				34.45		3.60	
				34.05		(0.40) 4.00	
4.00	SPT	N7				Soft dark grey black organic gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of flint. [LAKE DEPOSITS]	
						Medium dense grey brown fine to coarse, angular to subangular flint GRAVEL. [BEENHAM GRANGE GRAVEL MEMBER]	
						(1.00)	
				33.05		5.00	
5.00	SPT	N8				(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks	
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater encountered at 2.3mbgl. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl, plain pipe with bentonite seal, 1.0mbgl to 5.0mbgl, slotted pipe with gravel filter. 5. Between 4mbgl and 5mbgl recovery was approximately 35%. 6. Terminated at 5.0mbgl.	
	2.3						

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS07
Job No CG/28390	Date 25-05-18	Ground Level (m) 38.92	Co-Ordinates (m) E 469,621.4 N 170,178.3	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.40	ES1			38.62		(0.30) 0.30	Soft to firm yellow brown gravelly slightly sandy silt. Gravel is fine to coarse, angular to subrounded of flint, brick, concrete, plastic fragments, engineering block and occasional tarmac. Sand is fine to coarse. Occasional wood fragments.	
				38.32		(0.30) 0.60	[MADE GROUND]	
				38.02		(0.30) 0.90	Soft to firm dark brown sandy gravelly clay. Gravel is fine to coarse, subangular to subrounded of flint. sand is fine to coarse.	
1.20	SPT	N6					[MADE GROUND]	
1.50	ES2						Brown sandy gravelly clay. Gravel is fine to coarse, angular to subrounded of flint, brick and concrete.	
2.00	SPT	N1				(2.50)	Soft to firm dark grey black organic very gravelly sandy clay. Gravel is fine to coarse, angular to subrounded of flint.	
3.00	SPT	N8					[MADE GROUND]	
				35.52		3.40		
						(0.60)	Firm light blue mottled red and dark yellow brown slightly sandy SILT. Sand is fine to medium.	
4.00	SPT	N44		34.92		4.00	[READING FORMATION]	
						(0.80)	Medium dense blue grey slightly silty SAND. sand is fine to medium.	
				34.12		4.80		
5.00	SPT	N45		33.92		5.00	Firm light blue grey and yellow brown CLAY.	
							[READING FORMATION]	
							(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered however soils at 0.9m were saturated. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS08	
Job No CG/28390	Date 25-05-18	Ground Level (m) 39.14	Co-Ordinates (m) E 469,621.4 N 170,144.6		
Client Berkeley Homes (Western)				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.30	ES1			38.49		0.65	Firm brown sandy gravelly clay. Gravel is fine to coarse, angular to rounded of flint, brick, concrete and ceramic tile. [MADE GROUND]	
0.80	ES2			38.14		1.00	Dark grey brown sandy gravelly clay with tarmac fragments, clinker, brick, flint and occasional concrete. [MADE GROUND]	
							Obstruction. Hand pit terminated and location moved. (Window sample terminated at 1m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Backfilled with arisings. 5. Terminated at 1.0mbgl due to an obstruction within the hand dug pit.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS08A
Job No CG/28390	Date 29-05-18	Ground Level (m) 39.14	Co-Ordinates (m) E 469,621.4 N 170,144.6	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
1.20	SPT	N4		37.44		1.70	Grass over brown gravelly clayey sand. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of flint brick ceramic fragments, tarmac and concrete. Rootlets to 0.15m. [MADE GROUND]	
1.80	ES1							
2.00	SPT	N4		36.34		2.80	Very soft to soft becoming firm, dark grey black organic gravelly silt. Gravel is fine to coarse, subangular to angular of flint and chert. [MADE GROUND]	
3.00	SPT	N4		35.39		3.75	Soft to firm grey gravelly slightly sandy SILT with some brown mottling. Sand is fine to medium. [ALLUVIUM]	
4.00	SPT	N21		35.34		3.80	Grey SAND and GRAVEL. Sand is coarse. Gravel is fine to coarse, rounded to subrounded of flint. [BEENHAM GRANGE GRAVEL MEMBER]	
						1.20	Firm slightly blue light grey orange brown mottled sandy SILT. Sand is fine to coarse. [READING FORMATION]	
5.00	SPT	N32		34.14		5.00	(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl plain pipe with bentonite seal, 1.0mbgl to 4.0mbgl, slotted pipe with gravel filter. Monitoring installation fitted with end cap and gas bung tap. Fitted with raised cover. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS09
Job No CG/28390	Date 29-05-18	Ground Level (m) 40.05	Co-Ordinates (m) E 469,677.4 N 170,291.1	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.30	ES1	N20		39.45		0.60	Firm brown sandy gravelly clay. Gravel is fine to coarse, angular to subrounded of flint, concrete, brick and clinker. Sand is fine to coarse. [MADE GROUND]	
0.80	ES2					(1.10)	Soft grey to grey brown slightly sandy gravelly clay. Gravel is fine to coarse angular to subrounded of flint and concrete with a metal can. Sand is fine to coarse. [MADE GROUND]	
1.00	SPT			38.35		1.70		
2.00	SPT	N5				(1.10)	Soft to firm blue, grey and brown slightly sandy silt. Sand is fine to coarse. Occasional gravel of flint, brick, concrete, ceramic fragments and clinker. [MADE GROUND]	
2.30	ES3			37.25		2.80		
3.00	SPT	N5				(1.65)	Soft light grey and orange brown mottled slightly sandy silt. Sand is fine to coarse. [MADE GROUND]	
4.00	SPT	N6		35.60		4.45		
						(0.55)	Soft grey with black mottled sandy silt and occasional organic matter. Sand is fine to coarse. [MADE GROUND]	
5.00	SPT	N11		35.05		5.00		
							(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. B - Bulk Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl plain pipe with betonite seal, from 1.0mbgl to 3.0mbgl, slotted pipe with gravel filter. Monitoring installation fitted with end cap and gas bung tap. Fitted with raised cover. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS10
Job No CG/28390	Date 29-05-18	Ground Level (m) 39.65	Co-Ordinates (m) E 469,700.0 N 170,309.8	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.50	ES1					(0.80)	Firm brown sandy gravelly clay. Gravel is fine to coarse, angular to subrounded of flint, brick, concrete, wood and engineering block. Sand is fine coarse. [MADE GROUND]	
				38.85		0.80	0.55 More brick	
0.95	ES2					(0.90)	Soft to firm grey and orange brown, very gravelly sandy clay. Gravel is fine to coarse, angular to rounded of flint and occasional brick. sand is fine to coarse. [MADE GROUND]	
1.20	SPT	N8		37.95		1.70		
				37.65		(0.30) 2.00	Firm light grey red and brown, with dark grey and black colouration (likely from above soils) gravelly sandy CLAY. Sand is fine to medium. [ALLUVIUM]	
2.00	SPT	N4				(0.80)	Firm dark grey, very sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse, angular to subrounded of flint. [ALLUVIUM]	
				36.85		2.80		
3.00	SPT	N4				(2.20)	Firm light blue grey mottled red and dark yellow, sandy SILT. Sand is fine to medium. [READING FORMATION]	
4.00	SPT	N5						
				34.65		5.00		
5.00	SPT	N24					(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks	
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.	

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS11
Job No CG/28390	Date 29-05-18	Ground Level (m) 38.82	Co-Ordinates (m) E 469,656.7 N 170,344.6	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	
0.40	ES1	N13		38.22		(0.60) 0.60	
0.90 1.00	ES2 SPT			37.57		(0.65) 1.25	
2.00-3.00 2.00	B1 SPT	N6				(2.45)	
3.00	SPT	N4		35.12		3.70	
4.00	SPT	N4		34.12		(1.00) 4.70	
5.00	SPT	N16		33.87 33.82		4.95 5.00	
Brown sandy gravelly clay. Gravel is fine to coarse subangular to subrounded of brick flint, concrete, wire and occasional plastic. Sand is fine to coarse. [MADE GROUND] Soft grey to grey brown moist very sandy gravelly clay. Gravel fine to coarse, angular to subrounded of flint, brick and concrete. Frequent organic matter and organic odour noted. Sand is fine to coarse. [MADE GROUND] Firm dark grey sandy very gravelly clay. Gravel is fine to coarse, angular to rounded of flint. Sand is fine to coarse. Occasional pockets of silty sand. [POSSIBLE MADE GROUND] Soft dark grey black sandy gravelly CLAY with organic fragments. Gravel is fine to coarse sub rounded to angular of flint. Sand is fine to coarse. [ALLUVIUM] Grey SAND and GRAVEL. Gravel is fine to coarse, angular to subrounded of flint. Sand is coarse. [BEENHAM GRANGE GRAVEL MEMBER] Firm light blue grey mottled red and yellow brown silty CLAY. [READING FORMATION] (Window sample terminated at 5m)							

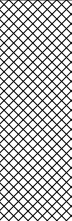
Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. B - Bulk Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl, plain pipe with bentonite seal. Monitoring installation fitted with end cap and gas bung tap. Fitted with raised cover. 5. Terminated at 5.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS12
Job No CG/28390	Date 29-05-18	Ground Level (m) 39.32	Co-Ordinates (m) E 469,644.8 N 170,315.2	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument /Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thick-ness)	DESCRIPTION	
0.80 1.00 1.35	ES1 SPT	N7		38.82		(0.50) 0.50	Dense grey sand and gravel. sand is fine to coarse. gravel is fine to coarse, angular to subangular roadstone. [MADE GROUND]	
	38.22			(0.60) 1.10		Grey loose sand and gravel. sand is fine to coarse. gravel is fine to coarse, angular to subrounded of flint, concrete, brick and ceramic. [MADE GROUND]		
	37.22			(1.00) 2.10		Soft to firm light grey brown gravelly sandy clay. Gravel is fine to coarse, angular to subrounded of flint. sand is fine to coarsse. [MADE GROUND] 1.35 Dark grey pockets. 1.50 Dark grey black mottled yellow brown.		
2.00	SPT	N9	36.02		(1.20) 3.30	Firm dark grey with grey mottled very gravelly sandy clay. Gravel is fine to coarse of flint. sand is fine to coarse. [MADE GROUND]		
3.00	SPT		35.82		3.50	Grey SAND and GRAVEL. Gravel is fine to coarse, subangular to subrounded of flint. Sand is coarse. [BEENHAM GRANGE GRAVEL MEMBER]		
4.00	SPT		35.32		(0.50) 4.00	Firm dark blue grey slightly sandy slightly gravelly organic CLAY. Gravel is fine to medium, subangular to subrounded of flint. Sand is fine to coarse. [BEENHAM GRANGE GRAVEL MEMBER]		
		N12			(0.80) 4.80	No recovery		
					34.52	4.80		
34.32	5.00				Firm light blue grey mottled red and dark yellow, sandy SILT. Sand is fine to medium. [READING FORMATION] <i>(Window sample terminated at 5m)</i>			
5.00	SPT	N24						

Boring Progress and Water Observations						General Remarks	
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered however soils at 0.5m were moist. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.	

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS13
Job No CG/28390	Date 30-05-18	Ground Level (m) 39.73	Co-Ordinates (m) E 469,594.9 N 170,322.8	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	
0.30	ES1			39.13		(0.60) 0.60	
1.00	ES2			38.68		(0.45) 1.05	
1.20	SPT	N5				(0.85) 1.90	
2.00	SPT	N13		37.83 37.73		(0.30) 2.00	
2.30-3.90	B1			37.43		(0.70) 3.00	
3.00	SPT	N15		36.73		(0.90) 3.90	
3.90	SPT	N14		35.83			
(Window sample terminated at 3.9m)							

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. B - Bulk Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl plain pipe with bentonite seal, 1.0mbgl to 2.0mbgl, slotted pipe with gravel filter. Monitoring installation fitted with end cap and gas bung tap. Fitted with flush cover. 5. Terminated at 3.9m bgl due to gravels collapsing back to 3.0m bgl..

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS14
Job No CG/28390	Date 30-05-18	Ground Level (m) 39.23	Co-Ordinates (m) E 469,573.7 N 170,283.2	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.80	ES1			38.73		(0.50) 0.50	Hardcore. Dense red grey sandy gravel. gravel is fine to coarse, angular to subangular of concrete, roadstone, brick, flint and engineering block. Sand is fine to coarse. Membrane present at base. [MADE GROUND]	
1.20	SPT	N10		37.88		(0.85) 1.35	Dark grey black sandy clayey gravel. Gravel is fine to coarse, angular to subrounded of flint, brick, concrete, ceramic tiles, wood and plastic fragments. Sand is fine to coarse. [MADE GROUND]	
1.60	ES2			37.33		(0.55) 1.90	Firm grey slightly sandy gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of flint. Sand is fine to coarse. Occasional shells noted. [ALLUVIUM]	
2.00	SPT	N28				(2.10) 4.00	Medium dense to dense grey SAND and GRAVEL. Gravel is fine to coarse, subangular to subrounded of flint. Sand is fine to coarse. [BEENHAM GRANGE GRAVEL MEMBER]	
3.00	SPT	N19						
4.00	SPT	N14		35.23			(Window sample terminated at 4m)	

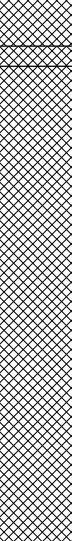
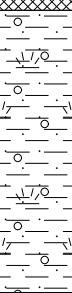
Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. B - Bulk Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl plain pipe with bentonite seal, 1.0mbgl to 3.0mbgl slotted pipe with gravel silter. Monitoring installation fitted with end cap and gas bung tap. Fitted with flush cover. 5. Terminated at 4.0mbgl due to gravels collapsing back to 3.0m bgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS15
Job No CG/28390	Date 30-05-18	Ground Level (m) 39.10	Co-Ordinates (m) E 469,593.9 N 170,258.6	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.45	ES1	N15		38.75		(0.35) 0.35	Hardcore. Dense red grey sandy gravel. Gravel is fine to coarse, angular to subangular of concrete, roadstone, brick, flint and engineering block. Sand is fine to coarse. Membrane present at base. [MADE GROUND]	
0.90	ES2					(0.75)	Firm grey brown and yellow brown very sandy gravelly clay. Gravel is fine to coarse, angular to subrounded of brick, concrete, tarmac, flint, clinker, wood debris and possible roadstone. Sand is fine to coarse. [MADE GROUND]	
1.00	SPT			38.00 37.90		1.10 1.20	Medium dense to dense grey slightly clayey sandy gravel. Gravel is fine to coarse, subangular to angular of flint. Sand is fine to coarse. [MADE GROUND]	
2.00	SPT	N9				(2.40)	Firm to stiff dark grey slightly sandy gravelly clay. Gravel is fine to coarse, angular to subrounded of flint. Sand is fine to coarse. [POSSIBLE MADE GROUND]	
3.00	SPT	N4						
3.80	ES3	N5		35.50		3.60	Soft dark brown black very organic slightly sandy slightly gravelly CLAY. Gravel is fine to medium, angular to subrounded of flint. Sand is fine to coarse. Occasional shells. [ALLUVIUM]	
4.00	SPT					(1.40)		
5.00	SPT	N13		34.10		5.00	(Window sample terminated at 5m)	

Boring Progress and Water Observations						General Remarks	
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Backfilled with arisings. 5. Terminated at 5.0mbgl.	
	2.3						

