Taylor Wimpey

Chesterton

Geo-environmental site assessment

313035-01(00)

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RSK GENERAL NOTES

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1 INTRODUCTION

RSK Environment Limited (RSK) was commissioned by Taylor Wimpey to carry out a geo-environmental assessment of the land at Chesterton. It is understood the site is being considered for redevelopment as residential housing with gardens.

This report is subject to the RSK service constraints given in Appendix A.

1.1 Background

The site currently comprises a field and paddock with a compound area which RSK have previously completed a Phase 1 preliminary risk assessment report ref 313024-01(00), dated April 2015. This report should be read in conjunction with the above PRA report referenced above.

1.2 Objective

The objective of the work is to provide a Phase 2 Geoenvironmental Study including an assessment of the existing geotechnical and geo-environmental ground conditions in order to aid safe and economic design at the site.

1.3 Scope

The scope of the investigation and layout of this report has been designed with consideration of CLR11 (Environment Agency, 2004a) and BS 10175: 2011 (BSI, 2011) and guidance on land contamination reports issued by the Environment Agency (EA) (2010a).

The project was carried out to an agreed brief as set out in RSK's proposal (ref. 313035, dated 20th April 2015). The scope of works for the assessment included:

- an intrusive investigation consisting of 6no window sampler boreholes, 8no trial pits and 4no hand dug foundation pits with laboratory analysis plus subsequent groundwater and gas monitoring
- development of a refined conceptual site model followed by generic quantitative risk assessment (GQRA) to assess complete pollutant linkages that may require the implementation of mitigation measures to facilitate redevelopment
- identification of outline mitigation measures for complete pollutant linkages or recommendations for further work
- interpretation of ground conditions and geotechnical data to provide recommendations with respect to foundations and infrastructure design

- a factual and interpretative report with recommendations for further works (i.e. undertake a remedial options appraisal to identify appropriate mitigation measures/produce a remedial implementation and verification plan) and/or remediation as necessary
- an assessment of the potential waste classification implications of soil arisings.

1.4 Existing reports

The following site investigation has been designed based on the findings of the Preliminary risk assessment: Chesterton report, ref.313024-01(00), by RSK, dated April 2015. This report should be read in conjunction with the following report.

1.5 Limitations

The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows may vary from those reported due to seasonal, or other, effects.

Whilst asbestos containing materials were not identified during the fieldworks or supporting laboratory analysis, the history of the site indicates asbestos may well be present. Asbestos is often present in discrete areas. Thus, although not encountered during the site investigation, may be found during more extensive ground works.

2 THE SITE

2.1 Site location and description

The site is located on the eastern edge of Chesterton, which is approximately 1.4km south west of Bicester with a national grid reference of 455791, 221399, as shown in figure 1.

The site comprises three distinct areas, an arable field that occupies the south western two thirds of the site, a compound area with storage sheds located in the north corner of the site, and a paddock, accessed through the compound area and occupying the north eastern third of the site.

Surrounding the site is an area of allotments to the north east, residential houses to the south east, arable fields to the south west and Green Lane, beyond which is Bicester Golf Course to the north west.

2.2 Proposed development

The site in question is being considered for redevelopment with forty one, two storey houses, together with access roads, two water attenuation ponds and a 'wildlife enhancement' area, as shown on Figure 3.

3 SITE INVESTIGATION METHODOLOGY

RSK carried out intrusive investigation work and subsequent ground gas and groundwater monitoring to confirm the potential pollutant linkages identified in the outline conceptual model, detailed in the preliminary risk assessment (PRA) report 313024-01(00) and to inform geotechnical constraints.

3.1 Sampling strategy and methodology

The techniques adopted for the investigation were chosen based on the aims of the investigation and the anticipated ground conditions. The sampling strategy was primarily focused on the characterisation of the shallow soils; in order to confirm or otherwise the presence of contamination, and to obtain soil parameters to facilitate geotechnical design.

The layout of the investigation was designed to provide both targeted and non-targeted coverage across the site, and an exploratory location plan is presented as Figure 2. The investigation points were located approximately by reference to physical features present on the site at the time of investigation.

Window sample boreholes were used to provide non-targeted coverage of the site to accurately log the soils beneath the site, obtain representative samples for chemical and geotechnical laboratory testing facilitate in-situ testing for geotechnical purposes, and to allow the installation of ground gas / groundwater monitoring wells.

Trial pits were excavated in order to provide a non-targeted coverage of the site and to accurately log the soils beneath the site, obtain representative samples for chemical and geotechnical laboratory testing and to facilitate in-situ testing for geotechnical purposes.

In-situ CBR testing was targeted to areas of proposed roadways as identified on the proposed development plan, presented as Figure 3.

3.1.1 Health and safety considerations

Prior to breaking ground, each exploratory location was surveyed for underground services using a Cable Avoidance Tool (CAT), a corresponding signal generator and Ground Penetrating Radar (GPR). Prior to commencing drilling, an inspection pit was excavated by hand, where possible to depths of up to 1.20m bgl in order to confirm the absence of buried utility apparatus, however, where encountered, the limestone of the Cornbrash Formation was broken out by mechanical excavation.

3.1.2 Investigation locations

The following site work was carried out between the 19th and 20th of May 2015:

- 6no window sampler boreholes to depths of between 1.80m and 3.00m bgl,
- 8no trial pits to depths of between 0.90m to 3.50m bgl,
- 4no hand dug foundation pits to depths of between 0.25m to 0.30m bgl,
- associated in-situ testing for geotechnical and geo-environmental purposes,
- 8no in-situ landrover mounted CBRs,
- 3no in-situ soakaway tests at selected trial pits locations,
- installation of 6no shallow combined ground gas and groundwater monitoring wells,
- 6no return visit ground gas and groundwater monitoring programme undertaken on a weekly basis; and
- associated laboratory testing of soil samples for environmental and geotechnical purposes.

The investigation and the soil descriptions were carried out in general accordance with 'BS 5930:1999. Code of Practice for Site Investigations' (BSI, 1999). The exploratory hole records are presented in Appendix E.

The locations of the intrusive investigations are shown in Figure 2. The rationale for these locations is given in Table 1. The investigation included non-targeted locations to enable statistical analysis to be undertaken as per the rationale table.

Table 1: Exploratory hole location rationale

Exploratory hole number	Location	Rationale
WS01-06, TP01-08	Across the site	To provide non-targeted site investigation data across the development area
FP01-04	Around buildings within the compound area	Expose and identify existing foundations associated compound buildings
CBR01-08	Across the site	To target areas of proposed hardstanding
Notes:		

The investigation points were located approximately by reference to physical features present on the site at the time of investigation. The ground levels at the borehole locations have been interpolated from the levels shown on the site plan provided by the Client.

3.1.3 Soil sampling, in-situ testing and laboratory analysis

The sampling strategy was designed to characterise made ground and natural strata geotechnical and geochemical properties and to investigate potential migration of contaminants from potential sources identified in the phase I report. Some samples were

targeted at strata within the areas as detailed above; all other samples were non targeted in order to complete a statistical assessment if required.

Samples were stored in accordance with the RSK quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination.

Twenty six (26no) samples were taken and are recorded together with their depths on the exploratory hole records in Appendix E. The samples were transported to the laboratory in chilled cool boxes. Laboratory chain of custody forms can be provided if required. The rationale for soil sample chemical analysis is presented in Table 2.

Table 2: Scheduled analysis – soil

Exploratory hole no.	Analyte	Rationale
TP01, 02, 03, 06, 08, WS03, 05, 06, FP02	Soil suite including metals, poly-aromatic hydrocarbons (PAHs), hydrocarbons (to criteria working group), pH and total organic carbon (TOC)	To assess site wide soils for contamination at various locations across the site as identified during the PRA.
TP01, 02, 06, 08, FP01, 02, 03, 04, CBR06	Asbestos fibres screen	To assess site wide soils, as well as those in the compound area for asbestos fibres
TP02	Pesticides and herbicides	To assess for pesticides and herbicides within the field area
TP04, 08, WS03, FP02	Leachable metals suite	To target potential leachable contaminants within the soils
Notes:		

Standard penetration tests (SPTs) or cone penetration tests (CPTs) were carried out within all window sampler boreholes at regular intervals of approximately 1.0m. Test results are given on the borehole records presented in Appendix E and within the summary table included within that appendix. Disturbed samples were taken from each stratum encountered.

3.1.4 Groundwater monitoring and levelling

Depths to groundwater were recorded using an electronic dip meter on six occasions between the 29th May 2015 and the 2nd July 2015. The monitoring results are given in Section 4.2.

The groundwater monitoring data are given in Appendix F, alongside the ground gas monitoring data.

3.1.5 Ground gas monitoring

In line with the conceptual model 6 monitoring rounds have been undertaken. This included periods of low and/or falling atmospheric pressures and after rainfall.

An infrared gas meter was used to measure gas flow, concentrations of carbon dioxide (CO_2), methane (CH_4) and oxygen (O_2) in percentage by volume, while hydrogen sulphide (H_2S) and carbon monoxide (CO) were recorded in parts per million. Initial and steady state concentrations were recorded.

The atmospheric pressure before and during monitoring, together with the weather conditions, was recorded.

All monitoring results together with the temporal conditions are contained within Appendix F and discussed in Section 4.2.

3.1.6 In-situ hydraulic conductivity/infiltration testing

Soakaway tests were carried out in trial pits, TP01, 03 and 07 to establish the infiltration rate of the near surface soils at the site. The tests were carried out generally in accordance with the method described in BRE Digest 365 (BRE, 2007). This involved filling the pits with water from a tanker and recording the drop in water level with time as the water soaked into the ground. Due to time restrictions and the slow rate of infiltration, only one filling at each location was achieved during the site investigation. In addition, final infiltration rates have been calculated by extrapolation of the available data. The data are presented in Appendix K including the calculations in accordance with BS 5930 (BSI, 1999).

4 GROUND CONDITIONS

The results of the intrusive investigation and subsequent laboratory analysis undertaken are detailed below. The descriptions of the strata encountered, notes regarding visual or olfactory evidence of contamination, list of samples taken, field observations of soil and groundwater, in-situ testing and details of monitoring well installations are included on the exploratory hole records presented in Appendix E.

4.1 Soil

The exploratory holes revealed that the site is underlain by a variable thickness of topsoil over Cornbrash Formation with Forest Marble Formation encountered at depth. This appears to confirm the stratigraphical succession described within the initial conceptual model. For the purpose of discussion, the ground conditions are summarised in Table 3 and the strata discussed in subsequent subsections

Table 3: General succession of strata encountered

Strata	Exploratory holes encountered	Depth to top of stratum m bgl	Thickness (m)
Topsoil	All	GL	0.10 to 0.40m
Cornbrash Formation (Limestone)	All	0.10 to 0.40m bgl	0.30 to 1.20m
Cornbrash Formation (Sand)	All except TP06, 07, 08 and WS05	0.40 to 1.40m bgl	0.20 to 1.20m
Cornbrash Formation (Clay)	All except TP06, 07, and WS02, 06	0.60 to 1.50m bgl	0.20 to 1.50m
Forest Marble Formation (Clay)	All except TP06, 07 and WS02	1.30 to 2.80m bgl	At least 1.40m

4.1.1 Topsoil

The topsoil generally comprised brown, slightly clayey, gravelly sand. The gravel content typically comprised subangular, fine to medium sized limestone gravel, however it did rarely include slate, glass and metal, although this was limited to the northern corner of the site. The topsoil was present from surface, to depths of between 0.10m and 0.40m bgl.

4.1.2 Cornbrash Formation (limestone)

Below the topsoil a stratum comprising limestone, recovered as flat, subangular cobbles of medium strong to strong white limestone was encountered. This stratum was present from below the topsoil at depths of between 0.10m and 0.40m bgl, and extended to depths of between 0.40m and 1.40m bgl, achieving thicknesses of between 0.30m and 1.20m. The thickness is generally between 0.40m and 0.90m and generally thickens towards the west. A summary of the in-situ and laboratory test results in this stratum is presented in Table 4 and the in-situ and laboratory test results can be found in Appendix K.

Table 4: Summary of in-situ and laboratory test results for Cornbrash Formation (limestone)

Soil parameters	Range	Reference
Point Load Index ($I_{s(50)}$) (MN/m^2)	1.68-9.15	Appendix K
Moisture content (%)	1.4-4.5	
Strength	Medium strong to strong	Field observations

4.1.3 Cornbrash Formation (sand)

This stratum was encountered from beneath the limestone and comprised a layer of medium dense to dense orange brown slightly clayey, gravelly sand, with a gravel content of subangular to subrounded, fine to coarse sized limestone. The stratum was located beneath the limestone and extended to depth of between 0.60m and 2.20m bgl, achieving a thickness of between 0.20m and 1.20m, being generally deeper and thicker towards the east and south east of the site.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 5 and the in-situ and laboratory test results can be found in Appendix K.

Table 5: Summary of in-situ and laboratory test results for Cornbrash Formation (sand)

Soil parameters	Range	Reference
SPT 'N' values	N=19 to 46	Appendix E
Density term	Medium dense	

4.1.4 Cornbrash Formation (clay)

This stratum was encountered at a depth of between 0.60m and 1.50m below ground level and varies between 0.20m and 1.50m in thickness, being thickest in the south west of the site. Based on the site descriptions and laboratory and in-situ tests carried out this layer can be described as a stiff light grey occasionally mottled orange brown, slightly gravelly, friable clay.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 6 and the in-situ and laboratory test results can be found in Appendix K.

Table 6: Summary of in-situ and laboratory test results for Cornbrash Formation (clay)

Soil parameters		Range	Reference
Liquid limit (%)		40-52	Appendix K
Plasticity limit (%)		16-20	
Plasticity index (%)		24-32	
Modified plasticity index (%)		21-29	
Plasticity term		Intermediate	
Moisture content (%)		13-21	Appendix K
Volume change potential		Moderate	NHBC standards
Grading	Gravel (%)	4	Appendix K
	Sand (%)	10	
	Silt (%)	43	
	Clay (%)	43	
SPT 'N' values		N=15 to 21	Appendix E
Stiffness term		Stiff	

4.1.5 Forest Marble Formation (clay)

Forest Marble Formation was encountered below the Cornbrash Formation as a stiff to very stiff grey occasionally mottled orange brown clay to the base of exploratory holes where encountered. The stratum achieved a thickness of at least 1.40m.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 7 or the in-situ and laboratory test results can be found in Appendix K.

Table 7: Summary of in-situ and laboratory test results for Forest Marble Formation

Soil parameters	Range	Reference
Liquid limit (%)	44-50	Appendix K
Plasticity limit (%)	19-20	
Plasticity index (%)	25-31	
Modified plasticity index (%)	24-29	
Plasticity term	Intermediate	
Moisture content (%)	20-24	Appendix K
Volume change potential	Moderate	NHBC
SPT 'N' values	N=35 to >50	Appendix E

Soil parameters	Range	Reference
Undrained shear strength (kN/m^2) from shear vane and undrained triaxial testing	110 to 135	
Stiffness term	stiff to very stiff	

4.1.6 Groundwater

Groundwater was encountered during the investigation as detailed in Table 8.

Table 8: Groundwater results during investigation

BH/TP	Stratum	Strike (m bgl)	Rise (m)
TP01	CF (clay)	2.20 (seepage)	N/A
TP02	CF (clay)	2.20 (seepage)	N/A
TP03	CF (clay)	1.50 (seepage)	N/A
TP04	CF (clay)	1.50 (seepage)	N/A
TP05	FMF (clay)	2.60 (seepage)	N/A
WS01	CF (clay)	2.00	Not recorded
Notes: CF – Cornbrash Formation, FMF – Forest Marble Formation			

It should be noted that groundwater levels might fluctuate for a number of reasons including seasonal variations. Ongoing monitoring would be required to establish both the full range of conditions and any trends in groundwater levels.

The results of the subsequent groundwater monitoring and well surveying exercise are summarised in Table 9. Groundwater has been identified within the Cornbrash Formation, which is likely to be migrating in a southerly direction.

Table 9: Groundwater monitoring data

Monitoring well	Depth to water (m bgl)
WS01	1.43 to 1.70
WS02	1.45 to 1.50
WS03	1.68 to 1.88
WS04	1.90 to Dry (at 2.06m)
WS05	2.07 to 2.72
WS06	1.91 to 2.65

The findings reflect the general groundwater table in the Cornbrash Formation, which is at a depth of between 1.43m and 2.72m bgl.

Laboratory chemical analysis of soil samples identified concentrations of leachable water-soluble sulphate of generally <10mg/l within the topsoil and Cornbrash Formation, and between 18mg/l and 43mg/l within the Forest Marble Formation.

Groundwater analysis was not undertaken on samples of groundwater from the site.

4.1.7 Results of soakaway testing

The results of soakaway testing are summarised in Table 10.

Table 10: Soakaway test results

Trial pit	Geological unit	Test result (m/s)
TP01	Forest Marble Formation	N/A (water rise)
TP03	Forest Marble Formation	N/A (water rise)
TP06	Cornbrash Formation	$1.71x10^{-5}$
Notes:		

4.1.8 Visual/olfactory evidence of soil and groundwater contamination

No visual or olfactory evidence of gross contamination were noted during any of the fieldworks undertaken at the site.