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS16
Job No CG/28390	Date 30-05-18	Ground Level (m) 39.05	Co-Ordinates (m) E 469,576.1 N 170,239.9	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.40	ES1					(0.80)	Firm to stiff sandy gravelly clay. Gravel is fine to coarse, angular to subrounded of flint, brick, clinker, concrete and engineering block. Sand is fine to coarse. Occasional tarmac. [MADE GROUND] 0.50 Very gravelly with cobbles of brick.	
0.85	ES2			38.25		0.80		
1.00	SPT	N7		37.80		1.25	Firm black slightly sandy, slightly gravelly, organic clay with recent wood debris. Gravel is fine to medium, angular to subrounded of flint, glass, metal and newspaper. Sand is fine to coarse. Sulphurous odour noted. [MADE GROUND]	
				37.45		1.60	Soft dark grey silty CLAY with slightly organic odour. [ALLUVIUM]	
2.00	SPT	N26				(2.25)	Dense dark grey slightly clayey SAND and GRAVEL. Gravel is fine to coarse, angular to subrounded of flint. Sand is coarse. [BEENHAM GRANGE GRAVEL MEMBER] 2.00 - 2.30 No Recovery	
3.00	SPT	N8						
				35.20		3.85	3.75 Sand and fine to medium gravel.	
4.00	SPT	N14		35.05		4.00	Medium dense light blue grey coarse SAND. [READING FORMATION] (Window sample terminated at 4m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl plain pipe with bentonite seal, 1.0mbgl to 3.0mbgl slotted pipe with gravel filter. Monitoring installation fitted with end cap and gas bung tap. Fitted with raised cover. 5. Terminated at 4.0m bgl due to gravels collapsing back to 3.0m bgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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WINDOW SAMPLE LOG



Project Phase 6 - Green Park Village, Reading				HOLE No WS17
Job No CG/28390	Date 30-05-18	Ground Level (m) 39.62	Co-Ordinates (m) E 469,615.9 N 170,280.1	
Client Berkeley Homes (Western)				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thickness)	DESCRIPTION	
0.20	ES1			39.12		(0.50) 0.50	Stiff brown sandy gravelly clay. Gravel is fine to coarse, angular to subrounded of flint, brick, concrete, clinker, engineering block and occasional tarmac. Sand is fine to coarse. [MADE GROUND] 0.30 Cobbles of roadstone and concrete.	
1.00	SPT	N6				(1.20)	Firm grey/grey brown sandy very gravelly clay. Gravel is fine to coarse, angular to subrounded of flint, brick, concrete, clinker, engineering block and occasional tarmac. Sand is fine to coarse. [MADE GROUND]	
1.20	ES2			37.92		1.70		
				37.62		(0.30) 2.00	Soft dark grey black sandy gravelly organic CLAY. [LAKE DEPOSITS] 1.90 - 1.95 Layer of wood debris.	
2.00	SPT	N8		37.37		2.25	Medium dense to dense grey SAND and GRAVEL. Gravel is fine to coarse, angular to subrounded of flint. Sand is coarse. [BEENHAM GRANGE GRAVEL MEMBER]	
						(1.75)	Soft to firm dark blue grey slightly sandy silty gravelly CLAY. Gravel is fine to coarse, angular to subrounded of flint. Sand is fine to coarse. Frequent shells. [BEENHAM GRANGE GRAVEL MEMBER]	
3.00	SPT	N5						
				35.62		4.00		
4.00	SPT	N9					(Window sample terminated at 4m)	

Boring Progress and Water Observations						General Remarks
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth	
						1. ES - Environmental Sample. N - SPT 'N' Value. 2. All depths were measured from ground level. 3. Groundwater was not encountered. 4. Monitoring install details: From 0.0mbgl to 1.0mbgl plain pipe with bentonite seal, 1.0mbgl to 4.0mbgl slotted pipe with a gravel filter. Monitoring installation fitted with end cap and gas bung tap. Fitted with raised cover. 5. Terminated at 4.0mbgl.

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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CGL WS LOG CG28390.GPJ GINT STD AGS 3.1.GDT 9/7/18

DYNAMIC PROBE LOG



Project Phase 6 - Green Park Village, Reading				PROBE No DP01
Job No CG/28390	Date 24-05-18	Ground Level (m) 37.40	Co-Ordinates (m) E 469,701.7 N 170,202.0	
Client Berkeley Homes (Western)				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	0 0 1 1								Refused at 6.8m bgl
	1 1 1 1								
	2 1 5 2								
	2 2 1 2								
2	1 2 1 1								
	1 1 1 1								
	1 1 1 1								
3	1 2 1 2								
	1 2 1 3								
4	5 10 7 5								
	7 8 11 11								
5	15 32 28 20								
	13 14 22 17								
6	18 27 25 30								
	41 41 45 50								
7									
8									
9									
10									

Hammer Wt (kg)	63.5		General Remarks Location adjacent to WS01
Hammer Drop (mm)	750		
Cone Dia (mm)	50.5		
Cone Type	DPSH-B		
Damper			

Method/ Plant Used	Tracked window sample rig	Field Crew	RP Drilling	Logged By	JMM	Checked By	SMK
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CGI DP LOG (STARTING DEPTH >0M) CG28390.GPJ GINT STD AGS 3.1 GDT 9/7/18

DYNAMIC PROBE LOG



Project Phase 6 - Green Park Village, Reading				PROBE No DP02
Job No CG/28390	Date 24-05-18	Ground Level (m) 37.57	Co-Ordinates (m) E 469,654.3 N 17,209.4	
Client Berkeley Homes (Western)				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	2 2 1 1								Refused at 9.2m bgl
	1 1 1 0								
	0 0 1 0								
	0 0 0 0								
2	0 0 1 1								
	1 1 1 0								
	2 1 2 2								
3	3 3 3 4								
	6 6 7 11								
	9 8 5 6								
4	6 6 8 13								
	9 9 11 14								
	19 20 18 17								
	18 18 17 17								
5	16 16 14 11								
	19 19 17 15								
	14 14 14 17								
6	20 19 19 26								
	40 43 50								
7									
8									
9									
10									

Hammer Wt (kg)	63.5	General Remarks Location adjacent to WS02
Hammer Drop (mm)	750	
Cone Dia (mm)	50.5	
Cone Type	DPSH-B	
Damper		

Method/ Plant Used	Tracked window sample rig	Field Crew RP Drilling	Logged By JMM	Checked By SMK
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CGL DP LOG (STARTING DEPTH > 0M) CG28390.GPJ GINT STD AGS 3.1 GDT 9/7/18

DYNAMIC PROBE LOG



Project Phase 6 - Green Park Village, Reading					PROBE No DP03	
Job No CG/28390	Date 25-05-18	Ground Level (m) 37.37	Co-Ordinates (m) E 469,684.1 N 170,242.4		Sheet 1 of 1	
Client Berkeley Homes (Western)						

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	3 1 1 1								Refuseal at 8.9m bgl
	1 1 1 1								
	1 1 1 1								
	1 1 1 1								
2	5 4 2 2								
	2 4 3 3								
	2 2 1 1								
	1 1 1 1								
3	1 2 4 4								
	4 5 7 11								
	10 8 7 7								
	8 9 9 9								
4	10 11 18 28								
	23 17 14 13								
	15 14 13 13								
	15 18 22 23								
5	20 17 17 17								
	15 14 15 16								
	33 40 43 47								
	50								
6									
7									
8									
9									
10									

Hammer Wt (kg)	63.5		General Remarks Location adjacent to WS05
Hammer Drop (mm)	750		
Cone Dia (mm)	50.5		
Cone Type	DPSH-B		
Damper			

Method/ Plant Used	Tracked window sample rig	Field Crew RP Drilling	Logged By JMM	Checked By SMK
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CGI DP LOG (STARTING DEPTH >0M) CG28390.GPJ GINT STD AGS 3.1 GDT 9/7/18

DYNAMIC PROBE LOG



Project Phase 6 - Green Park Village, Reading					PROBE No DP04	
Job No CG/28390	Date 25-05-18	Ground Level (m) 38.05	Co-Ordinates (m) E 469,641.1 N 170,268.4			
Client Berkeley Homes (Western)					Sheet 1 of 1	

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	2 2 2 2 2 2 1 1 2 1 0 0 1 1 6 22 37 41 50								Refusal at 1.9m bgl
2									
3									
4									
5									
6									
7									
8									
9									
10									

Hammer Wt (kg)	63.5		General Remarks Location adjacent to WS06
Hammer Drop (mm)	750		
Cone Dia (mm)	50.5		
Cone Type	DPSH-B		
Damper			

Method/ Plant Used	Tracked window sample rig	Field Crew RP Drilling	Logged By JMM	Checked By SMK
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CGI DP LOG (STARTING DEPTH >0M) CG28390.GPJ GINT STD AGS 3.1 GDT 9/7/18

DYNAMIC PROBE LOG



Project Phase 6 - Green Park Village, Reading				PROBE No DP04a
Job No CG/28390	Date 25-05-18	Ground Level (m) 38.05	Co-Ordinates (m) E 469,641.1 N 170,268.4	
Client Berkeley Homes (Western)				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	2 2 3 1								Refusal at 6.0m bgl
	2 1 1 2 2								
	1 1 1 1 1								
	1 2 3 2 6								
2	5 4 3 3 2								
	2 1 1 2 2								
3	1 2 2 1 2								
	2 2 2 2 2								
4	2 2 2 4								
	5 6 4 4 3								
5	4 5 4 2 6								
	8 10 9 9 9								
6	10								
7									
8									
9									
10									

Hammer Wt (kg)	63.5		General Remarks Location adjacent to WS06
Hammer Drop (mm)	750		
Cone Dia (mm)	50.5		
Cone Type	DPSH-B		
Damper			

Method/ Plant Used	Tracked window sample rig	Field Crew RP Drilling	Logged By JMM	Checked By SMK
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CGI DP LOG (STARTING DEPTH > 0M) CG28390.GPJ GINT STD AGS 3.1 GDT 9/7/18

APPENDIX C

Ground Gas and Groundwater Monitoring Results

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	04/06/2018	Engineer:	JMM
Time:	09:00	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐	
Wind:	Calm	☐	Light	☒	Moderate	☐	Strong	☐	
Cloud cover:	None	☐	Slight	☐	Cloudy	☐	Overcast	☒	
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐	
Barometric pressure (mb):		1009 - 1011		Local pressure system*:		Falling		Air temperature (°C): 20°C	

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
RWS633	0	<0.1	<0.1	20.5	0.5	<0.1	<0.1	2.01	4.07
	15	<0.1	<0.1	20.3	0.9	<0.1			
	30	<0.1	<0.1	20.3	0.9	<0.1			
	45			20.0	0.9	<0.1			
	60			20.0	0.9	<0.1			
	90			20.0	0.9	<0.1			
	120			20.0	0.9	<0.1			
	150			20.0	0.9	<0.1			
	180			20.0	0.9	<0.1			
	240								
	300								
WS01	0	<0.1	<0.1	20.2	<0.1	<0.1	0.4	0.43	3.55
	15	<0.1	<0.1	20.4	<0.1	<0.1			
	30	<0.1	<0.1	20.4	<0.1	<0.1			
	45			20.5	<0.1	<0.1			
	60			20.4	<0.1	<0.1			
	90			20.5	<0.1	<0.1			
	120			20.5	<0.1	<0.1			
	150			20.6	<0.1	<0.1			
	180			20.5	<0.1	<0.1			
	240								
	300								
RWS634	0	<0.1	<0.1	20.3	<0.1	<0.1	NR	0.81	2.51
	15	<0.1	<0.1	20.7	<0.1	<0.1			
	30	<0.1	<0.1	20.6	<0.1	<0.1			
	45			20.6	<0.1	<0.1			
	60			20.6	<0.1	<0.1			
	90			20.6	<0.1	<0.1			
	120			20.6	<0.1	<0.1			
	150			20.6	<0.1	<0.1			
	180			20.6	<0.1	<0.1			
	240								
	300								
RBH608	0	<0.1	<0.1	20.4	6.1	<0.1	<0.1	1.18	3.81
	15	<0.1	<0.1	13.1	6.1	7.4			
	30	<0.1	<0.1	13.4	5.4	8.2			
	60			14.1	4.7	7.2			
	90			14.8	4.2	6.3			
	120			15.7	3.4	5.0			
	150			16.5	2.9	4.4			
	180			17.0	2.4	3.7			
	240			18.1	1.8	2.6			
	300			18.5	1.6	2.3			
	330			18.7	1.3	2.0			
WS08a	0	<0.1	<0.1	19.8	<0.1	<0.1	0.3	1.25	4.03
	15	<0.1	<0.1	19.5	0.6	<0.1			
	30	<0.1	<0.1	19.3	0.7	<0.1			
	45			19.4	0.7	<0.1			
	60			19.1	0.7	<0.1			
	90			19.0	0.8	<0.1			
	120			18.7	0.8	<0.1			
	150			18.8	0.8	<0.1			
	180			18.6	0.9	<0.1			
	240			18.4	1.0	<0.1			
	300			18.0	1.1	<0.1			
	360			17.9	1.4	<0.1			

Notes:
The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.
* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.
NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	04/06/2018	Engineer:	JMM
Time:	09:00	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐	
Wind:	Calm	☐	Light	☒	Moderate	☐	Strong	☐	
Cloud cover:	None	☐	Slight	☐	Cloudy	☐	Overcast	☒	
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐	
Barometric pressure (mb):		1009 - 1011		Local pressure system*:		Falling		Air temperature (°C):	20°C

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
WS06	0	<0.1	<0.1	20.0	<0.1	<0.1	1.7	2.0	3.49
	15	<0.1	<0.1	17.6	0.5	<0.1			
	30	<0.1	<0.1	17.2	0.6	<0.1			
	45			17.0	0.6	<0.1			
	60			16.9	0.6	<0.1			
	90			16.9	0.6	<0.1			
	120			16.8	0.6	<0.1			
	150			16.8	0.6	<0.1			
	180			16.7	0.6	<0.1			
	240								
	300								
WS17	0	<0.1	<0.1	19.9	<0.1	<0.1	<0.1	1.70	3.90
	15	<0.1	<0.1	1.3	24.5	32.8			
	30	<0.1	<0.1	1.0	25.7	38.5			
	45			0.7	25.9	38.9			
	60			0.6	26.1	39.0			
	90			0.5	26.1	39.0			
	120			0.5	26.1	39.1			
	150			0.5	26.1	39.1			
	180			0.5	26.1	39.1			
	240			0.5	26.1	39.1			
	300								
WS09	0	<0.1	<0.1	16.8	<0.1	<0.1	<0.1	3.65	3.95
	15	<0.1	<0.1	7.1	12.1	16.3			
	30	<0.1	<0.1	5.4	12.7	15.7			
	45			5.1	12.9	15.9			
	60			4.9	12.9	16.2			
	90			4.8	13.0	16.0			
	120			4.5	13.1	16.4			
	150			3.9	13.6	16.9			
	180			3.6	13.7	17.4			
	240			2.7	14.2	18.2			
	300			2.0	14.6	18.7			
RBH603	0	<0.1	<0.1	NR	NR	NR	NR	2.63	4.48
	15	<0.1	<0.1	16.8	4.6	<0.1			
	30	<0.1	<0.1	16.7	4.6	<0.1			
	45			16.6	4.7	<0.1			
	60			16.5	4.7	<0.1			
	90			16.5	4.7	<0.1			
	120			16.5	4.7	<0.1			
	150			16.5	4.7	<0.1			
	180			16.5	4.7	<0.1			
	240			16.5	4.7	<0.1			
	300								
RWS629	0	<0.1	<0.1	20.4	<0.1	<0.1	<0.1	2.33	4.0
	15	<0.1	<0.1	3.6	6.0	58.2			
	30	<0.1	<0.1	3.0	5.9	59.4			
	45			3.5	5.5	57.0			
	60			4.2	5.2	55.0			
	90			5.5	4.8	49.7			
	120			7.0	4.3	44.8			
	150			7.6	4.1	42.4			
	180			8.5	3.9	39.2			
	240			10.3	3.3	33.5			
	300			11.2	2.9	30.5			

Notes:

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.

NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	04/06/2018	Engineer:	JMM
Time:	09:00	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐	
Wind:	Calm	☐	Light	☒	Moderate	☐	Strong	☐	
Cloud cover:	None	☐	Slight	☐	Cloudy	☐	Overcast	☒	
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐	
Barometric pressure (mb):		1009 - 1011		Local pressure system*:		Falling		Air temperature (°C): 20°C	

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
WS11	0	21.3	245.0	5.1	NR	NR	<0.1	2.49	4.38
	15	18.0	216.0	1.2	4.9	11.2			
	30	17.0	200.0	0.4	5.2	12.6			
	45	15.8	185.0	0.2	5.2	12.8			
	60	14.2	164.0	0.1	5.3	12.8			
	90			0.1	5.3	12.8			
	120			0.1	5.4	12.8			
	150			<0.1	5.4	12.8			
	180			<0.1	5.4	12.8			
	240								
	300								
WS13	0	<0.1	<0.1	20.2	<0.1	<0.1	<0.1	0.83	2.86
	15	<0.1	<0.1	17.1	0.7	<0.1			
	30	<0.1	<0.1	16.9	0.7	<0.1			
	45			17.3	0.6	<0.1			
	60			17.6	0.6	<0.1			
	90			17.8	0.5	<0.1			
	120			18.0	0.5	<0.1			
	150			17.5	0.6	<0.1			
	180			17.6	0.5	<0.1			
	240			18.0	0.5	<0.1			
	300			18.0	0.5	<0.1			
WS14	0	<0.1	<0.1	19.2	<0.1	<0.1	2.3	1.50	3.08
	15	<0.1	<0.1	11.0	3.6	0.3			
	30	<0.1	<0.1	9.8	3.8	0.6			
	45			9.5	3.8	0.7			
	60			9.4	3.8	0.6			
	90			9.4	3.8	0.6			
	120			9.4	3.8	0.6			
	150			9.4	3.8	0.5			
	180			9.4	3.8	0.5			
	240								
	300								
RBH606	0	Unable to monitor borehole as gas tap/bung did not form good seal within the monitoring installation						1.4	16.6
	15								
	30								
	45								
	60								
	90								
	120								
	150								
	180								
	240								
	300								
WS16	0	1.5	8.0	18.1	<0.1	<0.1	<0.1	1.39	3.43
	15	1.3	6.0	2.0	4.8	35.9			
	30	1.1	5.0	1.3	4.8	37.2			
	45	1.1	5.0	0.6	4.9	39.3			
	60			0.5	5.0	39.4			
	90			0.4	5.0	39.4			
	120			0.3	5.0	39.4			
	150			0.3	5.0	39.5			
	180			0.3	5.0	39.5			
	240								
	300								

Notes:
The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.
* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.
NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	18/06/2018	Engineer:	EJS
Time:	09:00	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐	
Wind:	Calm	☐	Light	☐	Moderate	☒	Strong	☐	
Cloud cover:	None	☐	Slight	☐	Cloudy	☒	Overcast	☐	
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐	
Barometric pressure (mb):	1013		Local pressure system*:	Rising		Air temperature (°C):		20	

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
RWS633	0	<0.1	<0.1	20.2	<0.1	<0.1	NR	2.13	4.03
	15	<0.1	<0.1	19.5	1.6	<0.1			
	30	<0.1	<0.1	19.1	1.7	<0.1			
	45	<0.1	<0.1	19.0	1.7	<0.1			
	60	<0.1	<0.1	18.9	1.7	<0.1			
	90	<0.1	<0.1	18.9	1.7	<0.1			
	120	<0.1	<0.1	18.9	1.7	<0.1			
	150	<0.1	<0.1	18.9	1.7	<0.1			
	180	<0.1	<0.1	18.9	1.7	<0.1			
	240			18.9	1.8	<0.1			
	300			18.8	1.8	<0.1			
	360			18.8	1.8	<0.1			
WS01	0	<0.1	<0.1	20.2	<0.1	<0.1	NR	0.79	3.66
	15	<0.1	<0.1	20.4	<0.1	<0.1			
	30	<0.1	<0.1	20.2	<0.1	<0.1			
	45	<0.1	<0.1	20.2	<0.1	<0.1			
	60	<0.1	<0.1	20.3	<0.1	<0.1			
	90	<0.1	<0.1	20.3	<0.1	<0.1			
	120	<0.1	<0.1	20.4	<0.1	<0.1			
	150	<0.1	<0.1	20.4	<0.1	<0.1			
	180	<0.1	<0.1	20.4	<0.1	<0.1			
	240			20.4	<0.1	<0.1			
	300			20.5	<0.1	<0.1			
WS08A	0	<0.1	<0.1	20.4	0.0	<0.1	NR	0.45	4.02
	15	<0.1	<0.1	18.4	3.4	<0.1			
	30	<0.1	<0.1	17.8	3.7	<0.1			
	45	<0.1	<0.1	17.7	3.7	<0.1			
	60	<0.1	<0.1	17.7	3.7	<0.1			
	90	<0.1	<0.1	17.6	3.7	<0.1			
	120	<0.1	<0.1	17.7	3.7	<0.1			
	150	<0.1	<0.1	17.6	3.7	<0.1			
	180	<0.1	<0.1	17.6	3.7	<0.1			
	240			17.6	3.7	<0.1			
	300			17.6	3.7	<0.1			
WS17	0	<0.1	<0.1	20.2	<0.1	<0.1	NR	2.3	4.0
	15	<0.1	<0.1	4.7	18.2	18.1			
	30	<0.1	<0.1	6.8	20.5	17.7			
	45	<0.1	<0.1	6.7	20.7	17.9			
	60	<0.1	<0.1	6.7	20.7	18.0			
	90	<0.1	<0.1	6.8	20.5	17.7			
	120	<0.1	<0.1	7.1	20.2	17.3			
	150	<0.1	<0.1	7.1	19.9	16.8			
	180	<0.1	<0.1	7.4	19.4	16.3			
	240			8.3	18.4	14.5			
	300			8.7	17.2	12.7			
	360			9.4	15.2	10.1			
WS06	0	<0.1	<0.1	19.4	0.2	<0.1	NR	1.87	4.03
	15	<0.1	<0.1	17.8	1.3	<0.1			
	30	<0.1	<0.1	17.2	1.3	<0.1			
	45	<0.1	<0.1	17.1	1.3	<0.1			
	60	<0.1	<0.1	17.0	1.3	<0.1			
	90	<0.1	<0.1	17.0	1.3	<0.1			
	120	<0.1	<0.1	17.0	1.3	<0.1			
	150	<0.1	<0.1	16.9	1.3	<0.1			
	180	<0.1	<0.1	16.9	1.4	<0.1			
	240			16.7	1.4	<0.1			
	300			16.4	1.6	<0.1			
	360			16.1	1.7	<0.1			
	420			15.9	1.8	<0.1			
	480			15.8	1.7	<0.1			
	540			15.9	1.6	<0.1			

Notes:

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.

NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	18/06/2018	Engineer:	EJS
Time:	09:00	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐	
Wind:	Calm	☐	Light	☐	Moderate	☒	Strong	☐	
Cloud cover:	None	☐	Slight	☐	Cloudy	☒	Overcast	☐	
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐	
Barometric pressure (mb):		1013-1014		Local pressure system*:		Rising		Air temperature (°C):	20

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
WS09	0	<0.1	<0.1	19.8	<0.1	<0.1	NR	3.38	3.94
	15	<0.1	<0.1	3.2	16.2	15.9			
	30	<0.1	<0.1	2.0	18.3	18.6			
	45	<0.1	<0.1	1.7	18.5	19.0			
	60	<0.1	<0.1	1.7	18.5	19.1			
	90	<0.1	<0.1	1.5	18.6	19.2			
	120	<0.1	<0.1	1.4	18.7	19.2			
	150	<0.1	<0.1	1.3	18.7	19.4			
	180	<0.1	<0.1	1.3	18.7	19.5			
	240			1.0	19.0	19.5			
	300			0.6	19.3	19.9			
	360			0.2	19.5	20.3			
	420			0.0	19.7	20.6			
	480			0.0	19.8	20.2			
	540			0.0	19.7	19.8			
	600			0.4	19.5	18.7			
RBH603	0	<0.1	<0.1	18.7	0.6	<0.1	NR	2.86	4.41
	15	<0.1	<0.1	16.7	5.7	<0.1			
	30	<0.1	<0.1	16.1	6.0	<0.1			
	45	<0.1	<0.1	16.1	6.0	<0.1			
	60	<0.1	<0.1	16.0	6.1	<0.1			
	90	<0.1	<0.1	16.0	6.1	<0.1			
	120	<0.1	<0.1	16.0	6.1	<0.1			
	150	<0.1	<0.1	16.0	6.1	<0.1			
	180	<0.1	<0.1	16.0	6.1	<0.1			
	240			15.9	6.1	<0.1			
	300			15.9	6.1	<0.1			
RWS629	0	<0.1	<0.1	16.1	<0.1	<0.1	NR	2.82	4.03
	15	<0.1	<0.1	2.3	12.8	49.9			
	30	<0.1	<0.1	0.2	13.3	54.9			
	45	<0.1	<0.1	0.1	13.5	55.2			
	60	<0.1	<0.1	0.0	13.5	55.4			
	90	<0.1	<0.1	0.0	13.5	55.5			
	120	<0.1	<0.1	0.0	13.6	55.7			
	150	<0.1	<0.1	0.0	13.6	55.7			
	180	<0.1	<0.1	-0.1	13.6	55.6			
	240			-0.1	13.6	55.9			
	300			-0.1	13.7	56.0			
	360			-0.1	13.7	55.9			
	420			-0.1	13.7	55.8			
WS11	0	3.5	16.0	10.7	3.5	0.4	NR	3.2	4.3
	15	3.7	17.0	1.3	15.0	54.9			
	30	3.0	12.0	0.1	15.7	59.9			
	45	0.9	3.0	<0.1	15.8	61.0			
	60	<0.1	<0.1	<0.1	15.8	61.1			
	90	<0.1	<0.1	<0.1	15.9	61.2			
	120	<0.1	<0.1	<0.1	15.9	61.2			
	150	<0.1	<0.1	<0.1	15.9	61.1			
	180	<0.1	<0.1	<0.1	15.9	60.8			
	240			<0.1	15.9	60.8			
	300			0.1	15.9	60.8			
WS13	0	<0.1	<0.1	17.8	0.1	<0.1	NR	0.94	2.45
	15	<0.1	<0.1	19.0	2.3	<0.1			
	30	<0.1	<0.1	19.5	1.6	<0.1			
	45	<0.1	<0.1	20.1	0.9	<0.1			
	60	<0.1	<0.1	20.2	0.8	<0.1			
	90	<0.1	<0.1	20.5	0.4	<0.1			
	120	<0.1	<0.1	20.6	0.2	<0.1			
	150	<0.1	<0.1	20.6	0.1	<0.1			
	180	<0.1	<0.1	20.7	<0.1	<0.1			
	240			20.7	<0.1	<0.1			
	300			20.7	<0.1	<0.1			

Notes:

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.
 * With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.
 NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	18/06/2018	Engineer:	EJS
Time:	09:00	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION								
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐
Wind:	Calm	☐	Light	☐	Moderate	☒	Strong	☐
Cloud cover:	None	☐	Slight	☐	Cloudy	☒	Overcast	☐
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐
Barometric pressure (mb):	1013-1014		Local pressure system*:	Rising		Air temperature (°C):	20	

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
WS14	0	<0.1	<0.1	20.2	<0.1	<0.1	NR	2.23	3.06
	15	<0.1	<0.1	20.3	1.2	<0.1			
	30	<0.1	<0.1	20.0	1.3	<0.1			
	45	<0.1	<0.1	19.9	1.3	<0.1			
	60	<0.1	<0.1	19.9	1.3	<0.1			
	90	<0.1	<0.1	19.9	1.3	<0.1			
	120	<0.1	<0.1	19.8	1.2	<0.1			
	150	<0.1	<0.1	19.9	1.2	<0.1			
	180	<0.1	<0.1	19.9	1.1	<0.1			
	240			20.0	1.0	<0.1			
	300			20.1	0.8	<0.1			
WS16	0	<0.1	<0.1	20.1	0.8	<0.1	NR	1.73	3.03
	15	<0.1	<0.1	2.4	5.9	27.1			
	30	<0.1	<0.1	0.5	6.1	28.8			
	45	<0.1	<0.1	0.3	6.2	29.1			
	60	<0.1	<0.1	0.2	6.2	29.2			
	90	<0.1	<0.1	0.1	6.2	29.4			
	120	<0.1	<0.1	<0.1	6.2	29.5			
	150	<0.1	<0.1	<0.1	6.3	29.5			
	180	<0.1	<0.1	<0.1	6.3	29.7			
	240			<0.1	6.3	29.8			
	300			<0.1	6.3	30.1			
	360			<0.1	6.3	30.3			
	420			<0.1	6.3	30.4			
	480			<0.1	6.4	30.3			
	540			<0.1	6.3	30.3			
	600			<0.1	6.1	29.6			
RWS634	0	<0.1	<0.1	17.1	<0.1	<0.1	NR	0.58	2.09
	15	<0.1	<0.1	20.8	<0.1	<0.1			
	30	<0.1	<0.1	20.9	<0.1	<0.1			
	45	<0.1	<0.1	20.9	<0.1	<0.1			
	60	<0.1	<0.1	20.9	<0.1	<0.1			
	90	<0.1	<0.1	20.9	<0.1	<0.1			
	120	<0.1	<0.1	20.9	<0.1	<0.1			
	150	<0.1	<0.1	20.8	<0.1	<0.1			
	180	<0.1	<0.1	20.8	<0.1	<0.1			
	240			20.8	<0.1	<0.1			
	300			20.8	<0.1	<0.1			

Notes:

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.

NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	02/07/2018	Engineer:	EJS
Time:	08:30	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐	
Wind:	Calm	☐	Light	☐	Moderate	☒	Strong	☐	
Cloud cover:	None	☒	Slight	☐	Cloudy	☐	Overcast	☐	
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐	
Barometric pressure (mb):		1007		Local pressure system*:		Constant		Air temperature (°C):	25

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
RWS 633	0	<0.1	<0.1	20.5	<0.1	<0.1	<0.1	2.23	4.03
	15	<0.1	<0.1	20.6	0.3	<0.1			
	30	<0.1	<0.1	20.3	0.3	<0.1			
	45	<0.1	<0.1	20.2	0.3	<0.1			
	60	<0.1	<0.1	20.2	0.4	<0.1			
	90	<0.1	<0.1	20.2	0.4	<0.1			
	120	<0.1	<0.1	20.2	0.4	<0.1			
	150			20.2	0.4	<0.1			
	180			20.2	0.4	<0.1			
	240			20.1	0.4	<0.1			
	300			20.1	0.4	<0.1			
WS01	0	<0.1	<0.1	20.5	<0.1	<0.1	<0.1	0.83	3.62
	15	<0.1	<0.1	18.6	<0.1	<0.1			
	30	<0.1	<0.1	17.9	<0.1	<0.1			
	45	<0.1	<0.1	17.8	<0.1	<0.1			
	60	<0.1	<0.1	17.8	<0.1	<0.1			
	90	<0.1	<0.1	17.7	<0.1	<0.1			
	120	<0.1	<0.1	17.7	<0.1	<0.1			
	150			17.6	<0.1	<0.1			
	180			17.6	<0.1	<0.1			
	240			17.7	<0.1	<0.1			
	300			17.7	<0.1	<0.1			
WS08A	0	<0.1	<0.1	20.3	<0.1	<0.1	9.5	1.59	4.03
	15	<0.1	<0.1	18.0	3.7	<0.1	<0.1		
	30	<0.1	<0.1	17.7	3.9	<0.1			
	45	<0.1	<0.1	17.6	4.0	<0.1			
	60	<0.1	<0.1	17.4	4.0	<0.1			
	90	<0.1	<0.1	17.4	4.0	<0.1			
	120	<0.1	<0.1	17.5	4.0	<0.1			
	150			17.5	4.0	<0.1			
	180			17.3	4.0	<0.1			
	240			17.3	4.0	<0.1			
	300			17.3	4.0	<0.1			
WS17	0	<0.1	<0.1	20.2	<0.1	<0.1	<0.1	2.46	3.91
	15	<0.1	<0.1	5.1	26.6	25.8			
	30	<0.1	<0.1	2.9	28.4	29.2			
	45	<0.1	<0.1	2.7	28.7	29.7			
	60	<0.1	<0.1	2.6	28.8	29.8			
	90	<0.1	<0.1	2.5	29.1	30.2			
	120	<0.1	<0.1	2.3	29.2	30.4			
	150			2.2	29.5	30.5			
	180			2.0	29.7	31.0			
	240			1.6	30.4	31.7			
	300			1.1	31.5	32.5			
	360			0.6	32.2	33.3			
	420			0.2	33.2	33.8			
	480			<0.1	33.6	34.3			
	540			<0.1	33.6	34.2			
	600			<0.1	33.5	34.2			

Notes:

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.

NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS									
Site:	Phase 6 Green Park, Reading					Job No:	CG/28390		
Date:	02/07/2018					Engineer:	EJS		
Time:	08:30					Client:	Berkely Homes		

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	x	Moist		Wet		Snow		
Wind:	Calm		Light		Moderate	x	Strong		
Cloud cover:	None	x	Slight		Cloudy		Overcast		
Precipitation:	None	x	Slight		Moderate		Heavy		
Barometric pressure (mb):		1007		Local pressure system*:		Constant		Air temperature (°C):	25

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID	(ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
WS06	0	<0.1	<0.1	18.5	0.9	0.7	<0.1		2.06	4.15
	15	<0.1	<0.1	17.7	2.2	<0.1				
	30	<0.1	<0.1	17.2	2.2	<0.1				
	45	<0.1	<0.1	17.1	2.2	<0.1				
	60	<0.1	<0.1	17.0	2.2	<0.1				
	90	<0.1	<0.1	17.0	2.2	<0.1				
	120	<0.1	<0.1	16.9	2.2	<0.1				
	150			16.8	2.3	<0.1				
	180			16.7	2.3	<0.1				
	240			16.4	2.4	<0.1				
	300			16.1	2.7	<0.1				
	360			15.8	2.8	<0.1				
	420			15.6	3.1	<0.1				
	480			15.5	3.1	<0.1				
	540			15.5	3.0	<0.1				
	600			15.7	2.7	<0.1				
	WS09	0	<0.1	<0.1	20.2	<0.1	<0.1	<0.1		2.98
15		<0.1	<0.1	4.4	17.9	18.5				
30		<0.1	<0.1	2.6	18.9	20.4				
45		<0.1	<0.1	2.4	19.2	20.9				
60		<0.1	<0.1	2.3	19.2	21.1				
90		<0.1	<0.1	2.0	19.4	21.3				
120		<0.1	<0.1	1.9	19.5	21.5				
150				1.5	19.8	21.8				
180				1.3	20.0	22.0				
240				1.0	20.3	22.2				
300				0.7	20.8	22.6				
360				0.3	21.2	22.9				
420				0.0	21.5	23.2				
480				0.0	21.7	23.1				
540				0.0	21.6	22.9				
600				0.3	21.3	22.0				
RBH 603		0	<0.1	<0.1	18.0	0.6	0.9	<0.1		2.86
	15	<0.1	<0.1	10.5	9.8	<0.1				
	30	<0.1	<0.1	9.4	11.9	<0.1				
	45	<0.1	<0.1	9.3	11.1	<0.1				
	60	<0.1	<0.1	9.1	11.2	<0.1				
	90	<0.1	<0.1	9.0	11.3	<0.1				
	120	<0.1	<0.1	9.0	11.3	<0.1				
	150			8.9	11.3	<0.1				
	180			8.9	11.4	<0.1				
	240			8.8	11.5	<0.1				
	300			8.7	11.7	<0.1				
	360			8.6	11.8	<0.1				
	420			8.5	11.9	<0.1				
	480			8.4	12.0	<0.1				
	540			8.4	12.0	<0.1				
	600			8.4	12.0	<0.1				
	WS13	0	<0.1	<0.1	18.8	0.4	0.9	<0.1		1.7
15		<0.1	<0.1	18.9	2.5	<0.1				
30		<0.1	<0.1	19.7	1.7	<0.1				
45		<0.1	<0.1	20.0	1.2	<0.1				
60		<0.1	<0.1	20.2	1.1	<0.1				
90		<0.1	<0.1	20.7	0.5	<0.1				
120		<0.1	<0.1	20.5	0.8	<0.1				
150				20.8	0.5	<0.1				
180				20.9	0.5	<0.1				
240				20.8	0.5	<0.1				
300			21.0	0.2	<0.1					
WS11	0	<0.1	<0.1	17.6	0.4	2.0	<0.1		3.43	4.35
	15	<0.1	<0.1	3.0	20.6	53.9				
	30	<0.1	<0.1	1.0	23.3	60.0				
	45	<0.1	<0.1	0.9	23.7	61.1				
	60	<0.1	<0.1	0.7	23.8	61.5				
	90	<0.1	<0.1	0.6	24.0	61.8				
	120	<0.1	<0.1	0.5	24.1	62.2				
	150			0.4	24.1	62.4				
	180			0.4	24.2	62.4				
	240			0.4	24.3	62.8				
	300			0.4	24.4	62.8				
	360			0.3	24.6	63.2				
	420			0.5	24.5	62.5				
480			0.8	24.2	61.1					

Notes:

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.

NR= Not recorded

GAS MONITORING RECORD SHEET

JOB DETAILS			
Site:	Phase 6 Green Park, Reading	Job No:	CG/28390
Date:	02/07/2018	Engineer:	EJS
Time:	08:30	Client:	Berkely Homes

METEOROLOGICAL & SITE INFORMATION									
State of ground:	Dry	☒	Moist	☐	Wet	☐	Snow	☐	
Wind:	Calm	☐	Light	☐	Moderate	☒	Strong	☐	
Cloud cover:	None	☒	Slight	☐	Cloudy	☐	Overcast	☐	
Precipitation:	None	☒	Slight	☐	Moderate	☐	Heavy	☐	
Barometric pressure (mb):	1007		Local pressure system*:	Constant		Air temperature (°C):	25		

Well No.	Time (s)	Flow (l/hr)	dA (PA)	O ₂ (% vol. in air)	CO ₂ (% vol. in air)	CH ₄ (% vol. in air)	PID (ppm)	Depth to Groundwater (mbgl)	Depth to base (mbgl)
RWS 629	0	<0.1	<0.1	18.8	0.3	<0.1	<0.1	2.97	4.01
	15	<0.1	<0.1	2.7	17.1	70.5			
	30	<0.1	<0.1	0.6	17.9	76.4			
	45	<0.1	<0.1	0.3	18.2	77.5			
	60	<0.1	<0.1	0.2	18.2	77.6			
	90	<0.1	<0.1	0.1	18.3	78.1			
	120	<0.1	<0.1	<0.1	18.4	78.1			
	150			<0.1	18.3	78.1			
	180			<0.1	18.4	78.3			
	240			<0.1	18.5	78.3			
	300			<0.1	18.5	78.5			
	360			<0.1	18.6	78.7			
	420			<0.1	18.5	78.6			
	480			<0.1	18.6	78.3			
	540			0.2	18.4	77.4			
	600			0.5	18.2	76.0			
WS14	0	<0.1	<0.1	20.5	<0.1	<0.1	<0.1	2.37	3.06
	15	<0.1	<0.1	16.7	3.0	<0.1			
	30	<0.1	<0.1	16.2	3.1	<0.1			
	45	<0.1	<0.1	16.1	3.2	<0.1			
	60	<0.1	<0.1	16.1	3.2	<0.1			
	90	<0.1	<0.1	16.1	3.2	<0.1			
	120	<0.1	<0.1	16.1	3.2	<0.1			
	150			16.1	3.2	<0.1			
	180			16.2	3.2	<0.1			
	240			16.4	3.1	<0.1			
	300			16.8	3.0	<0.1			
WS16	0	<0.1	<0.1	20.1	<0.1	<0.1	<0.1	1.86	3.01
	15	<0.1	<0.1	4.2	9.2	29.1			
	30	<0.1	<0.1	2.8	9.5	31.8			
	45	<0.1	<0.1	2.6	9.6	32.2			
	60	<0.1	<0.1	2.5	9.6	32.5			
	90	<0.1	<0.1	2.4	9.6	32.5			
	120	<0.1	<0.1	2.4	9.6	32.4			
	150			2.3	9.6	32.5			
	180			2.3	9.6	32.5			
	240			2.1	9.7	32.7			
	300			1.9	9.7	33.0			
	360			1.7	9.7	33.6			
	420			1.5	9.8	33.8			
	480			1.4	9.8	33.9			
	540			1.3	9.7	33.9			
	600			1.3	9.6	33.8			
RWS 634	0	<0.1	<0.1	18.0	<0.1	0.3	<0.1	0.83	2.23
	15	<0.1	<0.1	21.1	<0.1	<0.1			
	30	<0.1	<0.1	21.1	<0.1	<0.1			
	45	<0.1	<0.1	21.1	<0.1	<0.1			
	60	<0.1	<0.1	21.1	<0.1	<0.1			
	90	<0.1	<0.1	21.1	<0.1	<0.1			
	120	<0.1	<0.1	21.1	<0.1	<0.1			
	150			21.1	<0.1	<0.1			
	180			21.1	<0.1	<0.1			
	240			21.2	<0.1	<0.1			
	300			21.3	<0.1	<0.1			
RBH 606	0							2.26	18.46
	15								
	30								
	45								
	60								
	90								
	120								
	150								
	180								
	240								
	300								

Notes:

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

* With reference to the Weather Underground rolling weather archive for Benson Air Base weather station.

NR= Not recorded

GROUNDWATER MONITORING RECORD SHEET

JOB DETAILS			
Site:	Green Park, Reading	Job No:	CG/28390
Date:	04/06/2018	Engineer:	EJS/JMM
Time:	08:00 - 16:00	Client:	Berkeley Homes
Weather:	Overcast, dry		

MONITORING & SAMPLING DETAILS								
Well / Borehole reference:	RWS633	WS01	RWS634	WS08A	RBH608	WS06	WS09	RBH603
Monitoring details								
Ground elevation (+mOD)								
Groundwater depth (mbgl)	2.5	0.43	0.81	1.62	1.18	2.02	4.4	2.63
Groundwater elevation (+mOD)								
Depth to base of well (mbgl)	4.56	3.55	2.51	4.4	3.81	3.49	4.4	4.48
Diameter of well (m)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Condition of well	Good	Good	Good	Good	Good	Good	Good	Good
Top of response zone (mbgl)								
Base of response zone (mbgl)								
Free product thickness (m)	None	None	None	None	None	None	None	None
Hydrocarbon sheen noted (Y/N)	N	N	N	N	N	N	N	N
Purging details								
Purge method	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer
Purged volume (litres)	12	18	10	22	16	9	Not purged	Not purged
Recharge (good / poor)	Good	Good	Good	Good	Good	Good	Poor	Poor
Sampling details								
Sampling method	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer
Volume of water sample taken (litres)	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	1x jar 1x viles	2x jar 2x viles
Volume of free product sample taken (litres)	None	None	None	None	None	None	None	None
Colour / odours noted*	grey brown	light brown	sulphurous/dark grey	grey	light grey brown	Light brown	fairly clear	light brown/cloudy
In-situ measurements								
pH	6.7	8.39	6.9	7.07	7.06	7.03	NR	7.23
Temperature (°C)	14	14	14.8	12.4	13	14	NR	14
Dissolved oxygen (mg/l)	0	0	4.9	5.7	17	1.4	NR	133
Redox potential (mV)	-34		294	124	158	147	NR	18
Electrical conductivity (µS/cm)	1218	2496	1827	2071	2101	2730	NR	1305
Total dissolved solids (ppt)	608	1245	916	1033	1051	1365	NR	652

* Respiratory protective equipment to be worn if odours are noted during initial monitoring & on sites which are potentially contaminated

NOTES	
Water level after purge: RWS633 - 2.53mbgl WS01 - 2.78mbgl RWS634 - 0.81mbgl WS08A - 1.8mbgl RBH608 - 1.65mbgl WS06 - 2.03mbgl. WS09 and RBH603 not purged, They were positioned at a higher level and did not recharge well. RWS633, WS01, RWS634, WS08A, RBH608 and WS06 water level measured from top of cover.	

GROUNDWATER MONITORING RECORD SHEET

JOB DETAILS			
Site:	Green Park, Reading	Job No:	CG/28390
Date:	04/06/2018	Engineer:	EJS/JMM
Time:	08:00 - 16:00	Client:	Berkeley Homes
Weather:	Overcast, dry		

MONITORING & SAMPLING DETAILS								
Well / Borehole reference:	WS17	RWS629	WS11	WS14	RBH606	WS13	WS16	
Monitoring details								
Ground elevation (+mOD)								
Groundwater depth (mbgl)	1.7	2.33	2.49	1.5	1.41	0.83	1.39	
Groundwater elevation (+mOD)								
Depth to base of well (mbgl)	3.9	4.03	4.38	3.08	16.62	2.86	3.43	
Diameter of well (m)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Condition of well	Good	Good	Good	Good	Good	Good	Good	
Top of response zone (mbgl)								
Base of response zone (mbgl)								
Free product thickness (m)	None	None	None	None	None	None	None	
Hydrocarbon sheen noted (Y/N)	None	None	None	None	None	None	None	
Purging details								
Purge method	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	
Purged volume (litres)	7	10	11	9	60	12	15	
Recharge (good / poor)	Good	Good	Good	Good	Good	Good	Good	
Sampling details								
Sampling method	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	Bailer	
Volume of water sample taken (litres)	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	2x jar 2x viles	
Volume of free product sample taken (litres)	None	None	None	None	None	None	None	
Colour / odours noted*	Orange becoming dark grey	Stagnant water clear. Turbid water black organic fragments in column	Orange					
In-situ measurements								
pH	NR	NR	NR	NR	NR	6.95	7.01	
Temperature (°C)	NR	NR	NR	NR	NR	12.5	14	
Dissolved oxygen (mg/l)	NR	NR	NR	NR	NR	9.5	44	
Redox potential (mV)	NR	NR	NR	NR	NR	-38	-62	
Electrical conductivity (µS/cm)	NR	NR	NR	NR	NR	1298	1390	
Total dissolved solids (ppt)	NR	NR	NR	NR	NR	648	695	
* Respiratory protective equipment to be worn if odours are noted during initial monitoring & on sites which are potentially contaminated								

NOTES	
WS13 and WS16 water level was measured from top of cover.	

APPENDIX D

Chemical Laboratory Results

**Jess McDermott**

Card Geotechnics Ltd
4 Godalming Business Centre
Woolsack Way
Godalming
Surrey
GU7 1XW

t: 01483 310600
f: 01483 527285
e: jessicam@cgl-uk.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 18-87098

Replaces Analytical Report Number : 18-87098, issue no. 1

Project / Site name:	Green Park Phase 6	Samples received on:	25/05/2018
Your job number:	CG-28390	Samples instructed on:	30/05/2018
Your order number:	788	Analysis completed by:	14/06/2018
Report Issue Number:	2	Report issued on:	14/06/2018
Samples Analysed:	10 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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4041



Environmental Science

Analytical Report Number: 18-87098

Project / Site name: Green Park Phase 6

Your Order No: 788

Lab Sample Number				970530	970531	970532	970533	970534
Sample Reference				WS01	WS02	WS02	WS03	WS03
Sample Number				ES1	ES1	ES2	ES1	ES2
Depth (m)				0.60	1.80	2.70	0.60	1.45
Date Sampled				23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	16	16	25	8.1	14
Total mass of sample received	kg	0.001	NONE	1.1	1.1	0.93	1.2	1.1

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Amosite	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001	-	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	8.5	8.2	7.9	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	2400	1900	2000	6300	550
Organic Matter	%	0.1	MCERTS	1.5	1.6	2.2	2.3	0.8

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.19	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.31	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.24	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.73	1.3	0.22	3.1	0.60
Anthracene	mg/kg	0.05	MCERTS	0.18	0.35	< 0.05	0.74	0.17
Fluoranthene	mg/kg	0.05	MCERTS	1.2	2.5	0.60	7.2	1.2
Pyrene	mg/kg	0.05	MCERTS	1.0	2.1	0.61	6.1	0.90
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.55	1.2	0.34	4.5	0.60
Chrysene	mg/kg	0.05	MCERTS	0.46	0.80	0.29	2.7	0.48
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.60	1.1	0.53	4.8	0.69
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.31	0.52	0.16	2.5	0.30
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.58	1.1	0.42	4.1	0.61
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.34	0.53	0.23	2.9	0.37
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.70	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.35	0.50	0.27	2.8	0.37
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	6.3	12	3.7	43	6.3
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Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.9	2.0	1.9	2.1	< 1.0
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	8.6	8.9	12	8.7
Barium (aqua regia extractable)	mg/kg	1	MCERTS	85	74	75	120	45
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.76	0.76	0.88	0.62	0.42
Boron (water soluble)	mg/kg	0.2	MCERTS	2.0	2.2	2.7	2.4	1.0
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	26	27	29	18	12
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	27	29	18	12
Copper (aqua regia extractable)	mg/kg	1	MCERTS	22	20	26	30	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	59	41	41	120	15
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	0.6	< 0.3	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	15	18	14	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.1	< 1.0	< 1.0	1.3	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	38	36	35	30	19
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	68	71	84	170	41

Analytical Report Number: 18-87098

Project / Site name: Green Park Phase 6

Your Order No: 788

Lab Sample Number	970530	970531	970532	970533	970534
Sample Reference	WS01	WS02	WS02	WS03	WS03
Sample Number	ES1	ES1	ES2	ES1	ES2
Depth (m)	0.60	1.80	2.70	0.60	1.45
Date Sampled	23/05/2018	23/05/2018	23/05/2018	23/05/2018	23/05/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Monoaromatics

Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	31	26	70	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	31	27	76	< 10

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	4.0	< 2.0	5.2	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	34	< 10	47	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	97	28	310	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	18	130	35	360	15



Analytical Report Number: 18-87098

Project / Site name: Green Park Phase 6

Your Order No: 788

Lab Sample Number	970535	970536	970537	970538	970539
Sample Reference	WS03	WS04	WS05	WS06	WS06
Sample Number	ES3	ES1	ES1	ES1	ES2
Depth (m)	2.60	0.70	0.50	0.80	1.90
Date Sampled	23/05/2018	23/05/2018	24/05/2018	24/05/2018	24/05/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	11	15
Total mass of sample received	kg	0.001	NONE	1.2	0.96

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.130	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	0.130	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.7	8.7	10.9	8.0	7.4
Total Cyanide	mg/kg	1	MCERTS	2	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	890	2800	4800	1400	1400
Organic Matter	%	0.1	MCERTS	2.4	1.4	1.1	1.3	4.4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.15
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.69
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.46
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	1.9	0.44	0.52	6.0
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.51	0.16	0.14	1.6
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	5.1	1.1	1.2	17
Pyrene	mg/kg	0.05	MCERTS	< 0.05	4.4	1.0	1.1	14
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	2.3	0.57	0.66	7.6
Chrysene	mg/kg	0.05	MCERTS	< 0.05	1.3	0.46	0.51	5.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.7	0.67	0.75	9.0
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.1	0.32	0.38	2.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.9	0.68	0.75	7.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.88	0.34	0.39	4.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.25	< 0.05	< 0.05	1.1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.80	0.34	0.43	4.0
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	< 0.9	22	6.1	6.8	82
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Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.4	1.3	1.9	1.4	3.4
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	7.8	11	13	10
Barium (aqua regia extractable)	mg/kg	1	MCERTS	58	61	63	96	200
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.59	0.75	0.60	0.83	0.82
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	1.8	2.1	1.7	2.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	0.6
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	35	24	22	30	30
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35	23	22	29	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27	16	15	22	68
Lead (aqua regia extractable)	mg/kg	1	MCERTS	61	33	30	38	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.5	0.3	0.4	< 0.3	1.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	15	13	18	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.4	< 1.0	< 1.0	< 1.0	2.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	26	34	38	43	33
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	89	52	52	63	210

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Project / Site name: Green Park Phase 6

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Lab Sample Number				970535	970536	970537	970538	970539
Sample Reference				WS03	WS04	WS05	WS06	WS06
Sample Number				ES3	ES1	ES1	ES1	ES2
Depth (m)				2.60	0.70	0.50	0.80	1.90
Date Sampled				23/05/2018	23/05/2018	24/05/2018	24/05/2018	24/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	14
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	14

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	2.5	< 2.0	8.9
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	23	14	11	95
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	72	55	61	230
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	11	97	71	73	340



Analytical Report Number: 18-87098
Project / Site name: Green Park Phase 6
Your Order No: 788

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
970530	WS01	0.60	138	Loose Fibres	Amosite	< 0.001	< 0.001
970536	WS04	0.70	149	Hard/Cement Type Material	Chrysotile	0.130	0.130

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.



Analytical Report Number : 18-87098

Project / Site name: Green Park Phase 6

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
970530	WS01	ES1	0.60	Brown clay and sand.
970531	WS02	ES1	1.80	Brown clay and sand with gravel.
970532	WS02	ES2	2.70	Brown clay and sand.
970533	WS03	ES1	0.60	Brown clay and sand with gravel.
970534	WS03	ES2	1.45	Brown clay and gravel with chalk.
970535	WS03	ES3	2.60	Brown clay and sand with gravel.
970536	WS04	ES1	0.70	Brown clay with gravel.
970537	WS05	ES1	0.50	Brown clay with gravel.
970538	WS06	ES1	0.80	Brown clay with gravel.
970539	WS06	ES2	1.90	Brown clay and sand.

Analytical Report Number : 18-87098

Project / Site name: Green Park Phase 6

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Iss No 18-87098-2 Green Park Phase 6 CG-28390

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The results included within the report are representative of the samples submitted for analysis.

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Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS01	ES1	S	18-87098	970530	c	Total cyanide in soil	L080-PL	c
WS02	ES1	S	18-87098	970531	c	Total cyanide in soil	L080-PL	c
WS02	ES2	S	18-87098	970532	c	Total cyanide in soil	L080-PL	c
WS03	ES1	S	18-87098	970533	c	Total cyanide in soil	L080-PL	c
WS03	ES2	S	18-87098	970534	c	Total cyanide in soil	L080-PL	c
WS03	ES3	S	18-87098	970535	c	Total cyanide in soil	L080-PL	c
WS04	ES1	S	18-87098	970536	c	Total cyanide in soil	L080-PL	c

**Jess McDermott**

Card Geotechnics Ltd
4 Godalming Business Centre
Woolsack Way
Godalming
Surrey
GU7 1XW

t: 01483 310600
f: 01483 527285
e: jessicam@cgl-uk.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 18-87548

Replaces Analytical Report Number : 18-87548, issue no. 1

Project / Site name:	Green Park, Reading	Samples received on:	31/05/2018
Your job number:	CG-28390	Samples instructed on:	31/05/2018
Your order number:	788	Analysis completed by:	18/06/2018
Report Issue Number:	2	Report issued on:	18/06/2018
Samples Analysed:	5 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Analytical Report Number: 18-87548

Project / Site name: Green Park, Reading

Your Order No: 788

Lab Sample Number	973103	973104	973105	973106	973107
Sample Reference	WS07	WS08	WS09	WS10	WS11
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.50	0.30	0.80	0.50	0.40
Date Sampled	25/05/2018	25/05/2018	29/05/2018	29/05/2018	29/05/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	18	8.6
Total mass of sample received	kg	0.001	NONE	1.3	1.1
				0.87	1.1

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile & Amosite	Chrysotile	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.002	0.052	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	0.002	0.052	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.5	7.9	8.0	8.1	9.8
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1700	2800	790	1400	3300
Organic Matter	%	0.1	MCERTS	2.3	1.4	5.4	5.8	1.4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.18	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.74	0.27	< 0.05	0.46	1.7
Anthracene	mg/kg	0.05	MCERTS	0.29	< 0.05	< 0.05	0.10	0.49
Fluoranthene	mg/kg	0.05	MCERTS	3.1	0.60	< 0.05	1.1	3.2
Pyrene	mg/kg	0.05	MCERTS	2.7	0.54	< 0.05	0.98	2.7
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.6	0.40	< 0.05	0.70	1.7
Chrysene	mg/kg	0.05	MCERTS	1.5	0.41	< 0.05	0.65	1.3
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.2	0.59	< 0.05	1.1	2.1
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.75	0.23	< 0.05	0.39	0.67
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.6	0.48	< 0.05	0.96	1.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.79	0.26	< 0.05	0.55	0.81
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.18	< 0.05	< 0.05	< 0.05	0.15
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.80	0.27	< 0.05	0.60	0.79
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	17	4.1	< 0.9	7.5	17
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Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.7	2.1	1.5	1.8	1.5
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.5	16	8.9	9.6	7.8
Barium (aqua regia extractable)	mg/kg	1	MCERTS	82	72	72	86	82
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.46	0.74	0.73	0.79	0.73
Boron (water soluble)	mg/kg	0.2	MCERTS	1.6	1.1	3.2	2.8	1.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	17	24	30	27	25
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	25	30	27	25
Copper (aqua regia extractable)	mg/kg	1	MCERTS	24	18	21	27	24
Lead (aqua regia extractable)	mg/kg	1	MCERTS	74	80	48	62	40
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	< 0.3	1.0	0.7	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11	16	17	18	16
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.1	1.1	1.4	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	23	43	29	34	34
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	98	89	100	120	87

Analytical Report Number: 18-87548

Project / Site name: Green Park, Reading

Your Order No: 788

Lab Sample Number	973103	973104	973105	973106	973107
Sample Reference	WS07	WS08	WS09	WS10	WS11
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.50	0.30	0.80	0.50	0.40
Date Sampled	25/05/2018	25/05/2018	29/05/2018	29/05/2018	29/05/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Monoaromatics

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	1.4	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	19	< 2.0	< 2.0	< 2.0	4.4
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	34	< 8.0	< 8.0	< 8.0	8.6
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	86	< 8.0	< 8.0	190	34
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	140	< 10	< 10	200	48

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	13	< 2.0	< 2.0	< 2.0	6.2
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	41	< 10	< 10	10	24
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	140	< 10	< 10	770	78
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	190	< 10	< 10	780	110



Analytical Report Number: 18-87548
Project / Site name: Green Park, Reading
Your Order No: 788

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
973103	WS07	1.50	127	Bitumen & Loose Fibres	Chrysotile & Amosite	0.002	0.002
973104	WS08	0.30	140	Loose Fibrous Debris	Chrysotile	0.052	0.052

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.



Analytical Report Number : 18-87548

Project / Site name: Green Park, Reading

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
973103	WS07	None Supplied	1.50	Grey sandy clay with gravel.
973104	WS08	None Supplied	0.30	Brown sandy clay with gravel.
973105	WS09	None Supplied	0.80	Brown loam and clay with gravel and vegetation.
973106	WS10	None Supplied	0.50	Brown clay and sand with stones.
973107	WS11	None Supplied	0.40	Light brown loam and clay with gravel and vegetation.

Analytical Report Number : 18-87548

Project / Site name: Green Park, Reading

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Iss No 18-87548-2 Green Park, Reading CG-28390

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The results included within the report are representative of the samples submitted for analysis.

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Sample Deviation Report



Sample ID	Other ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS07		S	18-87548	973103	c	Total cyanide in soil	L080-PL	c
WS08		S	18-87548	973104	c	Total cyanide in soil	L080-PL	c

**Jess McDermott**

Card Geotechnics Ltd
4 Godalming Business Centre
Woolsack Way
Godalming
Surrey
GU7 1XW

t: 01483 310600
f: 01483 527285
e: jessicam@cgl-uk.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 18-87349

Replaces Analytical Report Number : 18-87349, issue no. 1

Project / Site name:	Green Park, Reading	Samples received on:	31/05/2018
Your job number:	CG-28390	Samples instructed on:	31/05/2018
Your order number:	788	Analysis completed by:	18/06/2018
Report Issue Number:	2	Report issued on:	18/06/2018
Samples Analysed:	10 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 18-87349

Project / Site name: Green Park, Reading

Your Order No: 788

Lab Sample Number	972071	972072	972073	972074	972075
Sample Reference	WS12	WS12	WS13	WS14	WS14
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.80	1.35	0.30	0.80	1.60
Date Sampled	29/05/2018	29/05/2018	30/05/2018	30/05/2018	30/05/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	16	21
Total mass of sample received	kg	0.001	NONE	1.4	0.90

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	-	Chrysotile & Amosite	Chrysotile & Amosite	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Detected	Detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001	-	0.004	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001	-	0.004	< 0.001	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.9	8.4	8.1	8.2	7.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	3100	520	3300	20000	540
Organic Matter	%	0.1	MCERTS	1.0	0.5	3.3	2.5	1.4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.16	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.10	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.10	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.26	< 0.05	1.1	0.63	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.30	0.19	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.42	< 0.05	2.7	1.4	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.37	< 0.05	2.4	1.2	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.25	< 0.05	2.0	0.89	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.20	< 0.05	1.6	0.75	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.30	< 0.05	2.4	1.0	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.15	< 0.05	1.2	0.59	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.28	< 0.05	2.3	1.0	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.16	< 0.05	1.4	0.50	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.25	0.12	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.18	< 0.05	1.4	0.51	< 0.05
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	2.6	< 0.9	19	8.7	< 0.9
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Analytical Report Number: 18-87349