4.2 Ground gas regime

The results of the ground gas monitoring and testing carried out are given in Appendix F. The minimum and maximum results are recorded in Table 11.

Table 11: Summary of ground gas monitoring results

Borehole	Response zone/strata	Probable source(s) of ground gas	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Carbon monoxide (ppm)	Hydrogen sulphide (ppm)	Flow rate (l/hr)	Water level (m bgl)	Atmospheric pressure (mbar)
WS01	1.0-2.7	CF, FMF	<0.1	0.4-0.8	20.0-20.9	0	0	0	1.60-1.70	996-1018
WS02	0.8-1.8	CF	<0.1	0.7-1.4	19.5-21.3	0	0	0	1.45-1.50	995-1018
WS03	1.0-2.0	CF	<0.1	1.4-2.3	19.1-20.8	0	0	0.0-0.1	1.68-1.88	996-1018
WS04	1.0-2.0	CF, FMF	<0.1-0.1	1.1-1.4	19.6-20.6	0	0	0	1.90 to dry	996-1018

Borehole	Response zone/strata	Probable source(s) of ground gas	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Carbon monoxide (ppm)	Hydrogen sulphide (ppm)	Flow rate (l/hr)	Water level (m bgl)	Atmospheric pressure (mbar)
WS05	0.75-2.75	CF, FMF	<0.1	0.6-1.8	12.7-20.5	0	0	0	2.07-2.72	996-1017
WS06	1.0-2.7	CF, FMF	<0.1-0.1	1.2-2.0	19.7-20.1	0	0	0.0-0.2	1.91-2.65	996-1018
Note: CF – Cornbrash Formation, FMF – Forest Marble Formation										

{Note: if it is possible to zone the site and/or identify separate sources of ground gas, the table should be split up accordingly, to enable the different ground gas regimes to be assessed individually}

4.3 Refinement of the initial conceptual site model

The initial findings suggest that the site is generally underlain by topsoil, directly underlain by medium strong to strong limestone of the Cornbrash Formation. This is underlain by sand and clay fractions of the Cornbrash Formation respectively, with the clays of the Forest Marble Formation encountered at depth. Groundwater has been identified within the Cornbrash Formation, which is likely to be migrating in a southerly direction.

No visual or olfactory evidence of contamination was noted during any stage of the investigation.

Soil gas conditions have been monitored and concentrations of methane of between <0.1% and 0.1%, carbon dioxide of between 0.4% and 2.3% and oxygen concentrations of between 12.7% and 21.3%. In addition, carbon monoxide and hydrogen sulphide concentrations of 0ppm.

The above broadly confirms the anticipated ground conditions described in the CSM, with the following potential pollutant linkages to be considered:

- Direct contact, ingestion and inhalation of contaminated made ground to proposed site users (adults and children occupying houses);
- Chemical attack from contaminants in the made ground affecting potable water supply pipes; and
- The accumulation of ground gases generated from both on and off site sources within buildings.

5 QUANTITATIVE RISK ASSESSMENT

In line with CLR11 (EA, 2004a), there are two stages of quantitative risk assessment, generic and detailed. The GQRA comprises the comparison of soil, groundwater, soil gas and ground gas results with generic assessment criteria (GAC) that are appropriate to the linkage being assessed. This comparison can be undertaken directly against the laboratory results or following statistical analysis depending upon the sampling procedure that was adopted.

5.1 Linkages for assessment

Section 4.3 presents the refined conceptual model which identified the linkages that required assessment after the findings of the site investigation had been considered. These linkages together with the method of assessment are presented in Table 12.

Table 12: Linkages for generic quantitative risk assessment

Potentially relevant pollutant linkage	Assessment method
1. Direct contact with impacted soil by future residents	Human health GAC in Appendix H for a proposed residential end use with private gardens since proposed end use includes residential gardens. Statistical analysis undertaken owing to majority of sampling locations being non-targeted and made ground of similar composition.
2. Contaminants permeating potable water supply pipes	Comparison of soil data to GAC in Appendix J for plastic water supply pipes using UKWIR (2010) guidance.
3. Concentrations of methane and carbon dioxide in ground gas entering and accumulating in: depressions and excavations that could affect workers enclosed spaces or small rooms in new buildings, which could affect future residents. In the case of methane this could create a potentially explosive atmosphere, while death by asphyxiation could result from carbon dioxide.	Gas screening values (GSV) have been calculated using maximum methane and carbon dioxide concentrations with maximum flow rates recorded at the site. The GSV has been compared with the generic Traffic Lights, as presented within the NHBC ground gases guide (Boyle and Witherington, 2007) and the aforementioned CIRIA report C665, owing to the development comprising low-rise housing with suspended floors. In addition, the gas regime is considered within the context of a conceptual model as required by both aforementioned guidance documents and BS8576

5.2 Methodology and results

The methodology and results of the GQRA are presented for each relevant pollutant linkage in turn.

5.2.1 Direct contact with impacted soil by future residents

End users of the site are defined as those who are exposed to sources of contamination on a regular and predictable basis. In the case of developments for a residential with plant uptake end use, a female aged 1 to 6 has been considered as the critical receptor.

The chemical test results have been compared directly to the appropriate GAC for each contaminant, based upon a Soil Organic Matter (SOM) of 1.0%. The direct comparison table, which presents the chemical laboratory data set compared against the appropriate GAC, is included within Appendix I.

The results of the assessment indicate that the concentrations of contaminants present within the shallow soils beneath the site are not in exceedance of the relevant GAC; and it is therefore considered that a risk to human health via a direct contact pathway is not currently associated with the site.

Since both targeted and non-targeted soil samples were obtained during the site investigation, the results of these have been evaluated in the following subsections.

5.2.2 Impact of organic contaminants on potable water supply pipes

For initial assessment purposes, the results of the investigation have been compared with the GAC presented in Appendix J for this linkage, which are reproduced from *UKWIR Report 10/WM/03/21. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* (UKWIR, 2010).

The results indicate that a relevant linkage may exist associated with organic contaminants (marginally elevated concentrations of hydrocarbons within TP08) and therefore pollutant polyethylene (PE) water supply pipes are expected to be unsuitable for use on the development unless remedial measures are implemented that mitigate the risk. However, the use of polyvinyl chloride (PVC) water supply pipes are expected to be suitable for use at the site.

It should be noted that at the time of this investigation the future routes of water supply pipes had not been established, hence the investigation and sampling strategy may not be fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling/analytical strategy may be required at a later date once the route(s) of the supply pipe(s) are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

5.2.3 Ground gas

The results have been assessed in accordance with the guidance provided in BS8576 and *CIRIA Report C665*. In the assessment of risks and selection of appropriate mitigation measures, both reports highlight the importance of the conceptual model.

CIRIA C665 identifies two types of development, termed Situation A (modified Wilson and Card method), appropriate to all development excluding traditional low-rise construction, and Situation B (National House-Building Council, NHBC) only appropriate to traditional low-rise construction with ventilated sub-floor voids.

Both methods are based on calculations of the limiting borehole gas volume flow for methane and carbon dioxide, renamed as the gas screening value (GSV). The GSV (litres of gas per hour) is calculated by multiplying borehole flow rate (litres per hour) and gas concentration (percent by volume).

In both situations, it is important to note that the GSV thresholds are guideline values and not absolute. The GSV thresholds may be exceeded in certain circumstances, if the site conceptual model indicates it is safe to do so. Similarly, consideration of additional factors such as very high concentrations of methane, should lead to consideration of the need to adopt a higher risk classification than the GSV threshold indicates.

The site is to be redeveloped with residential houses and associated gardens and therefore falls under Situation B.

Situation B is a characterisation system developed by the NHBC (Boyle and Witherington, 2007), which relates only to low rise housing development constructed with a clear ventilated underfloor void. The system provides a risk-based approach that is designed to allow an identification of the required gas protection measures for low-rise housing by comparing the measured gas emission rates to generic “Traffic Lights”. The Traffic Lights include typical maximum concentrations that are provided for initial screening purposes and risk-based GSVs for situations where the typical maximum concentrations are exceeded. Based on the typical maximum gas concentrations and the GSVs, the appropriate Traffic Light, ranging from Green through Amber 1 and Amber 2 to Red, is determined from Table 8.7 of CIRIA C665.

The site is to be redeveloped with residential houses and therefore falls under Situation B. The gas monitoring data has identified a maximum methane concentration of 0.1% and a maximum concentration of carbon dioxide of 2.3%. A maximum gas flow rate of 0.2 l/hr has been recorded. The calculated GSV for methane is 0.0002 l/hr, and carbon dioxide is 0.0046 l/hr. Based on the GSVs the site has been characterised as Green.

For both types of development, CIRIA C665 provides details of the typical scope of protective measures to be adopted for the relevant site characterisation.

It should be noted that for low risk sites (Characteristic Situation 2), CIRIA C665 recommends a minimum thickness of gas resistant membrane of 2000 gauge, as the report considers that the standard unreinforced 1200 gauge membrane/DPM is unlikely to survive the construction process intact.

The proposed low-rise development, which fulfils the requirements of Situation B, has been characterised as Green, indicating that a negligible gas regime has been identified and that gas protection measures are not considered necessary.

It is considered that the gas monitoring programme carried out to-date has established the 'worst-case' scenario and has characterised the ground gas regime sufficient to enable the confident assessment of risk and subsequent design of an appropriate gas protection scheme(s) for the proposed development.

5.3 Environmental assessment conclusions

The results of the GQRA indicate that relevant pollutant linkages associated with direct contact with contaminated soils are absent however, it should be noted that it is recommended that PVC potable water supply pipes are utilised at the site.

The results of the GQRA of ground gases has indicated that the site can be characterised as Green indicating that a negligible gas regime has been identified and that gas protection measures are not considered necessary.

6 GEOTECHNICAL SITE ASSESSMENT

6.1 Engineering considerations

It is understood that the proposed development is to involve the construction of 41no residential properties and associated infrastructure. At this stage no specific information relating to building loads has been provided and therefore a wall loading of 100kN/m has been considered. It has been assumed the ground-bearing floor slabs will not be required and that beam and block flooring will be utilised.

6.2 Geotechnical hazards

A summary of commonly occurring geotechnical hazards is given in Table 13 together with an assessment of whether the site may be affected by each of the stated hazards.

Table 13: Summary of main potential geotechnical hazards that may affect site

Hazard category (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions			✓	Unlikely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓			Clay soils of moderate volume change potential. Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)			✓	Unlikely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions			✓	Unlikely to affect ground engineering and foundation design and construction
Running sand at and below water table			✓	Unlikely to affect ground engineering and foundation design and construction

Hazard category (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Karstic dissolution features (including 'swallow holes' in Chalk terrain)		✓		Relatively uncommon in Cornbrash, Unlikely to significantly affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence			✓	Unlikely to affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides			✓	Unlikely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present			✓	Unlikely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion			✓	Unlikely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)			✓	Unlikely to affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area			✓	Unlikely to affect deep foundations, basements and tunnels
Underground mining			✓	Unlikely to require special stabilisation measures
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)			✓	Unlikely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)			✓	Unlikely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)			✓	Unlikely to affect ground engineering and foundation design and construction

Hazard category (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.				

6.3 Foundations

6.3.1 General suitability

Given the presence of competent natural soils at a relatively shallow depth it is considered that traditional shallow spread footings will be suitable for the proposed development.

6.3.2 Shallow spread foundations

The recommendations for the design and construction of spread foundations in relation to the ground conditions are set out in Table 14.

Table 14: Design and construction of spread foundations

Design/construction considerations	Design/construction recommendations
Founding stratum	Stiff clays and medium dense sands of the Cornbrash Formation, with a minimum allowable bearing capacity of 120kN/m^2. Foundations should be taken through the limestone of the Cornbrash Formation.
Depth	Foundations should be taken to a minimum depth of 0.75m below finished ground level and at least 0.1m into the founding stratum below any overlying limestone or to any greater depth required in respect of the special design considerations given below.
Special design considerations	Owing to the presence of shrinkable clay soils, foundations should be designed taking into account all the normal precautions, including minimum founding depths, to minimise the risk of future foundation movements in accordance with NHBC standards or similar. The findings of the ground investigation indicate that foundations should be designed for shrinkable soils of medium volume change potential. Owing to the presence of a thin layer of limestone at surface, and the likelihood that foundations would be taken through this, consideration should be given to differential settlement between foundations and floor slabs and as such consideration should be given to suspending

Design/construction considerations	Design/construction recommendations
	floor slabs.
Bearing capacity	Strip foundations with a width of up to 0.60m may be designed using a net allowable capacity of 70kN/m, whilst a 1m strip would give a net allowable capacity of 120kN/m. The allowable bearing capacity includes an overall safety factor of 3 against bearing capacity failure and with total settlements associated with the bearing pressure estimated to be less than 25mm.
Stability of excavations	Generally the trial pits remained stable during excavation which indicates that foundation excavations should also remain stable in the short term. In the event that excavations are to remain open for longer periods, consideration should be given to the use of trench support systems.
Dewatering	Groundwater was encountered in some/all of the trial pits. Dewatering may therefore be required to facilitate foundation excavation. The cohesive nature of the soils encountered suggests that pumping from open sumps should be sufficient to keep the excavations reasonably dry. However, should significant proportions of sand be encountered, it should be noted that pumping from open sumps in non-cohesive soils should be avoided as this can result in instability and general loosening of the soils at the base of the excavation. It is likely that dewatering in non-cohesive soils will require the use of well-pointing systems.
Construction considerations	All foundation excavations should be inspected, and any made ground and soft, organic or otherwise unsuitable materials removed and replaced with mass concrete.

6.3.3 Floor slabs

Suspended floor slabs are recommended to avoid the risks of differential settlement between the foundations.

6.3.4 Roads, hardstanding and drainage

In the 1m to 1.5m below the proposed finished ground level the exploratory holes have revealed a soil profile comprising limestone over sand over clay, which together form the Cornbrash Formation. The potentially poorest sub-grade material within this profile is the clay.

In pavement design terms, the groundwater conditions are anticipated to comprise a low water table, i.e. at least 1m below the pavement formation level.

The estimated minimum, equilibrium soil-suction, California bearing ratio (CBR) value for the soils and groundwater conditions described above under a completed pavement is 3.0%, based upon Table C1 in TRRL (1984) Report LR1132, based on a silty, sandy clay, with a PI of between 24% and 32%.

The results of in-situ testing indicate that the near surface soils have a CBR value that ranges from between 1.2% and 22.0%, the results are summarised in Table 15.

Table 15: Summary of CBR values derived from in-situ DCP tests

Test location	Depth of test (m bgl)	Material type	Minimum CBR value determined at or just below anticipated formation level
CBR01	0.80	Clay	1.2%
CBR02	0.20	Clay	10.0%
CBR03	0.60	Silt	3.7%
CBR04	0.40	Clay	5.7%
CBR05	0.25	Silt	11.0%
CBR06	0.30	Silt	22.0%
CBR07	0.30	Silt	11.0%
CBR08	0.20	Silt	11.0%

The sub-grade soils in the vicinity of test locations may be susceptible to improvement by rolling with conventional compaction plant.

The recommended sub-grade soil CBR value for road pavement design is therefore 3.0%. This value assumes that during construction the formation level will be carefully compacted and any soft spots removed and replaced with well-compacted granular fill.

The sub-grade soils can be regarded as non-frost-susceptible where limestone, and frost-susceptible the silt clays of the Cornbrash Formation are located, based upon the criteria given in Appendix 1 of TRRL (1970) Report Road Note 29. When the sub-grade is frost-susceptible the thickness of sub-base must be sufficient to give a total thickness of non-frost-susceptible pavement construction over the soil of not less than 450mm.

6.3.5 Chemical attack on buried concrete

This assessment of the potential for chemical attack on buried concrete is based on current BRE guidance. The desk study and site walkover indicate that, for the purposes of this assessment of the aggressive chemical environment, the site should be considered as a brownfield development / site where disturbance of pyrite-bearing ground could result in additional sulphate / site that has not been subject to previous industrial development and does not contain pyrite. A (An extended) suite of chemical analyses appropriate to this site classification was carried out on soil (and water) samples.

“Characteristic value” is the highest result, or mean of the two highest if you have 5 to 9 readings from one area. The maximum water-soluble sulphate content in soil of 0.043g/l has been taken as the characteristic value. As this value is below the limiting value of 3.0g/l consideration of magnesium is not required. Based on Table C1 in the BRE guidance, Result one for Design Sulphate Class for the site is DS-1.

From consideration of results one for Greenfield a Design Sulphate Class of DS-1, may be adopted for the site. Based on groundwater being present just below the anticipated foundation depth it has been assumed that groundwater conditions are mobile. From consideration of the characteristic pH value, an Aggressive Chemical Environment for Concrete classification of AC-1^{d} may be assumed for design purposes.