Project / Site name: Green Park, Reading

Your Order No: 788

Lab Sample Number	972071	972072	972073	972074	972075
Sample Reference	WS12	WS12	WS13	WS14	WS14
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.80	1.35	0.30	0.80	1.60
Date Sampled	29/05/2018	29/05/2018	30/05/2018	30/05/2018	30/05/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.3	< 1.0	3.2	2.5	1.5
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.5	4.4	22	14	20
Barium (aqua regia extractable)	mg/kg	1	MCERTS	180	36	150	110	100
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.73	1.4	0.75	0.54	1.8
Boron (water soluble)	mg/kg	0.2	MCERTS	1.4	0.9	3.3	2.0	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.4	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	37	18	25	23	45
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	37	18	25	24	45
Copper (aqua regia extractable)	mg/kg	1	MCERTS	20	13	38	52	12
Lead (aqua regia extractable)	mg/kg	1	MCERTS	24	21	200	86	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	0.4	0.4	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18	34	17	14	25
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.7	1.2	< 1.0	1.3
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	28	25	33	31	66
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	69	68	150	200	57

Monoaromatics

Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	7.6	< 2.0	4.3	4.3	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	22	< 8.0	15	19	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	110	< 8.0	150	94	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	140	11	170	120	< 10

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	1.7	< 1.0	1.6	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	4.5	< 2.0	3.3	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	20	< 10	25	18	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	100	< 10	270	110	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	130	< 10	300	130	10

Analytical Report Number: 18-87349

Project / Site name: Green Park, Reading

Your Order No: 788

Lab Sample Number	972076	972077	972078	972079	972080
Sample Reference	WS15	WS15	WS16	WS16	WS17
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.90	3.80	0.40	0.85	0.20
Date Sampled	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	43
Moisture Content	%	N/A	NONE	16	26
Total mass of sample received	kg	0.001	NONE	0.68	0.76

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Amosite	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001	-	-	-	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.3	7.6	9.0	7.0	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	MCERTS	3900	1400	2000	20000	1200
Organic Matter	%	0.1	MCERTS	3.6	8.9	1.3	4.6	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.40	< 0.05	< 0.05	0.20	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	1.2	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.64	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.97	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	21	< 0.05	0.38	0.77	0.16
Anthracene	mg/kg	0.05	MCERTS	4.6	< 0.05	0.15	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	22	< 0.05	0.91	1.5	0.51
Pyrene	mg/kg	0.05	MCERTS	18	< 0.05	0.83	1.3	0.49
Benzo(a)anthracene	mg/kg	0.05	MCERTS	11	< 0.05	0.65	0.71	0.38
Chrysene	mg/kg	0.05	MCERTS	8.0	< 0.05	0.52	0.71	0.27
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	11	< 0.05	0.86	1.0	0.55
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	4.7	< 0.05	0.44	0.50	0.21
Benzo(a)pyrene	mg/kg	0.05	MCERTS	9.1	< 0.05	0.78	0.84	0.38
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	4.5	< 0.05	0.43	0.41	0.29
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.2	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	4.4	< 0.05	0.45	0.57	0.28
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	120	< 0.9	6.4	8.6	3.5
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Analytical Report Number: 18-87349

Project / Site name: Green Park, Reading

Your Order No: 788

Lab Sample Number				972076	972077	972078	972079	972080
Sample Reference				WS15	WS15	WS16	WS16	WS17
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	3.80	0.40	0.85	0.20
Date Sampled				30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	3.1	< 1.0	2.5	2.5	1.6
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	18	11	11	8.6
Barium (aqua regia extractable)	mg/kg	1	MCERTS	120	39	120	92	100
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.62	0.65	0.80	0.48	0.82
Boron (water soluble)	mg/kg	0.2	MCERTS	3.2	3.7	3.1	6.5	2.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.7	< 0.2	0.7
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	21	19	33	23	37
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	21	19	33	23	37
Copper (aqua regia extractable)	mg/kg	1	MCERTS	36	15	35	69	35
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160	18	73	95	48
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.5	0.5	0.7	< 0.3	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	25	18	23	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	3.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	26	25	32	31	31
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	170	36	130	150	110

Monoaromatics

Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	1.6	< 1.0	< 1.0	18	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	16	< 2.0	63	84	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	45	< 8.0	110	280	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	250	< 8.0	47	880	34
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	310	< 10	220	1300	39

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	1.5	< 1.0	< 1.0	4.5	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	30	< 2.0	65	54	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	220	< 10	140	230	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	500	< 10	75	730	13
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	750	< 10	280	1000	22



Analytical Report Number: 18-87349
Project / Site name: Green Park, Reading
Your Order No: 788

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
972071	WS12	0.80	170	Loose Fibres	Chrysotile	< 0.001	< 0.001
972073	WS13	0.30	140	Loose Fibres & Loose Fibrous Debris	Chrysotile & Amosite	0.004	0.004
972074	WS14	0.80	142	Loose Fibres	Chrysotile & Amosite	< 0.001	< 0.001
972076	WS15	0.90	100	Loose Fibres	Amosite	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.



Analytical Report Number : 18-87349

Project / Site name: Green Park, Reading

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
972071	WS12	None Supplied	0.80	Light brown clay and sand with gravel.
972072	WS12	None Supplied	1.35	Light brown clay and sand with gravel.
972073	WS13	None Supplied	0.30	Brown sandy clay with gravel and vegetation.
972074	WS14	None Supplied	0.80	Brown sandy clay with gravel and plastic.
972075	WS14	None Supplied	1.60	Brown clay with gravel.
972076	WS15	None Supplied	0.90	Brown loam and clay with vegetation and gravel
972077	WS15	None Supplied	3.80	Brown clay and sand with stones.
972078	WS16	None Supplied	0.40	Brown clay and sand with gravel.
972079	WS16	None Supplied	0.85	Brown sandy clay with gravel.
972080	WS17	None Supplied	0.20	Brown clay and sand with gravel.

Analytical Report Number : 18-87349

Project / Site name: Green Park, Reading

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Iss No 18-87349-2 Green Park, Reading CG-28390

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The results included within the report are representative of the samples submitted for analysis.

Page 8 of 8

**Elly Saunders**

Card Geotechnics Ltd
4 Godalming Business Centre
Woolsack Way
Godalming
Surrey
GU7 1XW

t: 01483 310600
f: 01483 527285
e: ellys@cgl-uk.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 18-87800

Project / Site name:	Green Park, Reading	Samples received on:	05/06/2018
Your job number:	CG-28390	Samples instructed on:	05/06/2018
Your order number:	826	Analysis completed by:	13/06/2018
Report Issue Number:	1	Report issued on:	13/06/2018
Samples Analysed:	15 water samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Analytical Report Number: 18-87800

Project / Site name: Green Park, Reading

Your Order No: 826

Lab Sample Number				974500	974501	974502	974503	974504
Sample Reference				RWS633	WS01	RWS634	WS08A	RBH608
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/06/2018	04/06/2018	04/06/2018	04/06/2018	04/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	6.9	8.7	6.8	7.0	6.9
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	11	< 1.0	< 1.0	< 1.0
Free Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	-	< 1	-	-	-
Sulphate as SO ₄	µg/l	45	ISO 17025	270000	1430000	195000	281000	473000
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	1200	2700	3300	10000	9900
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	16.6	137	91.7	29.8	30.5
Hardness - Total	mgCaCO ₃ /l	1	ISO 17025	505	1470	816	822	997

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	2.9	2.4	210	1.4	1.8
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
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Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.6	1.5	0.6	0.7	0.6
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.54	11.0	6.14	2.64	2.37
Barium (dissolved)	µg/l	0.06	ISO 17025	76	82	130	170	110
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	120	87	310	270	510
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03	< 0.02	< 0.02	< 0.02	0.02
Calcium (dissolved)	mg/l	0.012	ISO 17025	180	570	300	290	360
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	1.0	1.2
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	0.9	1.0	1.0	1.2
Copper (dissolved)	µg/l	0.5	ISO 17025	2.8	3.3	< 0.5	< 0.5	1.8
Lead (dissolved)	µg/l	0.2	ISO 17025	0.6	2.7	< 0.2	0.5	0.6
Magnesium (dissolved)	mg/l	0.005	ISO 17025	11	12	17	25	24
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.1	13	1.7	4.4	3.7
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.2	6.3	1.8	1.7	1.5
Vanadium (dissolved)	µg/l	0.2	ISO 17025	1.8	9.6	0.8	1.5	1.7
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.1	3.1	< 0.5	1.4	1.7



Analytical Report Number: 18-87800

Project / Site name: Green Park, Reading

Your Order No: 826

Lab Sample Number				974500	974501	974502	974503	974504
Sample Reference				RWS633	WS01	RWS634	WS08A	RBH608
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/06/2018	04/06/2018	04/06/2018	04/06/2018	04/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	44.3	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	44	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	44	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 18-87800

Project / Site name: Green Park, Reading

Your Order No: 826

Lab Sample Number				974505	974506	974507	974508	974509
Sample Reference				WS06	WS17	WS09	RBH603	RWS629
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/06/2018	04/06/2018	04/06/2018	04/06/2018	04/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	6.9	6.8	7.0	7.0	6.9
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	5.9	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1	-	-	-	-
Sulphate as SO ₄	µg/l	45	ISO 17025	421000	24100	98200	178000	89300
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	7900	17000	6100	820	8100
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	49.8	55.3	62.0	13.0	22.5
Hardness - Total	mgCaCO ₃ /l	1	ISO 17025	1400	1080	1160	557	890

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	1.5	2.3	3.1	< 1.0	1.6
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
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Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	0.4	ISO 17025	1.0	0.8	0.9	0.5	0.5
Arsenic (dissolved)	µg/l	0.15	ISO 17025	6.43	2.55	2.83	0.55	2.14
Barium (dissolved)	µg/l	0.06	ISO 17025	99	140	190	100	140
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	240	150	290	160	150
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02	0.03	< 0.02
Calcium (dissolved)	mg/l	0.012	ISO 17025	500	400	430	190	330
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	1.1	1.5	< 1.0	< 1.0	< 1.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.1	1.5	0.5	< 0.2	0.3
Copper (dissolved)	µg/l	0.5	ISO 17025	0.8	0.7	0.7	3.3	1.1
Lead (dissolved)	µg/l	0.2	ISO 17025	0.4	0.4	6.2	< 0.2	< 0.2
Magnesium (dissolved)	mg/l	0.005	ISO 17025	34	18	22	20	15
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	7.8	13	21	15	3.2
Selenium (dissolved)	µg/l	0.6	ISO 17025	4.4	4.5	6.6	1.9	1.9
Vanadium (dissolved)	µg/l	0.2	ISO 17025	1.1	0.9	0.3	0.9	0.3
Zinc (dissolved)	µg/l	0.5	ISO 17025	6.1	4.1	19	4.0	1.9



Analytical Report Number: 18-87800

Project / Site name: Green Park, Reading

Your Order No: 826

Lab Sample Number				974505	974506	974507	974508	974509
Sample Reference				WS06	WS17	WS09	RBH603	RWS629
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/06/2018	04/06/2018	04/06/2018	04/06/2018	04/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	110	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	110	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 18-87800

Project / Site name: Green Park, Reading

Your Order No: 826

Lab Sample Number				974510	974511	974512	974513	974514
Sample Reference				WS11	WS13	WS14	RBH606	WS16
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/06/2018	04/06/2018	04/06/2018	04/06/2018	04/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	6.9	6.9	7.0	7.3	6.9
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	-	-	-	-	-
Sulphate as SO ₄	µg/l	45	ISO 17025	204000	189000	146000	39600	241000
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	6100	2000	1300	410	3100
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	27.3	15.3	13.3	3.33	18.6
Hardness - Total	mgCaCO ₃ /l	1	ISO 17025	896	491	362	295	578

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	1.6	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
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Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.7	1.3	0.6	0.5	0.9
Arsenic (dissolved)	µg/l	0.15	ISO 17025	3.74	4.12	2.72	0.75	1.89
Barium (dissolved)	µg/l	0.06	ISO 17025	120	83	81	120	110
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	200	140	110	140	130
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Calcium (dissolved)	mg/l	0.012	ISO 17025	340	180	130	87	210
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.0	0.3	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1.0	2.6	0.6	1.8	1.9
Lead (dissolved)	µg/l	0.2	ISO 17025	1.3	< 0.2	< 0.2	< 0.2	< 0.2
Magnesium (dissolved)	mg/l	0.005	ISO 17025	13	11	8.4	19	13
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.5	13	5.2	1.5	2.9
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.9	1.9	1.1	< 0.6	1.8
Vanadium (dissolved)	µg/l	0.2	ISO 17025	1.6	2.4	2.1	0.3	3.8
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.8	5.1	1.3	8.3	1.3



Analytical Report Number: 18-87800

Project / Site name: Green Park, Reading

Your Order No: 826

Lab Sample Number				974510	974511	974512	974513	974514
Sample Reference				WS11	WS13	WS14	RBH606	WS16
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/06/2018	04/06/2018	04/06/2018	04/06/2018	04/06/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	23
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	23

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	19
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	19

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 18-87800

Project / Site name: Green Park, Reading

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Free cyanide (low level) in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Iss No 18-87800-1 Green Park, Reading CG-28390

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The results included within the report are representative of the samples submitted for analysis.

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Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
RBH608		W	18-87800	974504	d	BTEX and MTBE in water (Monoaromatics)	L073B-PL	d
RBH608		W	18-87800	974504	d	Ammoniacal Nitrogen as N in water	L082-PL	d
RBH608		W	18-87800	974504	d	TPHCWG (Waters)	L070-PL	d
RWS634		W	18-87800	974502	d	BTEX and MTBE in water (Monoaromatics)	L073B-PL	d
RWS634		W	18-87800	974502	d	Ammoniacal Nitrogen as N in water	L082-PL	d
RWS634		W	18-87800	974502	d	TPHCWG (Waters)	L070-PL	d
WS01		W	18-87800	974501	d	BTEX and MTBE in water (Monoaromatics)	L073B-PL	d
WS01		W	18-87800	974501	d	Ammoniacal Nitrogen as N in water	L082-PL	d
WS01		W	18-87800	974501	d	TPHCWG (Waters)	L070-PL	d
WS06		W	18-87800	974505	d	BTEX and MTBE in water (Monoaromatics)	L073B-PL	d
WS06		W	18-87800	974505	d	Ammoniacal Nitrogen as N in water	L082-PL	d
WS06		W	18-87800	974505	d	TPHCWG (Waters)	L070-PL	d
WS08A		W	18-87800	974503	d	BTEX and MTBE in water (Monoaromatics)	L073B-PL	d
WS08A		W	18-87800	974503	d	Ammoniacal Nitrogen as N in water	L082-PL	d
WS08A		W	18-87800	974503	d	TPHCWG (Waters)	L070-PL	d

**Elly Saunders**

Card Geotechnics Ltd
4 Godalming Business Centre
Woolsack Way
Godalming
Surrey
GU7 1XW

t: 01483 310600
f: 01483 527285
e: ellys@cgl-uk.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 18-92845

Project / Site name:	Green Park	Samples received on:	17/07/2018
Your job number:	CG-28390	Samples instructed on:	18/07/2018
Your order number:	826	Analysis completed by:	25/07/2018
Report Issue Number:	1	Report issued on:	25/07/2018
Samples Analysed:	1 water sample		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Analytical Report Number: 18-92845

Project / Site name: Green Park

Your Order No: 826

Lab Sample Number				1002240				
Sample Reference				SW1				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				16/07/2018				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	9.0				
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0				
Sulphate as SO ₄	µg/l	45	ISO 17025	98100				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	40				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	12.8				
Hardness - Total	mgCaCO ₃ /l	1	ISO 17025	150				

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	1.1				
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.6				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.86				
Barium (dissolved)	µg/l	0.06	ISO 17025	26				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	130				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	45				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.8				
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	9.2				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.6				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.9				
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.0				



Analytical Report Number: 18-92845

Project / Site name: Green Park

Your Order No: 826

Lab Sample Number				1002240				
Sample Reference				SW1				
Sample Number				None Supplied				
Depth (m)				None Supplied				
Date Sampled				16/07/2018				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10				

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 18-92845

Project / Site name: Green Park

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX E

Contamination Assessment Tables

ASSESSMENT CRITERIA

Table E1 below sets out CGL's rationale for generic assessment criteria (GAC) adoption in order to evaluate risks posed to potential receptors at Phase 6 – Green Park, Reading from identified chemical contamination. Potential receptors have been identified with reference to the Part IIA regime and associated DEFRA guidance. As with the Part IIA regime, under the planning regime all receptors (humans, controlled waters, ecology, crops/livestock and buildings) have been considered if there is the potential for them to be adversely affected by exposure to contamination. The results of the assessment for Phase 6 – Green Park, Reading are then presented in Tables E2 to E6 of this appendix.