6.3.6 Soakaways

Based upon the results of the soakaway tests presented in Section 4.1.7 above, the ground conditions appear suitable from a geotechnical viewpoint for the use of pit soakaways to discharge surface run-off water into the Cornbrash Formation. For environmental reasons, careful consideration will have to be given to selecting their locations and design details. A single soakaway test undertaken within the limestone of the Cornbrash Formation in TP06 in the north east of the site gave an infiltration rate of $1.71x10^{-5}$m/s.

The EA should be contacted at the design stage in order to obtain a 'consent to discharge'. This may not be forthcoming where soakage will be into or just above the water table, particularly in the Agency's sensitive aquifer protection zones. In addition, planning approval will have to be sought for their use.

The ground conditions do not appear suitable for the use of pit soakaways within the Forest Marble Formation as infiltration rates were so low, that water draining in from the Cornbrash Formation above caused the water level within the pit to rise over the course of both tests. However, consideration could be given to discharging to the existing storm water/foul sewer system.

7 REUSE OF MATERIALS AND WASTE

7.1 Reuse of suitable materials

Under the Waste Framework Directive naturally occurring soils are not considered waste if re-used on the site of origin for the purposes of development.

In accordance with the definition provided in the Waste Framework Directive, materials are only considered waste if 'they are discarded, intended to be discarded or required to be discarded, by the holder'. Thus, soils that are not of clean and natural origin, i.e. made ground (whether contaminated or not) and other materials such as recycled aggregate, do not become waste until the aforementioned criteria are met.

The Definition of Waste: Development Industry Code of Practice (CL:AIRE, 2011) (CoP) was developed in consultation with the Environment Agency and development industry to enable the re-use of materials under certain scenarios and subject to demonstrating that specific criteria are met. The current re-use scenarios covered by the CoP comprise:

- Re-use on the site of origin (with or without treatment)
- Direct transfer of clean and natural soils between sites
- Use in the development of land other than the site of origin following treatment at an authorised Hub site (including a fixed Soil Treatment Facility).

The importation of made ground soils (irrespective of contamination status) or crushed demolition materials is not currently permitted under the CoP and requires either a standard rules environmental permit or a U1 waste exemption (see below).

In the context of excavated materials used on sites undergoing development, four factors are considered to be of particular relevance in determining if the material is a waste or when it ceases to be waste:

- the aim of the Waste Framework Directive is not undermined, i.e. if the use of the material will create an unacceptable risk of pollution of the environment or harm to human health it is likely to be waste
- the material is certain to be used
- the material is suitable for use both chemically and geotechnically
- only the required quantity of material will be used.

The CoP requires the preparation of a materials management plan (MMP) that confirms the above factors will be met. This plan needs to be reviewed by a 'Qualified Person' (QP) who will then issue a declaration form to the EA. As the project progresses, data must be collated and on completion a verification report produced that shows the MMP was followed and describes any changes.

The MMP establishes whether specific materials are classified as waste and how excavated materials will be treated and/or re-used in line with the CoP. The MMP is likely to form part of the site waste management plan.

As the site has not been previously developed all excavation works are expected to generate only clean and naturally occurring soils. Under the Waste Framework Directive naturally occurring soils are not considered waste if re-used on the site of origin. However, if it is proposed to import clean and naturally occurring soils direct from another site, an MMP would need to be in place at the receiving site.

7.2 Treatment to meet suitable-for-use criteria

Where materials do not meet the suitable for use criteria it may be possible to treat them under an environmental permit (mobile treatment licence) to enable them to be reused onsite.

To enable the treatment options to be determined, an options appraisal and a remediation strategy document will be necessary to support discussion of the issues with regulators and third parties.

7.3 Reuse of waste materials

If material is discarded as waste then its reuse on site may still be possible. Waste soils and recycled aggregate can be reused on site under a standard rules environmental permit or a U1 waste exemption from the Environmental Permitting (England and Wales) Regulations 2010 provided that they are suitable for the proposed use, i.e. not cause harm to human health or the environment. However, it should be noted that these have strict limits on the quantity of material that can be reused.

7.4 Wastes for landfill disposal

Wastes require pre-treatment prior to disposal at landfill. Pre-treatment must be a physical, thermal, chemical or biological process (including sorting) that changes the characteristics of the waste to reduce its volume, reduce its hazardous nature, facilitate its handling and enhance its recovery.

The latest, edition of the EA's 'Technical Guidance WM2' (2013) Interpretation of the definition and classification of hazardous waste, requires that within a mixed waste* the separately identifiable wastes are assessed separately. Mixing of different types of hazardous waste and hazardous waste with other waste substances is prohibited under the Waste Framework Directive. Wastes that have been mixed must be separated whenever possible.

It is best practice to provide your waste carrier (or the disposal site) with details of how the waste has been treated. Your waste carrier may provide a pre-treatment confirmation form or space on the waste transfer note to detail the pre-treatment.

The classification of waste soil is a two-stage process, the first being an assessment of whether the soil is considered hazardous or not following the guidance within Technical Guidance WM2. For off-site disposal to landfill the results of Waste Acceptance Criteria (WAC) testing must then be reviewed to establish if the soil is acceptable at the relevant class of landfill or requires pre-treatment to reduce specific hazardous properties.

7.4.1 Waste acceptance criteria

All inert, stable non-reactive hazardous and hazardous wastes have limit values (waste acceptance criteria) set out in legislation that must be met before that class of landfill can accept the waste. Currently, no WAC are in place for non-hazardous waste.

Soil and other materials that are found not to be hazardous may be classified as either non hazardous or inert. In order to determine whether they can be classed as inert the soil must be tested and found to be below the inert waste acceptance criteria.

7.4.2 Waste sampling plan

Technical Guidance WM2 sets out in Appendix D requirements for waste sampling. It is a legal requirement to correctly assess and classify waste. The level of sampling should be proportionate to the volume of waste and its heterogeneity. At this stage RSK consider that the level of soil sampling is/is not sufficient to robustly/fully categorise the material.

RSK recommends that a Sampling Plan be prepared to support any waste classifications and hazardous waste assessments, prior to development.

7.4.3 Preliminary waste assessment

Given the level of data obtained, scale of the development and heterogeneity of the site soils the following assessment should be considered indicative and further assessment should be undertaken following the preparation of a Waste Sampling Plan.

Envirolab (an RSK company) has developed a waste soils characterisation assessment tool (HASWASTE), which follows the guidance within Technical Guidance WM2. The analytical results have been assessed using this tool for potential off-site disposal of materials in the future. The results are presented in Table 16.

Table 16: Results of waste soils characterisation assessment (HASWASTE)

Sample ref/location	Waste classification
TP01 at 0.90m bgl	Not hazardous
TP02 at 0.80m bgl	Not hazardous
TP04 at 0.50m bgl	Not hazardous
TP06 at 0.50m bgl	Not hazardous

Sample ref/location	Waste classification
TP08 at 0.15m bgl	Not hazardous
WS03 at 1.50m bgl	Not hazardous
WS05 at 0.70m bgl	Not hazardous
WS06 at 0.30m bgl	Not hazardous
FP02 at 0.20m bgl	Not hazardous
Notes:	

None of the samples were classified as hazardous waste. Therefore to determine whether waste might be classified as inert or non hazardous WAC testing will need to be undertaken.

7.4.4 Asbestos within waste soils

The latest, edition of Technical Guidance WM2, requires that within a mixed waste the separately identifiable wastes be assessed separately.

For instance where waste soil contains identifiable pieces of asbestos (visible to the naked eye) the asbestos should, where feasible, be separated from the soil and classified separately.

Samples of potential asbestos containing material were collected from site and analysed for the presence of asbestos, the results of which are presented in Appendix G. Analysis confirmed that asbestos is not present within any of the samples tested. Visible asbestos containing material should, where feasible, be separated from soils and classified as stable, non-reactive hazardous waste, which can then be disposed of within a stable non-reactive hazardous waste landfill or a special cell in a non-hazardous waste landfill.

7.5 Landfill tax

Waste producers disposing of material to landfill are required to pay landfill tax by HM Revenue and Customs.

The tax is chargeable by weight (tonnage) and two rates apply, either standard or lower rate. The lower rate only applies to those less polluting wastes as set out in the Landfill Tax (Qualifying Material) Order 2011, which include naturally occurring rock and soil, concrete, some minerals, some furnace slags and ash, and some low-activity organic compounds. Evidence confirming that the waste qualifies for the lower rate will be required, and standard rate tax will apply for the whole waste load for any loads of mixed waste.

Currently (since April 2015), standard rate landfill tax is £82.60 per tonne.

The lower rate of landfill tax applicable to less polluting wastes (i.e. 'inert' wastes) remains at £2.50 per tonne.

Material disposed of at a soil treatment centre will not be subject to landfill tax.

7.6 Groundwater

When there is an intention to discard groundwater, chemical test results will indicate the appropriate disposal options. This could include disposal to treatment facility, via consent (issued by the water authority) to foul sewer or via consent (issued by the EA) to a watercourse or land.

7.7 Recommendations

RSK recommends that consideration as to how potentially waste soils will be dealt with as part of this development/remediation is given as early in the project planning process as possible. Such planning can lead to cost savings where potentially waste soils are viewed as a resource and retained on-site as part of the development. We also recommend, where off-site disposal is being considered, that appropriate facilities are identified and discussions initiated to confirm suitability of the facility to take the material. Potentially, these may include soil treatment facilities as well as landfills.

RSK can provide specialist advice to assist in this process, which can be complex and subject to regular regulatory change.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Environmental

The results of the GQRA indicate that relevant pollutant linkages associated with direct contact with contaminated soils are absent however, it should be noted that it is recommended that PVC potable water supply pipes are utilised at the site.

The results of the GQRA of ground gases has indicated that the site is represents a Situation B site and has been characterised as Green indicating that a negligible gas regime has been identified and that gas protection measures are not considered necessary.

Therefore, no further environmental investigation is required.

8.2 Reuse of materials and waste

None of the samples were classified as hazardous waste. Therefore to determine whether waste might be classified as inert or non hazardous WAC testing will need to be undertaken.

The results of the GQRA indicate that the soil arisings from the site are likely to be suitable for reuse at the site.

8.3 Geotechnical

The site is to be developed with two to three storey residential houses with associated gardens. The site is underlain by limestone, over sand, over clay of the Cornbrash Formation, with clay of the Forest Marble Formation encountered at depth. Due to its variable thickness spread foundations with a width of up to 0.60m and constructed on the clay or sand of the Cornbrash Formation at a minimum depth of 0.75m may be designed using a net allowable bearing pressure of 120kN/m^2, with settlements of less than 25mm.

Owing to the presence of a thin layer of limestone at surface, and the likelihood that foundations would be taken through this, should ground bearing floor slabs be adopted consideration should be given to suspending floor slabs.

The recommended sub-grade soil CBR value for road pavement design is therefore 3%. This value assumes that during construction the formation level will be carefully compacted and any soft spots removed and replaced with well-compacted granular fill.

It is recommended that a **DS-1 AC-1_d** class concrete be used for in ground foundations and concrete.

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FIGURES

Indicative site boundary

Rev	Date	Description	Drn	Chk	App
00	22.05.15	313035	RG	SP	AJ

Chesterton

RSK

Figure 1

Site Location Plan

0 150
metres
Scale = 1:5,000 @ A3

N W E S

REV 00

File Name : X:\Cov Ground and Environment\Jobs\313000 ONWARDS\313000 - 313100\313035 - Chesterton Phase 2\10 Drawings\GIS\10 - Workspaces

Indicative site boundary

CBR

Foundation pit

Trial pit

Trial pit and soakaway

Window sample

Rev	Date	Description	Drn	Chk	App
00	22.05.15	313035	RG	SP	AJ

Chesterton

RSK

Figure 2

Exploratory Hole Location Plan

0 37.5

metres

Scale = 1:1,250 @ A3

N W E S

REV 00

File Name : X:\Cov Ground and Environment\Jobs\313000 ONWARDS\313000 - 313100\313035 - Chesterton Phase 2\10 Drawings\GIS\10 - Workspaces

N

Site Plan from Life Space Design, dated August 2014

REV	DATE	DESCRIPTION	BY	CHD.	APR.
A	08.07.15	FIRST ISSUE	HD	ML	ML

Dimensions	Projection	Scale	Orig Size
m		AS SHOWN	A3

RSK
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CLIENT
TAYLOR WIMPEY

PROJECT
CHESTERTON

TITLE
PROPOSED DEVELOPMENT PLAN

JOB No.:	DRAWING FILE:
313035	313035-R1(00)D003A

BY:	DATE:	CONTRACT NO.		REV:
HD	08.07.15		FIGURE 3	A

Approximate Scale
0 10 20 30 40 50m

APPENDIX A
SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Taylor Wimpey Oxfordshire (the "client") in accordance with the terms of a contract between RSK and the "client", dated 20th April 2015. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed in writing the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.**

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B
SUMMARY OF LEGISLATION AND POLICY RELATING TO CONTAMINATED LAND

Part IIA of the Environmental Protection Act 1990 (EPA) and its associated Contaminated Land Regulations 2000 (SI 2000/227), which came into force in England on 1 April 2000, formed the basis for the current regulatory framework and the statutory regime for the identification and remediation of contaminated land. Part IIA of the EPA 1990 defines contaminated land as 'any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused, or that there is significant possibility of significant harm being caused, or that pollution of controlled waters is being or is likely to be caused'. Controlled waters are considered to include all groundwater, inland waters and estuaries.

In August 2006, the Contaminated Land (England) Regulations 2006 (SI 2006/1380) were implemented, which extended the statutory regime to include Part IIA of the EPA as originally introduced on 1 April 2000, together with changes intended chiefly to address land that is contaminated by virtue of radioactivity. These have been replaced subsequently by the Contaminated Land (England) (Amendment) Regulations 2012, which now exclude land that is contaminated by virtue of radioactivity.

The intention of Part IIA of the EPA is to deal with contaminated land issues that are considered to cause significant harm on land that is not undergoing development (see Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, April 2012). This document replaces Annex III of Defra Circular 01/2006, published in September 2006 (the remainder of this document is now obsolete).

Water Framework Directive (WFD)

The Water Framework Directive 2000/60/EC is designed to:

- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands that depend on the aquatic ecosystems
- promote the sustainable use of water
- reduce pollution of water, especially by 'priority' and 'priority hazardous' substances
- ensure progressive reduction of groundwater pollution.

The WFD requires a management plan for each river basin be developed every six years.

Groundwater Directive (GWD)

The 1980 Groundwater Directive 80/68/EEC and the 2006 Groundwater Daughter Directive 2006/118/EC of the WFD are the main European legislation in place to protect groundwater. The 1980 Directive is due to be repealed in December 2013. The European legislation has been transposed into national legislation by regulations and directions to the Environment Agency.

Environmental Permitting Regulations (EPR)

The Environmental Permitting (England and Wales) Regulations 2010 provide a single regulatory framework that streamlines and integrates waste management licensing, pollution prevention and control, water discharge consenting, groundwater authorisations, and radioactive substances regulation. Schedule 22, paragraph 6 of EPR 2010 states: 'the regulator must, in exercising its relevant functions, take all necessary measures - (a) to prevent the input of any hazardous substance to groundwater; and (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.'

Water Resources Act (WRA)

The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 updated the Water Resources Act 1991, which introduced the offence of causing or knowingly permitting pollution of controlled waters. The Act provides the Environment Agency with powers to implement remediation necessary to protect controlled waters and recover all reasonable costs of doing so.

Priority Substances Directive (PSD)

The Priority Substances Directive 2008/105/EC is a 'Daughter' Directive of the WFD, which sets out a priority list of substances posing a threat to or via the aquatic environment. The PSD establishes environmental quality standards for priority substances, which have been set at concentrations that are safe for the aquatic environment and for human health. In addition, there is a further aim of reducing (or eliminating) pollution of surface water (rivers, lakes, estuaries and coastal waters) by pollutants on the list. The WFD requires that countries establish a list of dangerous substances that are being discharged and EQS for them. In England and Wales, this list is provided in the River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. In order to achieve the objectives of the WFD, classification schemes are used to describe where the water environment is of good quality and where it may require improvement.

Planning Policy

Contaminated land is often dealt with through planning because of land redevelopment. This approach was documented in Planning Policy Statement: Planning and Pollution Control PPS23, which states that it remains the responsibility of the landowner and developer to identify land affected by contamination and carry out sufficient remediation to render the land suitable for use.

PPS23 was withdrawn early in 2012 and has been replaced by much reduced guidance within the National Planning Policy Framework (NPPF).

The new framework has only limited guidance on contaminated land, as follows:

- *"planning policies and decisions should also ensure that:*
    - *the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
    - *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
    - *adequate site investigation information, prepared by a competent person, is presented".*

APPENDIX C
SITE PHOTOGRAPHS

PHOTOGRAPHIC LOG		
Photo no. **1**	**Date:** 19.05.15	
Direction photo taken: N/A		
Description: TP02 excavation		

Photo No. **2**	**Date:** 19.05.15	
Direction photo taken: N/A		
Description: TP02 spoil		

Photo No.	Date:	
3	19.05.15	
Direction Photo Taken: N/A		
Description: An example of reinstatement within the fields at TP04		

Photo No.	Date:	
4	20.05.15	
Direction Photo Taken: N/A		
Description: Foundation inspection pit at FP03		

Photo No.	Date:
5	20.05.15

Direction Photo Taken:

N/A

Description:

Recovered soils from WS05

Photo No.	Date:
6	20.05.15

Direction Photo Taken:

West

Description:

Stored materials within the compound area of the site

APPENDIX D
RISK ASSESSMENT METHODOLOGY

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. Under CLR11, three stages of risk assessment exist: preliminary, generic quantitative and detailed quantitative. An outline conceptual model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) pollutant linkages (contaminant–pathway–receptor) and is used as the basis for the design of the site investigation. The outline conceptual model is updated as further information becomes available, for example as a result of the site investigation.

Production of a conceptual model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk. RSK has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

- highly likely: the event appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution
- likely: it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term
- low likelihood: circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term
- unlikely: circumstances are such that it is improbable the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- severe: short term (acute) risk to human health likely to result in ‘significant harm’ as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000)
- medium: chronic damage to human health (‘significant harm’ as defined in ‘Draft Circular on Contaminated Land’, DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem

- mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment
- minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the probability of an event occurring and its consequences have been classified, a risk category can be assigned according to the table below.

		Consequences			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**Highly likely**	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very low	Very low

Definitions of these risk categories are as follows together with an assessment of the further work that may be required:

- Very high: there is a high probability that severe harm could occur or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability; urgent investigation and remediation are likely to be required.
- High: harm is likely to occur. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required. Remedial works may be necessary in the short term and are likely over the long term.
- Moderate: it is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term.
- Low: it is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild.
- Very low: there is a low possibility that harm could occur and if realised the harm is unlikely to be severe.

APPENDIX E
EXPLORATORY HOLE RECORDS

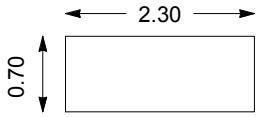
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP01**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES				Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	(0.40) 0.40	
0.50	2	B				White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong. (CORNBRASH FORMATION)	(0.40) 0.80	
0.90	3	ES				Orangish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of limestone. (CORNBRASH FORMATION)	(0.50) 1.30	
1.50	4	D		≈		Greyish white mottled orange friable sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular medium to coarse of micrite. (CORNBRASH FORMATION)	(1.50) 2.80	
1.60	5	B						
2.90	6	B				Stiff grey mottled orange CLAY. (FOREST MARBLE FORMATION)	(0.70) 3.50	
2.90		V	c_u=120/135/130					
3.00	7	D						
						Trial pit terminated at 3.50m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater seepage encountered at 2.20m bgl.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

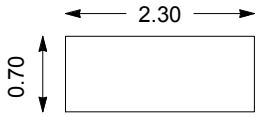
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP02**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10	1	ES				Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	0.20	
						White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong. (CORNBRASH FORMATION)	(0.30) 0.50	
0.80	2	ES				Orangish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of limestone and occasional cobbles of subangular limestone upto 100mm. (CORNBRASH FORMATION)	(0.90) 1.40	
0.80	3	D						
1.50	4	D				Greyish white mottled orange friable sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular medium to coarse of micrite and occasional cobbles of subangular limestone upto 80mm. (CORNBRASH FORMATION)	(1.20) 2.60	
2.00	5	B		≈				
2.30	6	D						
2.70	7	D				Stiff grey mottled orange CLAY. Clay is finely bedded and subangular flat cobbles of mudstone. (FOREST MARBLE FORMATION)	(0.60) 3.20	
2.80		V	c_u=110/115/118					
						Trial pit terminated at 3.20m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater seepage encountered at 2.20m bgl.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

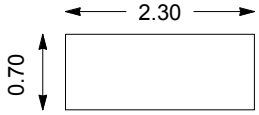
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP03**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	0.10 (0.30)	
0.30	1	B				White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong. (CORNBRASH FORMATION)	0.40 (0.60)	
0.80	2	ES				Orangish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of limestone. (CORNBRASH FORMATION)		
0.90	3	D						
1.00	4	B				Light greyish yellow slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular medium to coarse of limestone. (CORNBRASH FORMATION)	(0.90) 1.50	
1.60		V	c_u=115/125/138			very stiff grey CLAY. (FOREST MARBLE FORMATION)	(0.90) 2.40	
1.70	5	D						
						Light grey friable stiff CLAY. (FOREST MARBLE FORMATION)	(0.30) 2.70	
						Trial pit terminated at 2.70m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater seepage encountered at 1.50m bgl.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

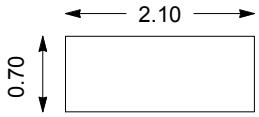
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP04**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	0.20	
0.50	1	ES				White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong and fine to coarse sand. (CORNBRASH FORMATION)	(1.10)	
0.70	2	B					1.30	
1.50	3	B				Orangish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of limestone and occasional subangular cobbles of limestone. (CORNBRASH FORMATION)	(0.40)	
							1.70	
1.80	4	B		≈		Greyish white mottled orange friable sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular medium to coarse of micrite. (CORNBRASH FORMATION)	1.90	
						Stiff grey mottled orange laminated friable CLAY. (FOREST MARBLE FORMATION)		
2.30	5	D					(1.00)	
2.80	6	D					2.90	
						Trial pit terminated at 2.90m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater seepage encountered at 1.50m bgl.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

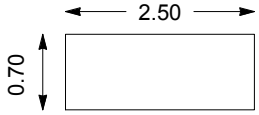
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP05**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15** End: **19.05.15**	**---**	**---**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10	1	ES				Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	0.15	
0.50	2	D				White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong. (CORNBRASH FORMATION)	(0.85)	
							1.00	
1.30	3	D				Orangish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse of limestone. (CORNBRASH FORMATION)	(0.50)	
1.40	4	B					1.50	
2.40	5	D		≈		Greyish white mottled orange friable sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular medium to coarse of micrite. (CORNBRASH FORMATION)	(1.00)	
							2.50	
2.60	6	D				Stiff grey friable CLAY. (FOREST MARBLE FORMATION)	(0.40)	
							2.90	
						Trial pit terminated at 2.90m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater seepage encountered at 2.60m bgl.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

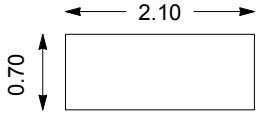
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP06**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.15	1	ES				Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	0.20	
0.50	2	ES				White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong. Layers of sand and gravel. Gravel is subangular to subrounded fine to coarse of limestone. (CORNBRASH FORMATION)	(0.90)	
0.50	3	D						
0.60	4	B					1.10	
						Trial pit terminated at 1.10m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

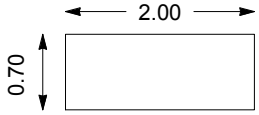
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP07**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.15	1	ES				Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	0.20	
0.30	2	D				White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong. Layers of sand and gravel. Gravel is subangular to subrounded fine to coarse of limestone. (CORNBRASH FORMATION)	(0.70)	
							0.90	
						Trial pit terminated at 0.90m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

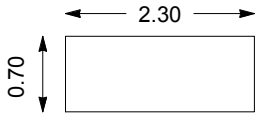
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**TP08**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.15	1	ES				Crop over brown slightly clayey gravelly SAND and frequent rootlets. Sand is fine to medium. Gravel is subangular fine to medium of limestone. (TOPSOIL)	0.20	
						White LIMESTONE recovered as flat subangular cobble sized fragments. Limestone is dark grey coarse grained medium strong to strong. (CORNBRASH FORMATION)	(1.20)	
							1.40	
1.50	2	D				Greyish white mottled orange friable sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular medium to coarse of micrite. (CORNBRASH FORMATION)	(0.70)	
1.60	3	B					2.10	
2.30	4	D				Stiff light grey CLAY, (FOREST MARBLE FORMATION)	(0.70)	
2.40		V	c_u=125/132/122					
2.50	5	D						
2.60	6	B					2.80	
						Trial pit terminated at 2.80m bgl.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Trial pit remained stable during excavation.
3. Groundwater not encountered.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Machine dug	**JCB-3CX**	**adamjones**	

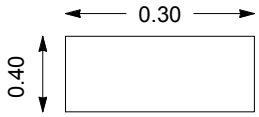
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**FP01**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**20.05.15**	**---**	**---**	**1** of **1**
	End: **20.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.15	1	ES				Gravel over brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of slate and limestone. (TOPSOIL)	(0.30)	
						. . . wooden post down to 0.05m.	0.30	
						Medium strong to strong, coarse grained, white LIMESTONE. (CORNBRASH FORMATION)	0.35	
						. . . concrete footing extends to a depth of 0.30m.		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Foundation pits to investigate footings of buildings on site. Buildings comprise of wooden posts with corrugated metal roofs and sides.
3. No groundwater encountered.
4. Foundation pit back filled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MLawson**	

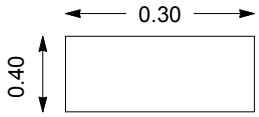
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**FP02**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**20.05.15**	**---**	**---**	**1** of **1**
	End: **20.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES				Gravel over brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone, slate, glass and metal. (TOPSOIL)	0.25	
						. . . Concrete footing extends to a depth of 0.15m.	0.30	
						Medium strong to strong, coarse grained, white LIMESTONE. (CORNBRASH FORMATION)		

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Foundation pits to investigate footings of buildings on site. Buildings comprise of wooden posts with corrugated metal roofs and sides.
3. No groundwater encountered.
4. Foundation pit back filled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MLawson**	

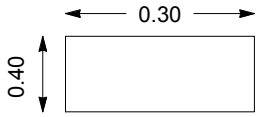
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**FP03**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**20.05.15**	**---**	**---**	**1** of **1**
	End: **20.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10	1	ES				Wooden post surrounded by gravel over brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of slate and limestone. (TOPSOIL)	(0.30)	
						. . . concrete footing extended to a depth of 0.20m.	0.30	
						Medium strong to strong, coarse grained, white LIMESTONE. (CORNBRASH FORMATION)	0.35	

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Foundation pits to investigate footings of buildings on site. Buildings comprise of wooden posts with corrugated metal roofs and sides.
3. No groundwater encountered.
4. Foundation pit back filled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MLawson**	

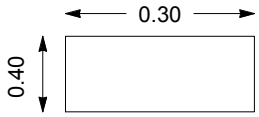
FINAL
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
Chesterton	**Taylor Winpey Oxfordshire**	**FP04**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**20.05.15**	**---**	**---**	**1** of **1**
	End: **20.05.15**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.15	1	ES				Wooden post surrounded by gravel over brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of slate and limestone. (TOPSOIL)	(0.30)	
						. . . concrete footing extended to a depth of 0.25m.	0.30	
						Medium strong to strong, coarse grained, white LIMESTONE. (CORNBRASH FORMATION)	0.35	

Plan (Not to Scale)



General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Foundation pits to investigate footings of buildings on site. Buildings comprise of wooden posts with corrugated metal roofs and sides.
3. No groundwater encountered.
4. Foundation pit back filled with arisings upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MLawson**	

FINAL
WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Chesterton	**Taylor Winpey Oxfordshire**	**WS01**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	End: **20.05.15**	**---**	**---**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.15	1	ES				Crop over brown slighty clayey gravelly SAND with numerous rootlets. sand is fine to medium. Gravel is subangular fine to coarse of limestone. (TOPSOIL)	0.25	
							White LIMESTONE recovered as subangular fine to coarse gravel sized pieces in bands with yellowish orange clayey sand between beds. (CORNBRASH FORMATION)	(0.65)	
								0.90	
	1.00-1.45	1	SPT(c)	N=15			Very stiff light grey mottled yellowish orange gravelly slightly sandy CLAY. Gravel is subangular medium to coarse of limestone. (CORNBRASH FORMATION)		
	1.10	2	D						
1.00 - 2.00 (65mm dia) 96% rec	1.40	3	D					(1.30)	
	1.80	4	D		1				
	2.00-2.45	2	SPT(c)	N=19			. . . no gravel from 2.00m.		
								2.20	
2.00 - 2.70 (55mm dia) 60% rec	2.30	5	D				Stiff grey mottled orange CLAY. (FOREST MARBLE FORMATION)	(0.50)	
	2.60	6	D					2.70	
	2.70-3.09	3	SPT(c)	N:50 for 275mm			Window sample hole terminated at 2.70m.		

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater encountered at 2.00m bgl.
4. Gas and groundwater monitoring well installed to 2.70m bgl upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier Compact 110**	**Dynamic Sampling UK Ltd**	**adamjones**	

FINAL
WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Chesterton	**Taylor Winpey Oxfordshire**	**WS02**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	End: **20.05.15**	**---**	**---**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.15	1	ES				Crop over brown slighty clayey gravelly SAND with numerous rootlets. sand is fine to medium. Gravel is subangular fine to coarse of limestone. (TOPSOIL)	(0.30) 0.30	
	0.50	2	D				White LIMESTONE recovered as subangular fine to coarse gravel sized pieces in bands with yellowish orange clayey sand between beds. (CORNBRASH FORMATION)	(0.90) 1.20	
1.00 - 1.80 (75mm dia) 80% rec	1.00-1.45	1	SPT(c)	N=23					
	1.30	3	D				Greyish white mottled orange very clayey slightly gravelly SAND. Sand is fine to medium. Gravel is subangular medium to coarse of limestone. (CORNBRASH FORMATION)	(0.60) 1.80	
	1.80-2.14	2	SPT(c)	N:50 for 255mm			Window sample hole terminated at 1.80m.		
	1.80	4	D						

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater not encountered.
4. Gas and groundwater monitoring well installed to 1.80m bgl upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier Compact 110**	**Dynamic Sampling UK Ltd**	**adamjones**	

FINAL
WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Chesterton	**Taylor Winpey Oxfordshire**	**WS03**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	**19.05.15**	**---**	**---**	**1** of **1**
	End: **19.05.15**			

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Crop over brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular fine to coarse of limestone. (TOPSOIL)	0.20	
							White LIMESTONE recovered as subangular fine to coarse gravel sized pieces in bands with yellowish orange clayey sand between beds. (CORNBRASH FORMATION)	(0.80)	
								1.00	
1.00 - 1.90 (75mm dia) 90% rec	1.00-1.45	1	SPT(c)	N=46			Greyish white clayey gravelly SAND with occasional cobbles. sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular of limestone upto 70mm. (CORNBRASH FORMATION)	(1.20)	
	1.50	1	D						
	1.90-2.35	2	SPT(c)	N=25					
	2.10	2	D					2.20	
1.90 - 2.90 (55mm dia) 99% rec	2.40	3	D				Very stiff to hard mottled orange CLAY. (FOREST MARBLE FORMATION)	(0.70)	
	2.80	4	D					2.90	
	2.90-3.29	3	SPT(c)	N:50 for 240mm					

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater not encountered.
4. Gas and groundwater monitoring well installed to 2.00m bgl upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier Compact 110**	**Dynamic Sampling UK Ltd**	**adamjones**	

FINAL
WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Chesterton	**Taylor Winpey Oxfordshire**	**WS04**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	End: **20.05.15**	**---**	**---**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.15	1	ES				Crop over brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular fine to coarse of limestone. (TOPSOIL)	0.15	
0.50 - 1.00 (75mm dia) 50% rec							White LIMESTONE recovered as subangular fine to coarse gravel sized pieces in bands with yellowish orange clayey sand between beds. (CORNBRASH FORMATION)	(0.55)	
	0.80	2	D					0.70	
	1.00-1.45	1	SPT(c)	N=19			Light yellowish orange mottled grey very clayey slightly gravelly SAND. Sand is fine to medium. gravel is subangular medium to coarse of limestone, and occasional limestone subangular cobbles of upto 60mm. (CORNBRASH FORMATION)	(0.60)	
1.00 - 2.00 (65mm dia) 100% rec								1.30	
	1.40	3	D				very stiff light grey mottled orange CLAY. (FOREST MARBLE FORMATION)	(0.90)	
	1.80	4	D						
	2.00-2.45	2	SPT(c)	N=50				2.20	
							Window sample hole terminated at 2.20m.		

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater not encountered.
4. Gas and groundwater monitoring well installed to 2.00m bgl upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier Compact 110**	**Dynamic Sampling UK Ltd**	**adamjones**	

FINAL
WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Chesterton	**Taylor Winpey Oxfordshire**	**WS05**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	End: **20.05.15**	**---**	**---**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instru-mentation	Description of Strata	Depth (Thick ness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Crop over brown gravelly clayey SAND. Sand is fine to medium. Gravel is subangular fine to coarse of limestone. (TOPSOIL)	0.20	
							White LIMESTONE recovered as subangular fine to coarse gravel sized pieces in bands with yellowish orange clayey sand between beds. (CORNBRASH FORMATION)	(0.30) 0.50	
0.50 - 1.00 (85mm dia) 100% rec	0.70	1	ES				Firm to stiff orangish yellow mottled grey sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular fine to medium of limestone. With occasional subangular cobbles of limestone upto 55mm. (CORNBRASH FORMATION)		
	0.90	2	D						
	1.00-1.45	1	SPT(c)	N=21				(1.10) 1.60	
1.00 - 2.00 (75mm dia) 100% rec	1.40	3	D				Very stiff brownish grey CLAY. (FOREST MARBLE FORMATION)		
	1.80	4	D						
	2.00-2.45	2	SPT(c)	N=43					
2.00 - 3.00 (65mm dia) 100% rec	2.40	5	D				. . . friable from 2.25-2.30m.	(1.40) 3.00	
	2.80	6	D						
	3.00-3.43	3	SPT(c)	N:50 for 275mm			Window sample hole terminated at 3.00m.		