Table E1. Rationale for Assessment Criteria Adoption

Source / Media	CGL's Approach & Rationale
<i>Risks to Human Health (long-term chronic risks)</i>	
Soil contaminants	- Laboratory test results have been compared against Generic Assessment Criteria (GACs) derived in-house by CGL using the Contaminated Land Exposure Assessment (CLEA) model and version 1.06 of the CLEA software. Where Soil Guideline Values (SGVs) have been published previously by the Environment Agency, the CGL GACs have updated these based on current exposure parameters (e.g. updated inhalation rates). - The GACs have been generated assuming a sandy loam soil type and a Soil Organic Material of 2.5% for the Made Ground (measured range 0.5 - 5.8%) and 2.5% for the natural soils (measured 1.4 to 8.9%). - In the event impacts are identified on a site above the GAC level for arsenic, cadmium, chromium VI, benzene or benzo(a)pyrene, the results have been compared to the applicable Category 4 Screening Level (C4SL) published by DEFRA to further assess risks. - The exception to the above relates to lead. The SGV for lead has been withdrawn and the C4SL for lead is used by CGL directly as a first tier of assessment. - The CGL GACs represent conservative screening criteria (set at acceptable or minimal risk) and have generally been calculated using the default parameters for the standard land use scenarios set out in the CLEA technical report and toxicological inputs in line with the requirements of Science Report SC050021/SR2 and, in the case of petroleum hydrocarbons, Science Report P5-080/TR3. - Where a CGL GAC has not been derived alternative assessment criteria will be sourced from current commercially-available sources (including international standards where no suitable UK assessment criteria exists). - Concentrations of cyanide above the laboratory reporting limit are assessed against a Soil Screening Value (SSV) developed by Atkins. Atkins have based this assessment criteria on acute exposure to a 0 to 6 year old child. - Where the dataset is of appropriate size, assessment against the applicable GAC or C4SL is carried out at the 95th percentile of the sample mean (designated US₉₅), which is considered to represent a reasonable worst-case scenario. An assessment of the normality of the data has been undertaken. Where datasets are normally distributed the one sample t-test has been applied to calculate the US₉₅. In the case of non-parametric datasets, the Chebychev Theorem has been applied. The Grubbs Test has also been used to identify potential outliers within datasets. - It is noted that the British Geological Survey has published background levels for a number of organic and inorganic constituents. In the event that the C4SL or a GAC is found to be exceeded, the risk may still be considered to be low, unlikely to meet the definition of contaminated land under Part IIA and potentially suitable for use from a development perspective, if the contaminant concentrations are below local background levels, assuming no other contributing factors. - At this time an authoritative GAC is not available for asbestos fibres in soil. A positive identification of asbestos fibres in a soil sample by the laboratory is considered sufficient to warrant additional assessment of risks. Laboratory identification and quantification by microscopy may be required subject to source of material.
Dissolved contaminants	Concentrations of organic constituents detected above the laboratory reporting limit in shallow groundwater or perched water have been assessed against groundwater vapour generic assessment criteria (GAC_{gwvap}) developed by the Society of Brownfield Remediation Risk Assessment (SoBRA). These assess chronic risks to human health via the indoor and outdoor air inhalation pathway only. The values assume a sand soil type, a soil organic matter of 1% and a depth below ground level of 650mm.

Source / Media	CGL's Approach & Rationale
Ground gas	Concentrations and flow rates of carbon dioxide and methane in ground gas are converted to Gas Screening Values (GSVs) in accordance with CIRIA (2007). Potential risks associated with gas chemistry are evaluated in accordance with guidance presented in CIRIA (2007), NHBC (2007), BSI (2007).
Radon	Risks from the radon content of soil gas are evaluated in accordance with BRE (2011).
<i>Risks to Controlled Waters</i>	
Soil contaminants	Results from any eluted liquids have been directly compared to Environmental Quality Standards (EQS) and Drinking Water Values (DWV) as an initial screen of water quality. These are considered to be conservative screening criteria.
Dissolved contaminants	Results have been directly compared to Environmental Quality Standards (EQS) and Drinking Water Values (DWV) as an initial screen of water quality. These are considered to be conservative screening criteria.
<i>Risks to Buildings & Structures</i>	
Water supply pipes	The evaluation of water supply pipe requirements at the site has been undertaken in general accordance with guidance and criteria produced by the UK Water Industry (2011).
Sulfate & pH conditions	The evaluation of risks to buried concrete has followed the guidance and criteria produced by BRE (2005).
<i>Risks to Vegetation & Plants</i>	
Soil contaminants	Risks to plant growth (i.e. phytotoxicity) have been assessed for specific contaminants where the limits for phytotoxic effect proposed (e.g. by BS 3882) are significantly lower than the health GAC.

Table E2. Data assessment summary – potential soil risks to human health (residential land use without homegrown produce consumption) - Made Ground

Determinand	GAC SOM = 2.5%	Note on SSL ¹	Measured range	US ₉₅	US ₉₅ > Assessment Criteria? (Y/N) #- outlier detected
			(mg/kg)	(mg/kg)	
Antimony	*	-	<1.0 to 3.4	2.192	N
Arsenic	35	-	4.4 to 22.0	14.147	N
Barium	*	-	36.0 to 200	110.605	N
Beryllium	88	-	0.42 to 1.40	0.898	N #
Boron (water soluble)	*	-	0.9 to 2.5	3.418	N #
Cadmium	87	-	<0.2 to 0.7	0.428	N
Chromium (III)	3,300	-	12 to 37	28.111	N
Chromium (VI)	6.3	-	<1.2	1.2	N
Copper	9,400	-	11 to 69	43.994	N
Lead ²	310	-	15 to 200	112.727	N
Mercury (inorganic)	250	-	<0.3 to 1.5	0.847	N
Nickel	190	-	11 to 34	20.995	N #
Selenium	600	-	<1.0 to 2.0	1.396	N #
Vanadium	1,100	-	19 to 43	33.867	N
Zinc	20,000	-	41 to 210	125.201	N
Benzene	1.6	-	<1.0	0.001	N
Toluene	1,900	(c)	<1.0	0.001	N
Ethyl benzene	1,200	-	<1.0	0.001	N
m-xylene ³	500	-	<1.0	0.001	N
o-xylene	540	-	<1.0	0.001	N
p-xylene	480	-	<1.0	0.001	N
Phenol ⁴	3,500	-	<1.0	1.000	N
Cyanide ⁵	34	-	<1.0 to 2.0	1.244	N
TPH aliphatic EC5-6	130	-	<1.0	0.001	N
TPH aliphatic EC>6-8	340	-	<1.0	0.001	N
TPH aliphatic EC>8-10	82	-	<1.0	0.001	N
TPH aliphatic EC>10-12	5,800	(b)	<10	1.097	N #
TPH aliphatic EC>12-16	6,400	(b)	<10	30.143	N #
TPH aliphatic EC>16-35	130,000 [21]	(a)	<10	347.795	N
TPH aromatic EC5-7	1.6	-	<1.0	0.001	N
TPH aromatic EC>7-8	1,900	-	<1.0	0.001	N
TPH aromatic EC>8-10	130	-	<1.0	0.001	N
TPH aromatic EC>10-12	670	-	<1.0	1.946	N #
TPH aromatic EC>12-16	2,500	(b)	<10	26.011	N
TPH aromatic EC>16-21	1,900 [150]	(a)	<10	107.667	N
TPH aromatic EC>21-35	1,900 [12]	(a)	<10	375.771	N
Naphthalene	15	-	<0.05 to 0.4	0.147	N #
Acenaphthene	4,100	(b)	<0.5 to 0.69	0.298	N #
Fluorene	4,000	(b)	0.05 to 0.97	0.318	N #
Anthracene	36,000 [19]	(a)	<0.05 to 0.46	1.386	N #
Fluoranthene	5,000 [47]	(a)	<0.05 to 22	8.529	N #
Pyrene	3,700 [5.5]	(a)	<0.05 to 18.0	7.059	N
Benzo(a)anthracene	21 [4.3]	(a)	<0.05 to 11.0	4.248	N
Chrysene	230 [1.1]	(a)	<0.05 to 8.0	3.079	N
Benzo(b)fluoranthene	23 [3.0]	(a)	<0.05 to 11.0	4.567	N
Benzo(k)fluoranthene	23 [1.7]	(a)	<0.05 to 4.7	1.885	N
Benzo(a)pyrene	3.6 [2.3]	(c)	<0.05 to 9.1	3.815	Y
Indeno(1,2,3-c,d)pyrene	34 [0.15]	(a)	<0.05 to 4.5	2.111	N
Dibenzo(a,h)anthracene	2.3 [0.01]	(a)	<0.05 to 1.2	0.525	N
Benzo(g,h,i)perylene	230 [0.05]	(a)	<0.05 to 4.4	2.039	N

¹ - = green; (a) = amber i.e. GAC set to model output, [SSL provided in square brackets]; (b) = red i.e. SSL exceeded & considered to affect interpretation. GAC calculated in accordance with CLEA Software Handbook; (c) = GAC limited to SSL.

² Published C4SL.

³ Concentrations for total xylenes should be compared against m-xylene for fresh spills and to o-xylene for all other cases.

⁴ GAC relates to phenol (C₆H₅OH) only.

⁵ Assessment criteria for cyanide derived by Atkins based on acute exposure for a 0-6 year old child.

Table E3. Data assessment summary – potential soil risks to human health (residential land use without homegrown produce consumption) Natural

Determinand	GAC SOM = 2.5%	Note on SSL ¹	Measured range	US ₉₅	US ₉₅ > Assessment Criteria? (Y/N) #- outlier detected
			(mg/kg)	(mg/kg)	
Antimony	*	-	<1.0 to 1.9	2.227	N
Arsenic	35	-	8.9 to 20	25.608	N
Barium	*	-	39 to 100	123.030	N
Beryllium	88	-	0.65 to 1.8	2.136	N
Boron (water soluble)	*	-	0.5 to 3.70	5.060	N
Cadmium	87	-	<0.2	0.200	N
Chromium (III)	3,300	-	19 to 45	53.110	N
Chromium (VI)	6.3	-	<1.2	<1.2	N
Copper	9,400	-	12 to 26	30.093	N
Lead ²	310	-	16 to 41	48.421	N
Mercury (inorganic)	250	-	0.5 to 0.6	0.679	N
Nickel	190	-	18 to 25	32.840	N #
Selenium	600	-	<1.0 to 3.0	3.585	N
Vanadium	1,100	-	25 to 66	78.040	N
Zinc	20,000	-	36 to 48	99.566	N
Benzene	1.6	-	<0.001	<0.001	N
Toluene	1,900	(c)	<0.001	<0.001	N
Ethyl benzene	1,200	-	<0.001	<0.001	N
m-xylene ³	500	-	<0.001	<0.001	N
o-xylene	540	-	<0.001	<0.001	N
p-xylene	480	-	<0.001	<0.001	N
Phenol ⁴	3,500	-	<1.0	<1.0	N
Cyanide ⁵	34	-	<1.0	<1.0	N
TPH aliphatic EC5-6	130	-	<0.001	<0.001	N
TPH aliphatic EC>6-8	340	-	<0.001	<0.001	N
TPH aliphatic EC>8-10	82	-	<0.001	<0.001	N
TPH aliphatic EC>10-12	5,800	(b)	<1.0	<1.0	N
TPH aliphatic EC>12-16	6,400	(b)	<2.0	<2.0	N
TPH aliphatic EC>16-35	130,000 [21]	(a)	16 to 26	33.867	N #
TPH aromatic EC5-7	1.6	-	<0.001	<0.001	N
TPH aromatic EC>7-8	1,900	-	<0.001	<0.001	N
TPH aromatic EC>8-10	130	-	<0.001	<0.001	N
TPH aromatic EC>10-12	670	-	<1.0	<1.0	N
TPH aromatic EC>12-16	2,500	(b)	<2.0	<2.0	N
TPH aromatic EC>16-21	1,900 [150]	(a)	<10	<10.0	N
TPH aromatic EC>21-35	1,900 [12]	(a)	<10 to 28	42.160	N #
Naphthalene	15	-	<0.05	<0.05	N
Acenaphthene	4,100	(b)	<0.05	<0.05	N
Fluorene	4,000	(b)	<0.05	<0.05	N
Anthracene	36,000 [19]	(a)	<0.05	<0.05	N
Fluoranthene	5,000 [47]	(a)	<0.5 to 0.6	1.033	N #
Pyrene	3,700 [5.5]	(a)	<0.05 to 0.61	1.051	N #
Benzo(a)anthracene	21 [4.3]	(a)	0.05 to 0.34	0.568	N #
Chrysene	230 [1.1]	(a)	<0.05 to 0.29	0.479	N #
Benzo(b)fluoranthene	23 [3.0]	(a)	<0.05 to 0.53	0.908	N #
Benzo(k)fluoranthene	23 [1.7]	(a)	<0.05 to 0.16	0.247	N #
Benzo(a)pyrene	3.6 [2.3]	(c)	<0.05 to 0.42	0.711	N #
Indeno(1,2,3-c,d)pyrene	34 [0.15]	(a)	<0.05 to 0.23	0.372	N #
Dibenzo(a,h)anthracene	2.3 [0.01]	(a)	<0.05	0.050	N
Benzo(g,h,i)perylene	230 [0.05]	(a)	<0.05 to 0.27	0.443	N #

¹ - = green; (a) = amber i.e. GAC set to model output, [SSL provided in square brackets]; (b) = red i.e. SSL exceeded & considered to affect interpretation. GAC calculated in accordance with CLEA Software Handbook; (c) = GAC limited to SSL.

² Published C4SL.

³ Concentrations for total xylenes should be compared against m-xylene for fresh spills and to o-xylene for all other cases.

⁴ GAC relates to phenol (C₆H₅OH) only.

⁵ Assessment criteria for cyanide derived by Atkins based on acute exposure for a 0-6 year old child.