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater not encountered.
4. Gas and groundwater monitoring well installed to 3.00m bgl upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier Compact 110**	**Dynamic Sampling UK Ltd**	**adamjones**	

FINAL
WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
Chesterton	**Taylor Winpey Oxfordshire**	**WS06**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
313035	End: **20.05.15**	**---**	**---**	**1** of **1**

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
							Crop over brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular fine to coarse of limestone. (TOPSOIL)	0.20	
	0.30	1	ES				White LIMESTONE recovered as subangular fine to coarse gravel sized pieces in bands with yellowish orange clayey sand between beds. (CORNBRASH FORMATION)	(0.70)	
								0.90	
	1.00-1.45	1	SPT(c)	N=19			Light grey mottled orangish brown very clayey gravelly SAND. Sand if fine to medium. Gravel is subangular fine to coarse of limestone. With occasional cobbles of subangular limestone. (CORNBRASH FORMATION)	(0.70)	
1.00 - 2.00 (65mm dia) 100% rec	1.10	2	D					1.60	
	1.70	3	D				Very stiff to hard brownish grey slightly sandy CLAY. Sand is fine to medium. (FOREST MARBLE FORMATION)	(1.10)	
	2.00-2.45	2	SPT(c)	N=35					
2.00 - 2.70 (55mm dia) 68% rec	2.10	4	D						
	2.60	5	D					2.70	
	2.70-3.14	3	SPT(c)	N:50 for 290mm			Window sample hole terminated at 2.70m.		

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

1. Location scanned with GPR and a CAT and Signal Generator prior to breaking ground.
2. Hand dug inspection pit to 1.20m bgl.
3. Groundwater not encountered.
4. Gas and groundwater monitoring well installed to 2.70m bgl upon completion.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Premier Compact 110**	**Dynamic Sampling UK Ltd**	**adamjones**	AGS

APPENDIX F
GROUND GAS MONITORING DATA

IN-SITU GAS MONITORING RESULTS

[Pressures]	Previous	During	Start	End	Equipment Used & Remarks
Round 1	Falling	Fluctuating	996	996	Ground: Damp + Wind: None + Air Temp: 10DegC
Round 2	Rising	Constant	1014	1014	Ground: Dry + Wind: None + Air Temp: 17DegC
Round 3	-	Constant	1013	-	
Round 4	-	Rising	1017	1018	Ground: Dry + Wind: None + Air Temp: 15DegC
Round 5	Fluctuating	Constant	1000	1000	Ground: Dry + Wind: Light + Air Temp: 16DegC
Round 6	Constant	Constant	1009	1009	Ground: Dry + Wind: Light + Air Temp: 18DegC

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS01	1	50	1	2.70	2.55	1.00 to 2.70	29/05/2015	996	996	$0.0_{(I)}$	1.43	0.1	0.0	20.9	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	0.5	0.0	20.5	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	30 secs	-	-	-	-	0.5	0.0	20.9	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	60 secs	-	-	-	-	0.6	0.0	20.9	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	90 secs	-	-	-	-	0.6	0.0	20.9	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	120 secs	-	-	-	-	0.6	0.0	20.9	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	180 secs	-	-	-	-	0.6	0.0	20.9	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	240 secs	-	-	-	-	0.6	0.0	20.9	-	0.0	0.0
WS01	1	50	1		---	1.00 to 2.70	300 secs	-	-	-	-	0.6	0.0	20.9	-	0.0	0.0
WS01	1	50	2	2.70	2.55	1.00 to 2.70	03/06/2015 14:10:00	1014	1014	$0.0_{(I)}$	1.56	0.0	0.0	20.8	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	0.5	0.0	20.6	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	30 secs	-	-	-	-	0.5	0.0	20.6	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	60 secs	-	-	-	-	0.5	0.0	20.5	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	90 secs	-	-	-	-	0.5	0.0	20.5	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	120 secs	-	-	-	-	0.5	0.0	20.5	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	180 secs	-	-	-	-	0.5	0.0	20.5	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	240 secs	-	-	-	-	0.5	0.0	20.5	0.0	0.0	0.0
WS01	1	50	2		---	1.00 to 2.70	300 secs	-	-	-	-	0.5	0.0	20.5	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
	08/07/15			**313035**

Contract: **Chesterton**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS01	1	50	3	2.70	2.55	1.00 to 2.70	11/06/2015	1013	1013	$0.3_{(I)}$	0.60	0.0	0.0	20.8	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	0.4	0.0	20.3	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	30 secs	-	-	-	-	0.4	0.0	20.3	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	60 secs	-	-	-	-	0.4	0.0	20.3	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	90 secs	-	-	-	-	0.4	0.0	20.4	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	120 secs	-	-	-	-	0.4	0.0	20.4	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	180 secs	-	-	-	-	0.4	0.0	20.4	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	240 secs	-	-	-	-	0.4	0.0	20.4	0.0	0.0	0.0
WS01	1	50	3		---	1.00 to 2.70	300 secs	-	-	-	-	0.4	0.0	20.5	0.0	0.0	0.0
WS01	1	50	4	2.70	2.54	1.00 to 2.70	16/06/2015	1018	1018	$0.1_{(I)}$	1.64	0.0	0.0	20.8	0.0	0.0	0.0
WS01	1	50	4		---	1.00 to 2.70	15 secs	-	-	$0.1_{(SS)}$	-	0.5	0.0	20.3	0.0	1.0	0.0
WS01	1	50	4		---	1.00 to 2.70	30 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS01	1	50	4		---	1.00 to 2.70	60 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS01	1	50	4		---	1.00 to 2.70	90 secs	-	-	-	-	0.6	0.0	20.3	0.0	0.0	0.0
WS01	1	50	4		---	1.00 to 2.70	120 secs	-	-	-	-	0.6	0.0	20.3	0.0	0.0	0.0
WS01	1	50	4		---	1.00 to 2.70	180 secs	-	-	-	-	0.6	0.0	20.3	0.0	0.0	0.0
WS01	1	50	4		---	1.00 to 2.70	240 secs	-	-	-	-	0.6	0.0	20.3	0.0	0.0	0.0
WS01	1	50	4		---	1.00 to 2.70	300 secs	-	-	-	-	0.6	0.0	20.3	0.0	0.0	0.0
WS01	1	50	5	2.70	2.52	1.00 to 2.70	22/06/2015 08:20:00	1000	1000	$0.3_{(I)}$	1.70	0.1	0.0	20.8	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	0.6	0.0	20.2	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	30 secs	-	-	-	-	0.6	0.0	20.4	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	60 secs	-	-	-	-	0.7	0.0	20.4	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	90 secs	-	-	-	-	0.7	0.0	20.3	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	120 secs	-	-	-	-	0.7	0.0	20.2	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	180 secs	-	-	-	-	0.7	0.0	20.2	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS01	1	50	5		---	1.00 to 2.70	240 secs	-	-	-	-	0.8	0.0	20.0	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	300 secs	-	-	-	-	0.8	0.0	20.1	0.0	0.0	0.0
WS01	1	50	5		---	1.00 to 2.70	360 secs	-	-	-	-	0.8	0.0	20.2	0.0	0.0	0.0
WS01	1	50	6	2.70	2.50	1.00 to 2.70	02/07/2015 13:25:00	1009	1009	$0.0_{(I)}$	1.56	0.0	0.0	20.8	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	0.6	0.0	20.4	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	30 secs	-	-	-	-	0.6	0.0	20.3	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	60 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	90 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	120 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	180 secs	-	-	-	-	0.6	0.0	20.1	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	240 secs	-	-	-	-	0.6	0.0	20.1	0.0	0.0	0.0
WS01	1	50	6		---	1.00 to 2.70	300 secs	-	-	-	-	0.6	0.0	20.0	0.0	0.0	0.0
WS02	1	50	1	1.80	1.81	0.80 to 1.80	29/05/2015	995	995	$0.0_{(I)}$	1.46	0.1	0.0	20.9	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	15 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	20.4	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	30 secs	-	-	-	-	1.4	0.0	20.4	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	60 secs	-	-	-	-	1.4	0.0	20.4	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	90 secs	-	-	-	-	1.4	0.0	20.4	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	120 secs	-	-	-	-	1.4	0.0	20.4	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	180 secs	-	-	-	-	1.4	0.0	20.4	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	240 secs	-	-	-	-	1.4	0.0	20.4	-	0.0	0.0
WS02	1	50	1		---	0.80 to 1.80	300 secs	-	-	-	-	1.4	0.0	20.4	-	0.0	0.0
WS02	1	50	2	1.80	1.83	0.80 to 1.80	03/06/2015 14:20:00	1014	1014	$0.0_{(I)}$	1.50	0.0	0.0	20.8	0.0	0.0	0.0
WS02	1	50	2		---	0.80 to 1.80	15 secs	-	-	$0.0_{(SS)}$	-	0.9	0.0	20.1	0.0	0.0	0.0
WS02	1	50	2		---	0.80 to 1.80	30 secs	-	-	-	-	0.9	0.0	19.9	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS02	1	50	2		---	0.80 to 1.80	60 secs	-	-	-	-	0.9	0.0	19.9	0.0	0.0	0.0
WS02	1	50	2		---	0.80 to 1.80	90 secs	-	-	-	-	0.9	0.0	19.8	0.0	0.0	0.0
WS02	1	50	2		---	0.80 to 1.80	120 secs	-	-	-	-	0.9	0.0	19.8	0.0	0.0	0.0
WS02	1	50	2		---	0.80 to 1.80	180 secs	-	-	-	-	0.9	0.0	19.7	0.0	0.0	0.0
WS02	1	50	2		---	0.80 to 1.80	240 secs	-	-	-	-	0.9	0.0	19.6	0.0	0.0	0.0
WS02	1	50	2		---	0.80 to 1.80	300 secs	-	-	-	-	0.9	0.0	19.5	0.0	0.0	0.0
WS02	1	50	3	1.80	1.82	0.80 to 1.80	11/06/2015	1013	1013	$0.0_{(I)}$	0.45	0.0	0.0	20.7	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	15 secs	-	-	$0.0_{(SS)}$	-	0.6	0.0	20.3	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	30 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	60 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	90 secs	-	-	-	-	0.6	0.0	20.2	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	120 secs	-	-	-	-	0.6	0.0	20.1	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	180 secs	-	-	-	-	0.7	0.0	20.0	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	240 secs	-	-	-	-	0.7	0.0	20.0	0.0	0.0	0.0
WS02	1	50	3		---	0.80 to 1.80	300 secs	-	-	-	-	0.7	0.0	20.0	0.0	0.0	0.0
WS02	1	50	4	1.80	1.81	0.80 to 1.80	16/06/2015	1018	1018	$0.1_{(I)}$	1.46	0.0	0.0	20.8	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	15 secs	-	-	$0.1_{(SS)}$	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	30 secs	-	-	-	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	60 secs	-	-	-	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	90 secs	-	-	-	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	120 secs	-	-	-	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	180 secs	-	-	-	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	240 secs	-	-	-	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	4		---	0.80 to 1.80	300 secs	-	-	-	-	0.9	0.0	21.3	0.0	0.0	0.0
WS02	1	50	5	1.80	1.78	0.80 to 1.80	22/06/2015 08:10:00	1000	1000	$0.1_{(I)}$	1.49	0.1	0.0	20.8	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS02	1	50	5		---	0.80 to 1.80	15 secs	-	-	$0.1_{(SS)}$	-	1.1	0.0	20.1	0.0	0.0	0.0
WS02	1	50	5		---	0.80 to 1.80	30 secs	-	-	-	-	1.1	0.0	19.9	0.0	0.0	0.0
WS02	1	50	5		---	0.80 to 1.80	60 secs	-	-	-	-	1.1	0.0	20.1	0.0	0.0	0.0
WS02	1	50	5		---	0.80 to 1.80	90 secs	-	-	-	-	1.1	0.0	20.0	0.0	0.0	0.0
WS02	1	50	5		---	0.80 to 1.80	120 secs	-	-	-	-	1.0	0.0	20.2	0.0	0.0	0.0
WS02	1	50	5		---	0.80 to 1.80	180 secs	-	-	-	-	1.0	0.0	20.1	0.0	0.0	0.0
WS02	1	50	5		---	0.80 to 1.80	240 secs	-	-	-	-	1.0	0.0	20.3	0.0	0.0	0.0
WS02	1	50	5		---	0.80 to 1.80	300 secs	-	-	-	-	1.0	0.0	20.2	0.0	0.0	0.0
WS02	1	50	6	1.80	1.85	0.80 to 1.80	02/07/2015 13:30:00	1009	1009	$0.0_{(I)}$	1.48	0.0	0.0	20.8	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	19.9	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	30 secs	-	-	-	-	1.1	0.0	19.8	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	60 secs	-	-	-	-	1.1	0.0	19.8	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	90 secs	-	-	-	-	1.1	0.0	19.8	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	120 secs	-	-	-	-	1.1	0.0	19.8	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	180 secs	-	-	-	-	1.2	0.0	19.7	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	240 secs	-	-	-	-	1.2	0.0	19.7	0.0	0.0	-
WS02	1	50	6		---	0.80 to 1.80	300 secs	-	-	-	-	1.2	0.0	19.6	0.0	0.0	-
WS03	1	50	1	2.00	2.95	1.00 to 2.00	29/05/2015	996	996	$0.0_{(I)}$	1.68	0.1	0.0	20.9	-	0.0	0.0
WS03	1	50	1		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	2.1	0.0	20.8	-	0.0	0.0
WS03	1	50	1		---	1.00 to 2.00	30 secs	-	-	-	-	2.1	0.0	20.5	-	0.0	0.0
WS03	1	50	1		---	1.00 to 2.00	60 secs	-	-	-	-	2.1	0.0	20.4	-	0.0	0.0
WS03	1	50	1		---	1.00 to 2.00	90 secs	-	-	-	-	2.1	0.0	20.4	-	0.0	0.0
WS03	1	50	1		---	1.00 to 2.00	120 secs	-	-	-	-	2.2	0.0	20.4	-	0.0	0.0
WS03	1	50	1		---	1.00 to 2.00	180 secs	-	-	-	-	2.3	0.0	20.4	-	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
	08/07/15			**313035**