Table E4. Data assessment summary – potential soil risk to vegetation and plants

Determinant	Assessment Criteria (mg/kg)	Measured range	US ₉₅	US ₉₅ > Assessment Criteria? (Y/N) #- outlier detected
		(mg/kg)	(mg/kg)	
Copper ¹	135	11 to 69	43.994	N
Zinc ¹	200	41 to 210	125.201	N
Nickel ¹	75	11 to 34	20.995	N #
Boron (water soluble) ²	5	0.9 to 2.5	3.418	N #

¹ BSI, (2015). *Specification for topsoil and requirements for use. BS 3882:2015*. Values taken for pH 6-7

² Limit for phytotoxic effect. Nable, Banuelos and Paul, (1997). *Boron Toxicity*. Plant and Soil, Volume 193, pp 181-198

Table E5. Data assessment summary – potential risk to controlled waters (groundwater) - freshwater

Contaminant	Freshwater EQS ¹ (µg/l)	EC Drinking Water Value (µg/l)	Measured range (µg/l)	Bioavailable Concentration (µg/l)	No. of samples exceeding EQS	No. of samples exceeding Drinking Water Value
Arsenic	50	10	0.55 to 11	-	0 of 15	1 of 15
Cadmium	0.08 - 0.25 ²	5	<0.02 to 0.03	-	0 of 15	0 of 15
Chromium VI	3.4	50 ³	<5.0	-	0 of 15	0 of 15
Chromium III	4.7	50 ³	<1.0 to 1.5	-	0 of 15	0 of 15
Lead	7.2	10	<0.2 to 6.2	-	0 of 15	0 of 15
Mercury	0.07	1	<0.05	-	0 of 15	0 of 15
Selenium	* ⁴	10	<0.6 to 6.6	-	0 of 15	0 of 15
Boron	*	1,000	87 to 510	-	0 of 15	0 of 15
Copper	1⁵	2,000	<0.5 to 3.3	0.01 to 3.30	8 of 15	0 of 15
Nickel	4⁵	20	1.5 to 21	0.15 to 6.26	8 of 15	1 of 15
Zinc	2.0^{5,6}	(5,000)⁷	<0.5 to 19	0.12 to 4.07	9 of 15	0 of 15
Barium	*	(1,000) ⁷	76 to 190	-	0 of 15	0 of 15
Beryllium	(15) ⁸	*	<0.1	-	0 of 15	0 of 15
Phenols	7.7	(0.5)⁷	<1.0 to 210	-	1 of 15	10 of 15
Free Cyanide	1	50 ⁹	<1.0	-	0 of 15	0 of 15
Sulphate (mg/l)	*	250	24.1 to 1430	-	0 of 15	5 of 15
TPH	*	(10)⁷	<1.0 to 110	-	0 of 15	3 of 15
PAH	*	0.1 ¹⁰	<0.1	-	0 of 15	0 of 15
Anthracene	0.1	*	<0.01	-	0 of 15	0 of 15
Benzo(a)pyrene	0.02 [0.00017] ¹¹	0.01	<0.01	-	0 of 15	0 of 15
Fluoranthene	0.1 (0.0063) ¹¹	*	<0.01	-	0 of 15	0 of 15
Naphthalene	2	*	<0.01	-	0 of 15	0 of 15
Benzene	10	1	<1.0	-	0 of 15	0 of 15
Toluene	74	*	<1.0 to 44.3	-	0 of 15	0 of 15
Total ammonia/ ammoniacal nitrogen as NH₄	*	500	410 to 17000	-	0 of 15	14 of 15
Hardness (mg CaCO ₃ /l)	*	*	295 to 1470	-	0 of 15	0 of 15
pH	6.0 - 9.0	6.5 - 10.0	6.8 to 8.7	-	0 of 15	0 of 15

¹ Annual Averages prescribed within The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

² EQS varies with water hardness where range given. Evaluated against class 1.

³ This value relates to total chromium.

⁴ * = No values defined or given.

⁵ Screened against the bioavailable fraction of the dissolved concentration of copper, nickel and zinc. "bioavailable" means the fraction of the dissolved concentration of zinc, nickel and copper likely to result in toxic effects as determined using the UKTAG Metal Bioavailability Assessment Tool.

⁶ 10.9 µg/l bioavailable plus ambient background concentration (µg/l) dissolved. Ambient background concentrations for dissolved zinc in freshwaters in England and Wales to be used in conjunction with item 6.

⁷ Concentration formerly prescribed within the Water Supply (Water Quality) Regulations 1989.

⁸ Dutch Indication Level of Serious Contamination.

⁹ Drinking water standard based on total cyanide.

¹⁰ Sum concentration of 4 PAH comprising benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene.

¹¹ The previous published value for benzo(a)pyrene and fluoranthene is given in the table, and the current published value is given in square brackets. The square brackets value must be used if the waters in question could feed into an area where fishery products are produced.

Table E6. Standard Water Supply Pipe Assessment

Test Group ¹	Testing Required?	PE threshold (mg/kg)	Metal Pipes / Barrier Pipe	Laboratory Detection Limit (mg/kg)	Testing UKAS accredited Y/N	Maximum concentration at proposed pipeline depth ² (mg/kg)	Maximum site concentration ³ (mg/kg)	Locations and depths where concentrations exceed proposed pipeline threshold.
Total BTEX & MTBE	Where preliminary Risk Assessment (PRA) has identified land potentially affected by contamination	0.1	Pass	1.0	Y	<1.0	<1.0	-
EC5–EC10 aliphatic and aromatic hydrocarbons		2	Pass	0.001	Y	<0.001	<0.001	-
EC10-EC16 aliphatic and aromatic hydrocarbons		10	Pass	1.0	Y	84	84	WS07 @ 1.5mbgl WS15 @ 0.9mbgl WS16 @ 0.4mbgl WS16 @ 0.85mbgl
EC16-EC40 aliphatic and aromatic hydrocarbons		500	Pass	10	Y	730	880	WS16 @ 0.85mbgl WS10 @ 0.5mbgl
Phenols		2	Pass	1.0	Y	<1.0	<1.0	-
Corrosive	Conductivity Redox pH	Pass	Note ⁴	1.0	Y	9.9	10.9	*

¹ Tests Groups as per Appendix G of UKWIR Guidance.

² Water pipes are normally laid 0.75-1.35 metres below finished ground level.

³ State if liquid free product is present in soil or groundwater.

⁴ Threshold: For wrapped steel, corrosive if pH<7 and conductivity >400 µs/cm. For wrapped ductile iron corrosive if pH<5, Eh not neutral and conductivity >400 µs/cm. For copper, corrosive if pH<5 or >8 and Eh positive.

*Plastic pipes assumed to be used, therefore no pH limits.

APPENDIX F

CGL Import Specification

Table F1. Maximum permissible concentrations for imported soils.

Determinant		Maximum permissible concentration ¹ (mg/kg) ²		Rationale
		Residential without plant uptake		
		6% SOM	1% SOM	
Arsenic		35	35	GAC ⁴
Beryllium		88	88	GAC ⁴
Boron (water soluble)		5	5	Limit for phytotoxic effect ⁵
Cadmium		87	87	GAC ⁴
Chromium (III)		3,300	3,300	GAC ⁴
Chromium (VI)		6.3	6.3	GAC ⁴
Lead		310	310	C4SL ¹⁰
Mercury		250	250	GAC ⁴
Selenium		600	600	GAC ⁴
Copper		135 ³	135 ³	BS 3882:2015 Specification for Topsoil ³
Nickel		75 ³	75 ³	BS 3882:2015 Specification for Topsoil ³
Zinc		200 ³	200 ³	BS 3882:2015 Specification for Topsoil ³
Vanadium		1100	1100	GAC ⁴
Benzo(a)pyrene		3.6	3.6	GAC ⁴
Benzo(a)anthracene		22	18	GAC ⁴
Benzo(b)fluoranthene		23	23	
Benzo(k)fluoranthene		23	23	
Chrysene		230	220	
Dibenzo(a,h)anthracene		2.3	2.2	
Indeno(1,2,3-cd)pyrene		23	26	
Naphthalene		35	6.3	
TPH aliphatic ⁶	EC5-6	260	80	GAC ⁴
	EC>6-8	750	160	GAC ⁴
	EC>8-10	190	34	GAC ⁴
	EC>10-12	1,000 ⁷	1,000 ⁷	Hazardous waste threshold ⁷
	EC>12-16	1,000 ⁷	1,000 ⁷	Hazardous waste threshold ⁷
	EC>16-35	1,000 ⁷	1,000 ⁷	Hazardous waste threshold ⁷
TPH aromatic ⁶	EC5-7	3.2	0.88	GAC ⁴
	EC>7-8	1,000 ⁷	870	GAC ⁴ / Hazardous waste threshold ⁷
	EC>8-10	310	55	GAC ⁴
	EC>10-12	1,000	290	GAC ⁴ / Hazardous waste threshold ⁷
	EC>12-16	1,000 ⁷	1,000 ⁷	GAC ⁴ / Hazardous waste threshold ⁷
	EC>16-21	1,000 ⁷	1,000 ⁷	GAC ⁴ / Hazardous waste threshold ⁷
	EC>21-35	1,000 ⁷	1,000 ⁷	Hazardous waste threshold ⁷
Sum of TPH aliphatic & aromatic C5-C10		< 1,000	< 1,000	Hazardous waste thresholds ⁸ (C10+ MPC based on threshold for C25+)
Sum of TPH aliphatic & aromatic C10+		< 1,000	< 1,000	
pH		5-10	5-10	
Phenols		6,000	2,000	GAC ⁴
Cyanide		34	34	GAC ¹¹
Asbestos		No detectable fibres ⁹		

Notes:

- These maximum permissible concentrations (MPCs) are import criteria only and are not necessarily appropriate for human health risk assessment.
- In mg/kg dry soil except pH and asbestos.
- British Standard BS3882:2015 Specification for Topsoil and requirements for use. Table 1. Values taken for pH 6-7.
- Generic Assessment Criteria generated 'in-house' based on CLEA model Version 1.06.
- Nable, Banuelos and Paul. (1997). *Boron Toxicity*. Plant and Soil, **Vol. 193**, pp1 81-198.
- Speciated TPH values must not exceed GAC, or hazardous waste threshold, where indicated above. Assessment of TPH must be made against hazardous waste threshold to confirm imported soils do not classify as hazardous material.
- GAC derived MPC for TPH fraction limited to 1,000mg/kg based on 'waste thresholds'.
- Environment Agency. (2007). *A Guide to Hazardous Waste Regulations: How to find out if waste oil and waste that contain oil are hazardous*. HWR08.
- Laboratory screen by microscopy may be required subject to source of material.
- Published C4SL for lead (DEFRA, 2014)
- GAC for cyanide derived by Atkins based on acute exposure for a 0-6 year old child

APPENDIX G

Verification Plan

Reference	Principal Requirements	Remediation or Construction Related?	Site Visit Required by Qualified Geoenvironmental Engineer?	Supporting Documentation
1.0 General principles	It is proposed to develop the site for predominantly residential purposes, and it is understood that development is to comprise eight blocks, ranging in height from 2-storeys to 12-storeys. Ground floor undercroft car-parking is proposed beneath blocks D, F, G, H, and the café, with communal landscaping areas proposed across the first floor podium level between the blocks. The site remediation requirements are as follows: • Ground gas protection measures in accordance with CS2 and CS4 classification; • Provision of a capping layer/growth medium around the ground level communal landscaping by blocks A, B, and C. • Provision of a growth across the podium communal landscaping; • The use of appropriate water supply pipe material; • Watching brief and discovery strategy; and • Materials management.	Remediation & construction	YES • As detailed below	Details of construction programme to be provided by client/contractor. Method statements As built records and photographs
2.0 Compliance with legislation	The construction and remediation activities on the site will be undertaken in accordance with all current health and safety and environmental legislation.	Remediation & construction	-	-
3.0 Health and Safety requirements	This verification plan does not specifically cover health and safety requirements. This will be addressed in the Contractor's Health and Safety Plan.	Remediation & construction	-	-
4.0 Ground gas and vapour protection measures	Based on the gas monitoring undertaken to date, it is considered the site should be zoned with regards its gas regimes. The north eastern section of the site is currently designated as Characteristic Situation (CS) CS4 due to the gas monitoring undertaken to date. The infilled lake is classed as CS1 and therefore doesn't require any gas protection measures. The remainder of the site has been classed as CS2 and will require gas protection measures to be incorporated. It is noted that the gas regimes outlined are interim only at this stage and following the completion of the remaining three monitoring visits, the site will be re-assessed.	Remediation & Construction	YES • To inspect placement of gas / membrane and ventilation measures	Construction drawings Gas protection design Site visit records including photographs Membrane specification

Reference	Principal Requirements	Remediation or Construction Related?	Site Visit Required by Qualified Geoenvironmental Engineer?	Supporting Documentation
	CS2 protection for a Type B building = 3.5 points CS4 protection for a Type B building = 5.5 points			
5.0 Capping Layer / Growth Medium	It is proposed that around blocks A, B, and C, there will be ground level communal landscaping, and a capping layer may be required. Due to the location of this area being above the infilled lake, the exact composition of the placed soils within this area will depend on the chemical acceptability and thickness of the materials used to raise the levels. If the soils are clean and are suitable for use as a subsoil, then a minimum of 150mm of topsoil will be required. If the soils are not suitable for use as a subsoil, then a minimum capping layer thickness of 600mm will be required (to include a minimum of 150mm of topsoil). This could be reduced to 450mm (to include a minimum of 150mm of topsoil) with a geotextile membrane at the base. Where communal landscaping is proposed on the first floor podium, imported soils will be required to form a growth medium. A minimum of 150mm of topsoil is required, however the landscaping architect may require an increased thickness. Topsoil/subsoil will be soil imported from a known and reputable source. The pre-delivery chemical test results will be reviewed by a qualified geoenvironmental engineer prior to the material being brought onto site. The topsoil should also conform to BS 3882. The imported soils will be subject to verification testing to collect chemical samples to confirm that the imported soils meet the CGL import criteria. The frequency of the verification testing will need to be agreed with the regulators but is considered likely to be 1 sample per 250m³, with a minimum three per source.	Construction	YES - To inspect the imported material and take samples for chemical analysis – if multiple sources are used a minimum of 3 samples should be taken from each source - Minimum of 1 test per 250m³ Inspect thickness and construction of capping layer	Source certificates and pre-delivery test data (to be provided by Contractor) Site visit reports including photographs of capping layer construction Chemical test results Contractor method statements. Layout drawings showing location of areas of soft landscaping

Reference	Principal Requirements	Remediation or Construction Related?	Site Visit Required by Qualified Geoenvironmental Engineer?	Supporting Documentation
6.0 Services	Based on current guidance the use of barrier pipes (e.g. Protect-a-line) or metal pipes (except copper) is recommended. This assessment is based on the pipes being installed within the current ground levels, and does not take into account the raising of the site levels to facilitate the development. The water supply company should be provided with copies of the ground investigation report so that they can make the necessary provisions to safe guard their installations.	Construction	-	Confirmation of pipework material and acceptance of material choice by water supply company. Installation photographs
7.0 Watching brief	A watching brief is to be put into place whereby should unexpected areas of contamination (such as gross contamination by free product, asbestos, or the presence of buried tanks or structures) be encountered during construction works a qualified geoenvironmental engineer is to be informed to conduct a site visit, take additional samples and assess the risk. The regulators will also be notified. Should unknown contamination be identified during the watching brief the procedures documented in the Discovery Strategy should be followed.	Construction	YES (If unexpected contamination identified)	Site visit reports including photographs In-situ & laboratory test data Revised risk assessment (if necessary)
8.0 Waste disposal and materials management	Re-use of excavated Made Ground, superficial soils or crushed concrete at the site could be accomplished through waste exemptions, environmental permits, WRAP Protocol or through the Development Industry Code of Practice, depending on the material in question and quantity of material. At this stage, it is not anticipated that soils from the site will require off-site disposal, however Sections 7.5 within the report, details the preliminary waste classification.	Remediation & construction	YES To observe remedial works and take validation samples	Cut and fill records Duty of care records for disposal of waste. Evidence of material management procedures in place for reuse of materials (i.e. permit, MMP and declaration by QP, exemption etc.) Laboratory test results