Contract: **Chesterton**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS03	1	50	1		---	1.00 to 2.00	240 secs	-	-	-	-	2.3	0.0	20.4	-	0.0	0.0
WS03	1	50	1		---	1.00 to 2.00	300 secs	-	-	-	-	2.3	0.0	20.3	-	0.0	0.0
WS03	1	50	2	2.00	2.94	1.00 to 2.00	03/06/2015 14:30:00	1014	1014	$0.0_{(I)}$	1.80	0.0	0.0	20.8	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	19.0	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	30 secs	-	-	-	-	1.9	0.0	18.9	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	60 secs	-	-	-	-	2.0	0.0	18.9	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	90 secs	-	-	-	-	2.0	0.0	18.9	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	120 secs	-	-	-	-	2.0	0.0	18.9	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	180 secs	-	-	-	-	2.0	0.0	19.0	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	240 secs	-	-	-	-	2.0	0.0	19.0	0.0	0.0	0.0
WS03	1	50	2		---	1.00 to 2.00	300 secs	-	-	-	-	2.0	0.0	19.1	0.0	0.0	0.0
WS03	1	50	3	2.00	2.97	1.00 to 2.00	11/06/2015	1013	1013	$0.0_{(I)}$	1.83	0.0	0.0	20.6	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.2	0.0	20.0	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	30 secs	-	-	-	-	1.3	0.0	19.9	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	60 secs	-	-	-	-	1.3	0.0	19.9	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	90 secs	-	-	-	-	1.3	0.0	19.8	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	120 secs	-	-	-	-	1.3	0.0	19.8	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	180 secs	-	-	-	-	1.4	0.0	19.7	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	240 secs	-	-	-	-	1.4	0.0	19.7	0.0	0.0	0.0
WS03	1	50	3		---	1.00 to 2.00	300 secs	-	-	-	-	1.4	0.0	19.6	0.0	0.0	0.0
WS03	1	50	4	2.00	2.96	1.00 to 2.00	16/06/2015	1018	1018	$0.1_{(I)}$	1.87	0.0	0.0	20.8	0.0	0.0	0.0
WS03	1	50	4		---	1.00 to 2.00	15 secs	-	-	$0.1_{(SS)}$	-	1.5	0.0	20.8	0.0	0.0	0.0
WS03	1	50	4		---	1.00 to 2.00	30 secs	-	-	-	-	1.5	0.0	20.7	0.0	0.0	0.0
WS03	1	50	4		---	1.00 to 2.00	60 secs	-	-	-	-	1.5	0.0	20.7	0.0	0.0	0.0
WS03	1	50	4		---	1.00 to 2.00	90 secs	-	-	-	-	1.5	0.0	20.7	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS03	1	50	4		---	1.00 to 2.00	120 secs	-	-	-	-	1.5	0.0	20.7	0.0	0.0	0.0
WS03	1	50	4		---	1.00 to 2.00	180 secs	-	-	-	-	1.5	0.0	20.7	0.0	0.0	0.0
WS03	1	50	4		---	1.00 to 2.00	240 secs	-	-	-	-	1.5	0.0	20.7	0.0	0.0	0.0
WS03	1	50	4		---	1.00 to 2.00	300 secs	-	-	-	-	1.5	0.0	20.8	0.0	0.0	0.0
WS03	1	50	5	2.00	2.95	1.00 to 2.00	22/06/2015 07:50:00	1000	1000	$0.2_{(I)}$	1.88	0.1	0.0	20.8	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	15 secs	-	-	$0.1_{(SS)}$	-	1.8	0.0	20.0	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	30 secs	-	-	-	-	1.8	0.0	19.9	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	60 secs	-	-	-	-	1.8	0.0	19.7	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	90 secs	-	-	-	-	1.8	0.0	19.8	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	120 secs	-	-	-	-	1.8	0.0	19.9	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	180 secs	-	-	-	-	1.8	0.0	20.0	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	240 secs	-	-	-	-	1.8	0.0	19.7	0.0	0.0	0.0
WS03	1	50	5		---	1.00 to 2.00	300 secs	-	-	-	-	1.8	0.0	19.8	0.0	0.0	0.0
WS03	1	50	6	2.00	2.95	1.00 to 2.00	02/07/2015 13:40:00	1009	1009	$0.0_{(I)}$	1.82	0.0	0.0	20.8	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.9	0.0	19.6	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	30 secs	-	-	-	-	1.9	0.0	19.5	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	60 secs	-	-	-	-	1.9	0.0	19.5	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	90 secs	-	-	-	-	1.9	0.0	19.5	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	120 secs	-	-	-	-	2.0	0.0	19.5	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	180 secs	-	-	-	-	2.0	0.0	19.5	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	240 secs	-	-	-	-	2.0	0.0	19.5	0.0	0.0	0.0
WS03	1	50	6		---	1.00 to 2.00	300 secs	-	-	-	-	2.0	0.0	19.5	0.0	0.0	0.0
WS04	1	50	1	2.00	2.06	1.00 to 2.00	29/05/2015	996	996	$0.0_{(I)}$	DRY	0.1	0.0	20.9	-	0.0	0.0
WS04	1	50	1		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	20.0	-	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS04	1	50	1		---	1.00 to 2.00	30 secs	-	-	-	-	1.3	0.0	20.0	-	0.0	0.0
WS04	1	50	1		---	1.00 to 2.00	60 secs	-	-	-	-	1.3	0.0	20.1	-	0.0	0.0
WS04	1	50	1		---	1.00 to 2.00	90 secs	-	-	-	-	1.3	0.0	20.1	-	0.0	0.0
WS04	1	50	1		---	1.00 to 2.00	120 secs	-	-	-	-	1.3	0.0	20.0	-	0.0	0.0
WS04	1	50	1		---	1.00 to 2.00	180 secs	-	-	-	-	1.4	0.0	20.0	-	0.0	0.0
WS04	1	50	1		---	1.00 to 2.00	240 secs	-	-	-	-	1.4	0.0	19.9	-	0.0	0.0
WS04	1	50	1		---	1.00 to 2.00	300 secs	-	-	-	-	1.4	0.0	19.9	-	0.0	0.0
WS04	1	50	2	2.00	2.05	1.00 to 2.00	03/06/2015 14:50:00	1014	1014	$0.0_{(I)}$	DRY	0.0	0.0	20.8	0.0	0.0	0.0
WS04	1	50	2		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.3	0.0	19.8	0.0	1.0	0.0
WS04	1	50	2		---	1.00 to 2.00	30 secs	-	-	-	-	1.3	0.0	19.7	0.0	0.0	0.0
WS04	1	50	2		---	1.00 to 2.00	60 secs	-	-	-	-	1.3	0.0	19.8	0.0	0.0	0.0
WS04	1	50	2		---	1.00 to 2.00	90 secs	-	-	-	-	1.3	0.0	19.8	0.0	0.0	0.0
WS04	1	50	2		---	1.00 to 2.00	120 secs	-	-	-	-	1.4	0.0	19.8	0.0	0.0	0.0
WS04	1	50	2		---	1.00 to 2.00	180 secs	-	-	-	-	1.4	0.0	19.9	0.0	0.0	0.0
WS04	1	50	2		---	1.00 to 2.00	240 secs	-	-	-	-	1.4	0.0	19.9	0.0	0.0	0.0
WS04	1	50	2		---	1.00 to 2.00	300 secs	-	-	-	-	1.4	0.0	19.9	0.0	0.0	0.0
WS04	1	50	3	2.00	2.05	1.00 to 2.00	11/06/2015	1013	1013	$0.0_{(I)}$	2.01	0.0	0.0	20.6	0.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.1	19.9	1.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	30 secs	-	-	-	-	1.1	0.1	19.8	1.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	60 secs	-	-	-	-	1.1	0.1	19.8	1.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	90 secs	-	-	-	-	1.1	0.1	19.8	1.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	120 secs	-	-	-	-	1.1	0.1	19.8	1.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	180 secs	-	-	-	-	1.1	0.1	19.7	1.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	240 secs	-	-	-	-	1.1	0.1	19.7	1.0	0.0	0.0
WS04	1	50	3		---	1.00 to 2.00	300 secs	-	-	-	-	1.1	0.1	19.7	1.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS04	1	50	4	2.00	2.06	1.00 to 2.00	16/06/2015	1018	1018	$0.0_{(I)}$	1.94	0.0	0.0	20.9	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	20.7	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	30 secs	-	-	-	-	1.1	0.0	20.5	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	60 secs	-	-	-	-	1.1	0.0	20.5	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	90 secs	-	-	-	-	1.1	0.0	20.5	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	120 secs	-	-	-	-	1.1	0.0	20.5	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	180 secs	-	-	-	-	1.1	0.0	20.6	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	240 secs	-	-	-	-	1.2	0.0	20.6	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	300 secs	-	-	-	-	1.2	0.0	20.6	0.0	0.0	0.0
WS04	1	50	4		---	1.00 to 2.00	360 secs	-	-	-	-	1.2	0.0	20.6	0.0	0.0	0.0
WS04	1	50	5	2.00	2.02	1.00 to 2.00	22/06/2015 07:40:00	1000	1000	$0.0_{(I)}$	1.90	0.1	0.0	20.8	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	20.1	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	30 secs	-	-	-	-	1.2	0.0	19.7	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	60 secs	-	-	-	-	1.2	0.0	20.1	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	90 secs	-	-	-	-	1.2	0.0	19.9	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	120 secs	-	-	-	-	1.2	0.0	19.7	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	180 secs	-	-	-	-	1.2	0.0	19.8	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	240 secs	-	-	-	-	1.2	0.0	19.8	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	300 secs	-	-	-	-	1.3	0.0	19.6	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	360 secs	-	-	-	-	1.3	0.0	19.5	0.0	0.0	0.0
WS04	1	50	5		---	1.00 to 2.00	420 secs	-	-	-	-	1.3	0.0	19.6	0.0	0.0	0.0
WS04	1	50	6	2.00	2.06	1.00 to 2.00	02/07/2015 13:45:00	1009	1009	$0.0_{(I)}$	2.04	0.0	0.0	20.8	0.0	0.0	0.0
WS04	1	50	6		---	1.00 to 2.00	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	20.0	0.0	0.0	0.0
WS04	1	50	6		---	1.00 to 2.00	30 secs	-	-	-	-	1.1	0.0	19.9	0.0	0.0	0.0
WS04	1	50	6		---	1.00 to 2.00	60 secs	-	-	-	-	1.1	0.0	19.9	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS04	1	50	6		---	1.00 to 2.00	90 secs	-	-	-	-	1.1	0.0	19.9	0.0	0.0	0.0
WS04	1	50	6		---	1.00 to 2.00	120 secs	-	-	-	-	1.1	0.0	20.0	0.0	0.0	0.0
WS04	1	50	6		---	1.00 to 2.00	180 secs	-	-	-	-	1.1	0.0	20.0	0.0	0.0	0.0
WS04	1	50	6		---	1.00 to 2.00	240 secs	-	-	-	-	1.1	0.0	20.1	0.0	0.0	0.0
WS04	1	50	6		---	1.00 to 2.00	300 secs	-	-	-	-	1.1	0.0	20.1	0.0	0.0	0.0
WS05	1	50	1	2.75	3.12	0.75 to 2.75	29/05/2015	996	996	$0.0_{(I)}$	2.72	0.1	0.0	20.9	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	15 secs	-	-	$0.0_{(SS)}$	-	1.7	0.0	20.0	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	30 secs	-	-	-	-	1.8	0.0	19.4	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	60 secs	-	-	-	-	1.8	0.0	19.4	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	90 secs	-	-	-	-	1.8	0.0	19.4	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	120 secs	-	-	-	-	1.8	0.0	19.4	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	180 secs	-	-	-	-	1.8	0.0	19.4	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	240 secs	-	-	-	-	1.8	0.0	19.4	-	0.0	0.0
WS05	1	50	1		---	0.75 to 2.75	300 secs	-	-	-	-	1.8	0.0	19.5	-	0.0	0.0
WS05	1	50	2	2.75	3.10	0.75 to 2.75	03/06/2015 15:00:00	1014	1014	$0.0_{(I)}$	2.66	0.0	0.0	20.8	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	15 secs	-	-	$0.0_{(SS)}$	-	1.8	0.0	15.4	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	30 secs	-	-	-	-	1.2	0.0	14.9	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	60 secs	-	-	-	-	1.3	0.0	14.5	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	90 secs	-	-	-	-	1.4	0.0	14.1	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	120 secs	-	-	-	-	1.4	0.0	13.9	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	180 secs	-	-	-	-	1.6	0.0	13.2	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	240 secs	-	-	-	-	1.7	0.0	12.6	0.0	0.0	0.0
WS05	1	50	2		---	0.75 to 2.75	300 secs	-	-	-	-	1.7	0.0	12.7	0.0	0.0	0.0
WS05	1	50	3	2.75	3.10	0.75 to 2.75	11/06/2015	1013	1013	$0.0_{(I)}$	2.35	0.0	0.0	20.8	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS05	1	50	3		---	0.75 to 2.75	15 secs	-	-	$0.0_{(SS)}$	-	0.7	0.0	19.2	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	30 secs	-	-	-	-	0.7	0.0	18.5	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	60 secs	-	-	-	-	0.7	0.0	18.3	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	90 secs	-	-	-	-	0.7	0.0	18.1	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	120 secs	-	-	-	-	0.8	0.0	17.8	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	180 secs	-	-	-	-	1.1	0.0	17.0	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	240 secs	-	-	-	-	1.3	0.0	16.3	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	300 secs	-	-	-	-	1.4	0.0	15.9	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	360 secs	-	-	-	-	1.4	0.0	15.9	0.0	0.0	0.0
WS05	1	50	3		---	0.75 to 2.75	420 secs	-	-	-	-	1.4	0.0	16.2	0.0	0.0	0.0
WS05	1	50	4	2.75	3.12	0.75 to 2.75	16/06/2015	1017	1017	$0.1_{(I)}$	2.20	0.0	0.0	20.9	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	15 secs	-	-	$0.0_{(SS)}$	-	1.2	0.0	19.9	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	30 secs	-	-	-	-	1.2	0.0	19.5	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	60 secs	-	-	-	-	1.2	0.0	19.4	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	90 secs	-	-	-	-	1.2	0.0	19.4	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	120 secs	-	-	-	-	1.2	0.0	19.4	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	180 secs	-	-	-	-	1.3	0.0	19.3	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	240 secs	-	-	-	-	1.3	0.0	19.4	0.0	0.0	0.0
WS05	1	50	4		---	0.75 to 2.75	300 secs	-	-	-	-	1.3	0.0	19.3	0.0	0.0	0.0
WS05	1	50	5	2.75	3.07	0.75 to 2.75	22/06/2015 07:30:00	1000	1000	$0.1_{(I)}$	2.07	0.1	0.0	20.8	0.0	0.0	0.0
WS05	1	50	5		---	0.75 to 2.75	15 secs	-	-	$0.0_{(SS)}$	-	1.5	0.0	20.2	0.0	0.0	0.0
WS05	1	50	5		---	0.75 to 2.75	30 secs	-	-	-	-	1.6	0.0	19.8	0.0	0.0	0.0
WS05	1	50	5		---	0.75 to 2.75	60 secs	-	-	-	-	1.6	0.0	19.6	0.0	0.0	0.0
WS05	1	50	5		---	0.75 to 2.75	90 secs	-	-	-	-	1.6	0.0	19.8	0.0	0.0	0.0
WS05	1	50	5		---	0.75 to 2.75	120 secs	-	-	-	-	1.6	0.0	19.7	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS05	1	50	5		---	0.75 to 2.75	180 secs	-	-	-	-	1.6	0.0	19.7	0.0	0.0	0.0
WS05	1	50	5		---	0.75 to 2.75	240 secs	-	-	-	-	1.6	0.0	19.6	0.0	0.0	0.0
WS05	1	50	5		---	0.75 to 2.75	300 secs	-	-	-	-	1.6	0.0	19.8	0.0	0.0	0.0
WS05	1	50	6	2.75	3.08	0.75 to 2.75	02/07/2015 13:51:00	1009	1009	$0.0_{(I)}$	2.69	0.0	0.0	20.8	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	15 secs	-	-	$0.0_{(SS)}$	-	0.6	0.0	20.5	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	30 secs	-	-	-	-	0.7	0.0	20.4	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	60 secs	-	-	-	-	0.8	0.0	20.3	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	90 secs	-	-	-	-	0.8	0.0	20.3	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	120 secs	-	-	-	-	0.7	0.0	20.3	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	180 secs	-	-	-	-	1.0	0.0	20.2	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	240 secs	-	-	-	-	1.1	0.0	20.2	0.0	0.0	0.0
WS05	1	50	6		---	0.75 to 2.75	300 secs	-	-	-	-	1.2	0.0	20.1	0.0	0.0	0.0
WS06	1	50	1	2.70	2.74	1.00 to 2.70	29/05/2015	996	996	$0.1_{(I)}$	2.65	0.1	0.0	20.9	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	15 secs	-	-	$0.2_{(SS)}$	-	1.8	0.0	20.3	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	30 secs	-	-	-	-	1.9	0.0	19.9	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	60 secs	-	-	-	-	1.9	0.0	19.9	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	90 secs	-	-	-	-	1.9	0.0	19.9	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	120 secs	-	-	-	-	1.9	0.0	19.9	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	180 secs	-	-	-	-	1.9	0.1	19.8	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	240 secs	-	-	-	-	2.0	0.1	19.8	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	300 secs	-	-	-	-	2.0	0.1	19.8	-	0.0	0.0
WS06	1	50	1		---	1.00 to 2.70	360 secs	-	-	-	-	2.0	0.0	19.8	-	0.0	0.0
WS06	1	50	2	2.70	---	1.00 to 2.70	03/06/2015 15:10:00	-	-	-	-	-	-	-	-	-	-
	Remarks: No access to location.																

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
	08/07/15			**313035**

Contract: **Chesterton**

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS06	1	50	3	2.70	2.75	1.00 to 2.70	11/06/2015	-	-	$0.0_{(I)}$	2.13	0.0	0.0	20.7	0.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	1.1	0.0	20.0	0.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	30 secs	-	-	-	-	1.1	0.0	20.0	0.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	60 secs	-	-	-	-	1.2	0.0	19.9	0.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	90 secs	-	-	-	-	1.2	0.0	19.9	0.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	120 secs	-	-	-	-	1.2	0.0	19.9	0.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	180 secs	-	-	-	-	1.2	0.0	19.8	0.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	240 secs	-	-	-	-	1.2	0.1	19.8	1.0	0.0	0.0
WS06	1	50	3		---	1.00 to 2.70	300 secs	-	-	-	-	1.2	0.1	19.7	1.0	0.0	0.0
WS06	1	50	4	2.70	2.74	1.00 to 2.70	16/06/2015	1018	1018	$0.2_{(I)}$	2.00	0.0	0.0	20.8	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	15 secs	-	-	$0.2_{(SS)}$	-	1.1	0.0	20.2	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	30 secs	-	-	-	-	1.1	0.0	20.1	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	60 secs	-	-	-	-	1.1	0.0	20.0	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	90 secs	-	-	-	-	1.1	0.0	20.0	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	120 secs	-	-	-	-	1.1	0.0	20.1	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	180 secs	-	-	-	-	1.1	0.0	20.0	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	240 secs	-	-	-	-	1.2	0.0	20.0	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	300 secs	-	-	-	-	1.2	0.0	19.9	0.0	0.0	0.0
WS06	1	50	4		---	1.00 to 2.70	360 secs	-	-	-	-	1.2	0.0	19.9	0.0	0.0	0.0
WS06	1	50	5	2.70	2.71	1.00 to 2.70	22/06/2015 08:00:00	1000	1000	$-0.1_{(I)}$	1.91	0.1	0.0	20.8	0.0	0.0	0.0
WS06	1	50	5		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	1.4	0.0	20.1	0.0	0.0	0.0
WS06	1	50	5		---	1.00 to 2.70	30 secs	-	-	-	-	1.4	0.0	19.9	0.0	0.0	0.0
WS06	1	50	5		---	1.00 to 2.70	60 secs	-	-	-	-	1.4	0.0	19.9	0.0	0.0	0.0
WS06	1	50	5		---	1.00 to 2.70	90 secs	-	-	-	-	1.4	0.0	19.7	0.0	0.0	0.0
WS06	1	50	5		---	1.00 to 2.70	120 secs	-	-	-	-	1.5	0.0	19.6	0.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

IN-SITU GAS MONITORING RESULTS

Exploratory Position ID	Pipe ref	Pipe diameter (mm)	Monitoring Round	Reported Installation Depth (m)	Measured Installation Depth (mbgl)	Response Zone	Date & Time of Monitoring (elapsed time)	Borehole Pressure (mb)	Atmos Pressure (mb)	Gas Flow (l/hr)	Water Depth (mbgl)	Carbon Dioxide (% / vol)	Methane (% / vol)	Oxygen (% / vol)	LEL (%)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)
WS06	1	50	5		---	1.00 to 2.70	180 secs	-	-	-	-	1.5	0.0	19.7	0.0	0.0	0.0
WS06	1	50	5		---	1.00 to 2.70	240 secs	-	-	-	-	1.5	0.0	19.7	0.0	0.0	0.0
WS06	1	50	5		---	1.00 to 2.70	300 secs	-	-	-	-	1.5	0.0	19.8	0.0	0.0	0.0
WS06	1	50	6	2.70	2.74	1.00 to 2.70	02/07/2015 14:20:00	1009	1009	$0.0_{(I)}$	2.00	0.0	0.0	20.8	0.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	15 secs	-	-	$0.0_{(SS)}$	-	1.4	0.0	20.1	0.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	30 secs	-	-	-	-	1.4	0.1	20.0	1.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	60 secs	-	-	-	-	1.4	0.1	20.0	1.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	90 secs	-	-	-	-	1.5	0.1	20.0	1.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	120 secs	-	-	-	-	1.5	0.1	20.0	1.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	180 secs	-	-	-	-	1.5	0.1	20.0	1.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	240 secs	-	-	-	-	1.6	0.1	20.0	1.0	0.0	0.0
WS06	1	50	6		---	1.00 to 2.70	300 secs	-	-	-	-	1.6	0.1	20.0	1.0	0.0	0.0

Key: I = Initial, P = Peak, SS = Steady State. Note: LEL = Lower Explosive Limit = 5% v/v.

RSK Environment Ltd
Abbey Park
Humber Road
Coventry
CV3 4AQ

Compiled By	Date	Checked By	Date	Contract Ref:
	08/07/15			**313035**

Contract: **Chesterton**

APPENDIX G
LABORATORY CERTIFICATES FOR SOIL ANALYSIS

Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 15/03340
Issue Number: 1 **Date:** 08 June, 2015

Client: RSK Environment Ltd Coventry
Humber Road, Abbey Park
Coventry
UK
CV3 4AQ

Project Manager: Adam Jones/Michael Lawson
Project Name: Chesterton Phase 2
Project Ref: 313035
Order No: N/A
Date Samples Received: 22/05/15
Date Instructions Received: 22/05/15
Date Analysis Completed: 08/06/15

Prepared by:

Danielle Brierley
Administrative Assistant

Approved by:

Iain Haslock
Analytical Consultant

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/1	15/03340/2	15/03340/3	15/03340/4	15/03340/6	15/03340/8	15/03340/9	15/03340/11	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP01	TP02	TP02	TP04	TP06	TP06	TP08		
Depth to Top	0.20	0.90	0.10	0.80	0.50	0.10	0.50	0.15		
Depth To Bottom										
Date Sampled	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4E	5A	4AE	4A	4A	4AE	4A	4AE		
% Stones >10mm$_A^{\#}$	-	15.4	17.2	41.0	44.3	-	57.1	12.1	% w/w	A-T-044
pH$_D^{M\#}$	-	8.50	-	8.35	8.44	-	8.58	7.82	pH	A-T-031s
Total Organic Carbon$_D^{M\#}$	-	0.09	-	0.29	0.27	-	0.09	2.79	% w/w	A-T-032s
Arsenic$_D^{M\#}$	-	8	-	2	4	-	3	10	mg/kg	A-T-024s
Boron (water soluble)$_D^{M\#}$	-	<1.0	-	<1.0	<1.0	-	<1.0	<1.0	mg/kg	A-T-027s
Cadmium$_D^{M\#}$	-	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	mg/kg	A-T-024s
Copper$_D^{M\#}$	-	5	-	4	3	-	3	24	mg/kg	A-T-024s
Chromium$_D^{M\#}$	-	8	-	5	5	-	4	17	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	-	<1	-	<1	<1	-	<1	<1	mg/kg	A-T-040s
Lead$_D^{M\#}$	-	4	-	5	5	-	3	60	mg/kg	A-T-024s
Mercury$_D$	-	1.08	-	0.54	0.61	-	0.41	0.33	mg/kg	A-T-024s
Nickel$_D^{M\#}$	-	13	-	6	5	-	5	17	mg/kg	A-T-024s
Selenium$_D^{M\#}$	-	<1	-	<1	<1	-	<1	2	mg/kg	A-T-024s
Zinc$_D^{M\#}$	-	15	-	16	12	-	6	76	mg/kg	A-T-024s
Leachate Prep BS EN 12457-1 (2:1)$_A$	-	-	-	-	#	-	-	#		A-T-046
Arsenic (leachable)$_A^{\#}$	-	-	-	-	<1	-	-	7	µg/l	A-T-025w
Cadmium (leachable)$_A^{\#}$	-	-	-	-	<1	-	-	<1	µg/l	A-T-025w
Copper (leachable)$_A^{\#}$	-	-	-	-	<1	-	-	8	µg/l	A-T-025w
Chromium (leachable)$_A^{\#}$	-	-	-	-	<1	-	-	2	µg/l	A-T-025w
Lead (leachable)$_A^{\#}$	-	-	-	-	<1	-	-	6	µg/l	A-T-025w
Mercury (leachable)$_A^{\#}$	-	-	-	-	<0.1	-	-	<0.1	µg/l	A-T-025w
Nickel (leachable)$_A^{\#}$	-	-	-	-	<1	-	-	3	µg/l	A-T-025w
Selenium (leachable)$_A^{\#}$	-	-	-	-	<1	-	-	<1	µg/l	A-T-025w
Zinc (leachable)$_A^{\#}$	-	-	-	-	1	-	-	10	µg/l	A-T-025w
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	-	NAD	-	-	NAD	-	NAD		A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	-	N/A	-	-	N/A	-	N/A		Gravimetry

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/1	15/03340/2	15/03340/3	15/03340/4	15/03340/6	15/03340/8	15/03340/9	15/03340/11	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP01	TP02	TP02	TP04	TP06	TP06	TP08		
Depth to Top	0.20	0.90	0.10	0.80	0.50	0.10	0.50	0.15		
Depth To Bottom										
Date Sampled	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4E	5A	4AE	4A	4A	4AE	4A	4AE		
Pest-c										
Mevinphos$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Dichlorvos$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Diazinon$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Heptachlor$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Aldrin$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Methyl Parathion$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Malathion$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Fenitrothion$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Heptachlor Epoxide$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Parathion (Ethyl Parathion)$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
p,p-DDE$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
p,p-DDT$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
p,p-Methoxychlor$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
p,p-TDE (DDD)$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
o,p-DDE$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
o,p-DDT$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
o,p-Methoxychlor$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
o,p-TDE (DDD)$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Endosulphan I$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Endosulphan II$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Endosulphan Sulphate$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Endrin$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Ethion$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Dieldrin$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Azinphos-methyl$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/1	15/03340/2	15/03340/3	15/03340/4	15/03340/6	15/03340/8	15/03340/9	15/03340/11	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP01	TP02	TP02	TP04	TP06	TP06	TP08		
Depth to Top	0.20	0.90	0.10	0.80	0.50	0.10	0.50	0.15		
Depth To Bottom										
Date Sampled	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4E	5A	4AE	4A	4A	4AE	4A	4AE		
PAH 16										
Acenaphthene$_A^{M\#}$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	-	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	<0.04	-	<0.04	<0.04	-	<0.04	0.09	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	<0.04	-	<0.04	<0.04	-	<0.04	0.09	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	-	<0.05	-	<0.05	<0.05	-	<0.05	0.15	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	<0.05	-	<0.05	<0.05	-	<0.05	0.05	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	-	<0.07	-	<0.07	<0.07	-	<0.07	<0.07	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	<0.06	-	<0.06	<0.06	-	<0.06	0.11	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	-	<0.04	-	<0.04	<0.04	-	<0.04	<0.04	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	<0.08	-	<0.08	<0.08	-	<0.08	0.22	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	-	<0.03	-	<0.03	<0.03	-	<0.03	0.06	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	<0.03	-	<0.03	<0.03	-	<0.03	<0.03	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	<0.03	-	<0.03	<0.03	-	<0.03	0.08	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	<0.07	-	<0.07	<0.07	-	<0.07	0.19	mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	-	<0.08	-	<0.08	<0.08	-	<0.08	1.06	mg/kg	A-T-019s

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/1	15/03340/2	15/03340/3	15/03340/4	15/03340/6	15/03340/8	15/03340/9	15/03340/11	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP01	TP02	TP02	TP04	TP06	TP06	TP08		
Depth to Top	0.20	0.90	0.10	0.80	0.50	0.10	0.50	0.15		
Depth To Bottom										
Date Sampled	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4E	5A	4AE	4A	4A	4AE	4A	4AE		
Nitrogen Pests										
Ametryn$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Atraton $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Atrazine $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Prometon $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Prometryn $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Propazine $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Simazine $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Simetryn $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Terbuthylazine$_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon
Terbutryn $_A$	-	-	<50	-	-	-	-	-	µg/kg	Subcon

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/1	15/03340/2	15/03340/3	15/03340/4	15/03340/6	15/03340/8	15/03340/9	15/03340/11	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP01	TP02	TP02	TP04	TP06	TP06	TP08		
Depth to Top	0.20	0.90	0.10	0.80	0.50	0.10	0.50	0.15		
Depth To Bottom										
Date Sampled	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4E	5A	4AE	4A	4A	4AE	4A	4AE		
TPH CWG										
Ali >C5-C6$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_A$	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-022+23s
Aro >C5-C7$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Aro >C12-C16$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Aro >C16-C21$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	17.8	mg/kg	A-T-023s
Aro >C21-C35$_A^\#$	-	<0.1	-	<0.1	<0.1	-	<0.1	35.7	mg/kg	A-T-023s
Total Aromatics$_A$	-	<0.1	-	<0.1	<0.1	-	<0.1	53.5	mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$	-	<0.1	-	<0.1	<0.1	-	<0.1	53.5	mg/kg	A-T-022+23s
BTEX - Benzene$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_A^\#$	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_A^\#$	-	<0.01	-	<0.01	<0.01	-	*<0.01*	<0.01	mg/kg	A-T-022s

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/12	15/03340/14	15/03340/16	15/03340/17	15/03340/18	15/03340/19	15/03340/20	15/03340/21	Units	Method ref
Client Sample No										
Client Sample ID	WS01	WS03	WS05	WS06	FP01	FP02	FP03	FP04		
Depth to Top	0.15	1.50	0.70	0.30	0.15	0.20	0.10	0.10		
Depth To Bottom										
Date Sampled	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4AE	1A	5A	4AE	4AE	4A	4AE			
% Stones >10mm$_A^{\#}$	-	28.7	<0.1	27.8	-	8.7	-	-	% w/w	A-T-044
pH$_D^{M\#}$	-	8.78	8.58	8.26	-	8.40	-	-	pH	A-T-031s
Total Organic Carbon$_D^{M\#}$	-	0.10	0.20	1.02	-	1.42	-	-	% w/w	A-T-032s
Arsenic$_D^{M\#}$	-	3	3	5	-	9	-	-	mg/kg	A-T-024s
Boron (water soluble)$_D^{M\#}$	-	<1.0	<1.0	<1.0	-	<1.0	-	-	mg/kg	A-T-027s
Cadmium$_D^{M\#}$	-	<0.5	<0.5	<0.5	-	<0.5	-	-	mg/kg	A-T-024s
Copper$_D^{M\#}$	-	1	3	7	-	20	-	-	mg/kg	A-T-024s
Chromium$_D^{M\#}$	-	2	6	10	-	27	-	-	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	-	<1	<1	<1	-	<1	-	-	mg/kg	A-T-040s
Lead$_D^{M\#}$	-	1	4	12	-	22	-	-	mg/kg	A-T-024s
Mercury$_D$	-	0.94	1.12	0.61	-	0.37	-	-	mg/kg	A-T-024s
Nickel$_D^{M\#}$	-	2	6	10	-	16	-	-	mg/kg	A-T-024s
Selenium$_D^{M\#}$	-	<1	<1	<1	-	<1	-	-	mg/kg	A-T-024s
Zinc$_D^{M\#}$	-	<5	19	30	-	91	-	-	mg/kg	A-T-024s
Leachate Prep BS EN 12457-1 (2:1)$_A$	-	#	-	-	-	#	-	-		A-T-046
Arsenic (leachable)$_A^{\#}$	-	<1	-	-	-	6	-	-	µg/l	A-T-025w
Cadmium (leachable)$_A^{\#}$	-	<1	-	-	-	<1	-	-	µg/l	A-T-025w
Copper (leachable)$_A^{\#}$	-	<1	-	-	-	4	-	-	µg/l	A-T-025w
Chromium (leachable)$_A^{\#}$	-	<1	-	-	-	1	-	-	µg/l	A-T-025w
Lead (leachable)$_A^{\#}$	-	<1	-	-	-	2	-	-	µg/l	A-T-025w
Mercury (leachable)$_A^{\#}$	-	<0.1	-	-	-	<0.1	-	-	µg/l	A-T-025w
Nickel (leachable)$_A^{\#}$	-	<1	-	-	-	2	-	-	µg/l	A-T-025w
Selenium (leachable)$_A^{\#}$	-	<1	-	-	-	<1	-	-	µg/l	A-T-025w
Zinc (leachable)$_A^{\#}$	-	<1	-	-	-	5	-	-	µg/l	A-T-025w
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	-	-	-	NAD	NAD	NAD	NAD		A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	-	-	-	N/A	N/A	N/A	N/A		Gravimetry

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/12	15/03340/14	15/03340/16	15/03340/17	15/03340/18	15/03340/19	15/03340/20	15/03340/21	Units	Method ref
Client Sample No										
Client Sample ID	WS01	WS03	WS05	WS06	FP01	FP02	FP03	FP04		
Depth to Top	0.15	1.50	0.70	0.30	0.15	0.20	0.10	0.10		
Depth To Bottom										
Date Sampled	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4AE	1A	5A	4AE	4AE	4A	4AE			
PAH 16										
Acenaphthene$_A^{M\#}$	-	<0.01	<0.01	<0.01	-	0.03	-	-	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	-	<0.02	<0.02	<0.02	-	0.03	-	-	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	<0.04	<0.04	<0.04	-	0.28	-	-	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	<0.04	<0.04	<0.04	-	0.38	-	-	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	-	<0.05	<0.05	<0.05	-	0.70	-	-	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	<0.05	<0.05	<0.05	-	0.29	-	-	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	-	<0.07	<0.07	<0.07	-	0.26	-	-	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	<0.06	<0.06	<0.06	-	0.41	-	-	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	-	<0.04	<0.04	<0.04	-	0.06	-	-	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	<0.08	<0.08	<0.08	-	0.79	-	-	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	<0.01	<0.01	<0.01	-	0.02	-	-	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	-	<0.03	<0.03	<0.03	-	0.36	-	-	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	<0.03	<0.03	<0.03	-	<0.03	-	-	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	<0.03	<0.03	<0.03	-	0.33	-	-	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	<0.07	<0.07	<0.07	-	0.61	-	-	mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	-	<0.08	<0.08	<0.08	-	4.54	-	-	mg/kg	A-T-019s

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/12	15/03340/14	15/03340/16	15/03340/17	15/03340/18	15/03340/19	15/03340/20	15/03340/21	Units	Method ref
Client Sample No										
Client Sample ID	WS01	WS03	WS05	WS06	FP01	FP02	FP03	FP04		
Depth to Top	0.15	1.50	0.70	0.30	0.15	0.20	0.10	0.10		
Depth To Bottom										
Date Sampled	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15	20-May-15		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
MCERTS Sample Matrix Code	4AE	1A	5A	4AE	4AE	4A	4AE			
TPH CWG										
Ali >C5-C6$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
Ali >C6-C8$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
Ali >C8-C10$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
Ali >C10-C12$_A^\#$	-	<0.1	<0.1	<0.1	-	<0.1	-	-	mg/kg	A-T-023s
Ali >C12-C16$_A^\#$	-	<0.1	<0.1	<0.1	-	<0.1	-	-	mg/kg	A-T-023s
Ali >C16-C21$_A^\#$	-	<0.1	<0.1	<0.1	-	<0.1	-	-	mg/kg	A-T-023s
Ali >C21-C35$_A^\#$	-	<0.1	<0.1	<0.1	-	<0.1	-	-	mg/kg	A-T-023s
Total Aliphatics$_A$	-	<0.1	<0.1	<0.1	-	<0.1	-	-	mg/kg	A-T-022+23s
Aro >C5-C7$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
Aro >C7-C8$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
Aro >C8-C9$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
Aro >C9-C10$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
Aro >C10-C12$_A^\#$	-	<0.1	<0.1	<0.1	-	<0.1	-	-	mg/kg	A-T-023s
Aro >C12-C16$_A^\#$	-	<0.1	<0.1	<0.1	-	<0.1	-	-	mg/kg	A-T-023s
Aro >C16-C21$_A^\#$	-	<0.1	<0.1	<0.1	-	9.4	-	-	mg/kg	A-T-023s
Aro >C21-C35$_A^\#$	-	<0.1	<0.1	<0.1	-	2.4	-	-	mg/kg	A-T-023s
Total Aromatics$_A$	-	<0.1	<0.1	<0.1	-	11.8	-	-	mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$	-	<0.1	<0.1	<0.1	-	11.8	-	-	mg/kg	A-T-022+23s
BTEX - Benzene$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
BTEX - Toluene$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
BTEX - m & p Xylene$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
BTEX - o Xylene$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s
MTBE$_A^\#$	-	<0.01	<0.01	<0.01	-	<0.01	-	-	mg/kg	A-T-022s

Envirolab Job Number: 15/03340

Client Project Name: Chesterton Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03340/22								Units	Method ref
Client Sample No										
Client Sample ID	CBR06									
Depth to Top	0.15									
Depth To Bottom										
Date Sampled	20-May-15									
Sample Type	Soil - ES									
MCERTS Sample Matrix Code	4AE									
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^\#$	NAD									A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A									Gravimetry

REPORT NOTES

Notes - Soil chemical analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

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All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.
All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts.
Superscript "M" indicates method accredited to MCERTS.
If results are in italic font they are associated with an AQC failure. These are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

TPH analysis of water by method A-T-007
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

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

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations.

Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 15/03407
Issue Number: 1 **Date:** 08 June, 2015

Client: RSK Environment Ltd Coventry
Humber Road, Abbey Park
Coventry
UK
CV3 4AQ

Project Manager: Adam Jones/Michael Lawson
Project Name: Chesterton, Phase 2
Project Ref: 313035
Order No: N/A
Date Samples Received: 26/05/15
Date Instructions Received: 26/05/15
Date Analysis Completed: 08/06/15

Prepared by:

Danielle Brierley
Administrative Assistant

Approved by:

Gill Scott
Laboratory Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 15/03407

Client Project Name: Chesterton, Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03407/1	15/03407/2	15/03407/3	15/03407/4	15/03407/5	15/03407/6	15/03407/7	15/03407/8	Units	Method ref
Client Sample No										
Client Sample ID	TP01	TP02	TP04	TP05	TP03	WS01	WS02	WS04		
Depth to Top	1.50	0.10	1.50	0.10	0.50	2.30	0.50	0.80		
Depth To Bottom										
Date Sampled	19-May-15	19-May-15	19-May-15	19-May-15	19-May-15	20-May-15	20-May-15	20-May-15		
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D		
MCERTS Sample Matrix Code	5A	4AE	5A	4AE	5A	5	1A	5A		
% Stones >10mm$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	A-T-044
pH BRE$_D^{M\#}$	8.50	8.06	8.48	8.04	8.48	8.15	8.73	8.63	pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	34	<10	<10	<10	14	18	<10	<10	mg/l	A-T-026s

Envirolab Job Number: 15/03407

Client Project Name: Chesterton, Phase 2

Client Project Ref: 313035

Lab Sample ID	15/03407/9								Units	Method ref
Client Sample No										
Client Sample ID	WS06									
Depth to Top	2.10									
Depth To Bottom										
Date Sampled	20-May-15									
Sample Type	Soil - D									
MCERTS Sample Matrix Code	5A									
% Stones >10mm$_A^{\#}$	<0.1								% w/w	A-T-044
pH BRE$_D^{M\#}$	8.18								pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	43								mg/l	A-T-026s

REPORT NOTES

Notes - Soil chemical analysis
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APPENDIX H
HUMAN HEALTH GENERIC ASSESSMENT CRITERIA

Generic assessment criteria for human health: residential scenario with home-grown produce

Background

RSK's generic assessment criteria (GAC) were initially prepared following the publication by the Environment Agency (EA) of soil guideline value (SGV) and toxicological (TOX) reports, and associated publications in 2009[1]. RSK GAC were updated following the publication of GAC by LQM/CIEH in 2009[2]. RSK GAC are periodically revised when updated information on toxicological, land use or receptor parameters is published.

Updates to the RSK GAC: 2015

In 2014, the publication of Category 4 Screening Levels (C4SL)[3,4], as part of the Defra-funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3)[5] used in the generation of SGVs.

C4SL were published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern (LLTC; see Section 2.3 of research project report SP1010[3]). Where a C4SL has been published, the RSK GAC duplicates the C4SL published values using all input parameters within the SP1010 final project report[3] and associated appendices[6], and adopts them as GAC for these six substances.

For all other substances the C4SL exposure modifications, with the exception of the "top two" produce type approach taken in the C4SL, have been applied to the current RSK GAC. These include alterations to daily inhalation rates for residential and commercial scenarios, reducing soil adherence factors in children (age classes 1 to 12 only) for residential land use, reducing exposure frequency for dermal contact outdoors for residential land use, and updated produce type consumption rates (90th percentile) based on recent data from the National Diet and Nutrition Survey.

The RSK GAC have also been revised with updated toxicology published by LQM/CIEH in 2015[7], where a C4SL has not been published.

RSK GAC derivation for metals and organic compounds

Model selection

Soil assessment criteria (SAC) were calculated using the Contaminated Land Exposure Assessment (CLEA) tool v1.06, supporting EA guidance[5,8,9] and revised exposure scenarios published for the C4SL[3]. Groundwater assessment criteria (GrAC) protective of human health via the inhalation pathway were derived using the RBCA 1.3b model. RSK has updated the inputs within RBCA to reflect EA guidance[1,5,8,9]. The SAC and GrAC collectively are termed GAC.

Conceptual model

In accordance with SR3[5], the residential with home-grown produce scenario considers risks to a female child between the ages of 0 and 6 years old as the highest risk scenario. In accordance

with Box 3.1 of SR3[5], the pathways considered for production of the SAC in the residential with home-grown produce scenario are

- direct soil and dust ingestion
- consumption of home-grown produce
- consumption of soil attached to home-grown produce
- dermal contact with soil and indoor dust
- inhalation of indoor and outdoor dust and vapours.

Figure 1 is a conceptual model illustrating these linkages.

In line with guidance in the EA SGV report for cadmium[1], the RSK GAC for cadmium has been derived based on estimates representative of lifetime exposure. Although young children are generally more likely to have higher exposures to soil contaminants, the renal toxicity of cadmium, and the derivation of the TDI_{oral} and TDI_{inh}, are based on considerations of the kidney burden accumulated over 50 years or so. It is therefore reasonable to consider exposure not just in childhood but averaged over a longer period.

The pathway considered in production of the GrAC is the volatilisation of compounds from groundwater and subsequent vapour inhalation by residents while indoors. Figure 2 illustrates this linkage. Although the outdoor air inhalation pathway is also valid, this contributes little to the overall risks owing to the dilution in outdoor air. Within RBCA, the solubility limit of the chemical restricts the extent of volatilisation, which in turn drives the indoor air inhalation pathway. While the same restriction is not built into the CLEA model, the CLEA model output cells are flagged red where the soil saturation limit has been exceeded.

With respect to volatilisation, the CLEA model assumes a simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase[9]. The upper boundaries of this partitioning are represented by the maximum aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA model estimates saturated soil concentrations where these limits are reached[9]. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous- or vapour-based soil saturation limits. Model output cells are flagged red where the saturated soil concentration has been exceeded and the contribution of the indoor and outdoor vapour pathway to total exposure is greater than 10%. In this case, further consideration of the following is required[9]:

- Free phase contamination may be present.
- Exposure from the vapour pathways will be over-predicted by the model, as in reality the vapour phase concentration will not increase at concentrations above saturation limits
- Where the vapour pathway contribution is greater than 90%, it is unlikely the relevant health criteria value (HCV) will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV.

Where the vapour pathway is the predominant pathway (contributes greater than 90% of exposure) or the only exposure route considered and the cell is highlighted red (SAC exceeds saturation limit), the risk based on the assumed conceptual model is likely to be negligible as the vapour risk is assumed to be tolerable at maximum possible soil concentrations. In such circumstances, the vapour pathway exposure should be considered based on the presence of free phase or non-aqueous phase liquid sources and the measured concentrations of volatile organic compounds (VOC) in the vapour phase. Screening could be considered based on setting

the SAC as the modelled soil saturation limits. However, as stated within the CLEA handbook[9], this is likely to not be practical in many cases because of the very low saturation limits and, in any case, is highly conservative.

It should also be noted that for mixtures of compounds, free phase may be present where soil (or groundwater) concentrations are well below saturation limits for individual compounds.

Where the vapour pathway is only one of the exposure pathways considered, an additional approach can then be utilised as detailed within Section 4.12 of the CLEA model handbook[9], which explains how to calculate an effective assessment criterion manually.

SR3[5] states that, as a general rule of thumb, it is recognised that estimating vapour phase concentrations from dissolved and sorbed phase contamination by petroleum hydrocarbons are at least a factor of ten higher than those likely to be measured on-site. RSK has therefore applied an empirical subsurface to indoor air correction factor of 10 into the CLEA model chemical database for all petroleum hydrocarbon fractions (including BTEX, trimethylbenzenes and the polycyclic aromatic hydrocarbons (PAH) naphthalene, acenaphthene and acenaphthylene) to reduce this conservatism.

Input selection

The most up-to-date published chemical and toxicological data was obtained from EA Report SC050021/SR7[10], the EA TOX[1] reports, the C4SL SP1010 project report and associated appendices[3,6] or the 2015 LQM/CIEH report[7]. Where a C4SL has been published, the RSK GAC have duplicated the C4SL published values using all input parameters within the SP1010 final project report[3] and associated appendices[6], and has adopted them as GAC for these six substances. Toxicological and specific chemical parameters for aromatic hydrocarbon C_8–C_9 (styrene), 1,2,4-trimethylbenzene and methyl tertiary-butyl ether (MTBE) were obtained from the CL:AIRE Soil Generic Assessment Criteria report[11].

For TPH, aromatic hydrocarbons C_5–C_8 were not modelled, as this range comprises benzene and toluene, which are modelled separately. The aromatic C_8–C_9 hydrocarbon fraction comprises ethylbenzene, xylene and styrene. As ethylbenzene and xylene are being modelled separately, the physical, chemical and toxicological data for aromatic C_8–C_9 have been taken from styrene.

For the GrAC, owing to the lack of UK-specific data, default information in the RBCA model was used to evaluate MTBE. No published UK data was available for 1,3,5-trimethylbenzene, so information was obtained from the RBCA model. RBCA uses toxicity data for the inhalation pathway in different units to the CLEA model and cannot consider separately the mean daily intake (MDI), occupancy periods or breathing rates. Therefore, the HCV in RBCA was amended to take account of

- amendments to the MDI using Table 3.4 of SR2[8]
- a child weighing 13.3kg (average of 0–6 year old female in accordance with Table 4.6 of SR3[5]) and breathing 11.85m^3 (average daily inhalation rate for a 0–6-year old female in accordance with Table 4.14 of SR3[5]). Inhalation rates used in the derivation of the GrAC have not been updated in line with the 2011 USEPA published values[12]; these will be updated in subsequent revisions of the RSK GAC. The lower inhalation rates presented by the USEPA in 2011 for ages classes 1 to 11 (values are higher for age classes 12 to 18) are not considered to make a significant difference.
- the 50% rule (for petroleum hydrocarbons, trimethylbenzenes and MTBE)[8,9] where MDI data is not available but background exposure is considered important in the overall exposure.

Physical parameters

For the residential with home-grown produce scenario, the CLEA default building is a small, two-storey terrace house with a concrete ground-bearing slab. The house is assumed to have a 100m^2 private garden consisting of lawn and flowerbeds, incorporating a 20m^2 plot for growing fruit and vegetables consumed by the residents. SR3[5] notes this residential building type to be the most conservative in terms of potential for vapour intrusion. The building parameters used in the production of the RSK GACs are the default CLEA v1.06 inputs presented in Table 3.3 of SR3[3], with a dust loading factor detailed in Section 9.3 of SR3[5]. The parameters for a sandy loam soil type were used in line with Table 4.4 of SR3[5]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for SOM, RSK has produced an additional set of GAC for SOM of 1% and 2.5% for all substances using the CLEA tool.

For the GrAC, the depth to groundwater was taken as 2.5m based on RSK's experience of assessing the volatilisation pathway from groundwater. The GrAC were produced using the input parameters in Table 4.

Summary of modifications to the default CLEA 1.06/SR3[5] input parameters for residential with home-grown produce land-use scenario

In summary, the RSK GAC were produced using the default input parameters for soil properties, the air dispersion model, building properties and the vapour model detailed in SR3[5]. Modifications to the default SR3[5] exposure scenarios based on the C4SL exposure scenarios[3] are presented in Tables 2 and 3 below.

The final selected GAC are presented by pathway in Table 5 and the combined GAC in Table 6.

Figure 1: Conceptual model for residential scenario with home-grown produce

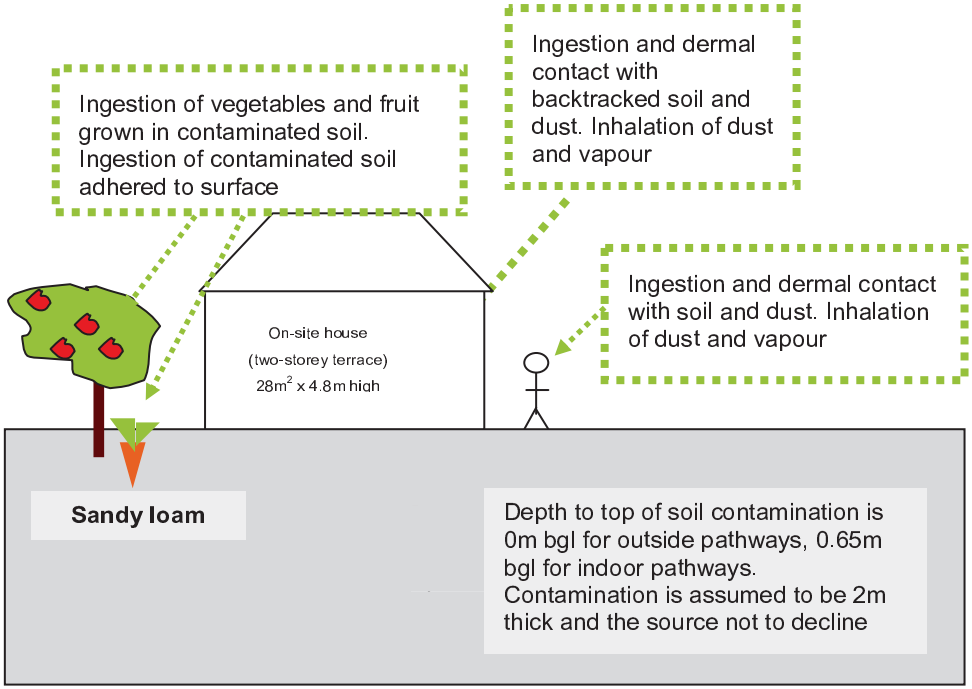

Table 1: Exposure assessment parameters for residential scenario with home-grown produce – inputs for CLEA model

Parameter	Value	Justification
Land use	Residential with homegrown produce	Chosen land use
Receptor	Female child age 1 to 6	Key generic assumption given in Box 3.1, SR3[5]
Building	Small terraced house	Key generic assumption given in Box 3.1, SR3. Small, two-storey terraced house chosen, as it is the most conservative residential building type in terms of protection from vapor intrusion (Section 3.4.6, SR3)[5]
Soil type	Sandy Loam	Most common UK soil type (Section 4.3.1, from Table 3.1, SR3)[5]
Start AC (age class)	1	Range of age classes corresponding to key generic assumption that the critical receptor is a young female child aged 0–6. From Box 3.1, SR3[5]
End AC (age class)	6	
SOM (%)	6	Representative of sandy loamy soil according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[13]
	1	To provide SAC for sites where SOM <6% as often observed by RSK
	2.5	
pH	7	Model default

Table 2: Residential with home-grown produce – modified home-grown produce data

Name	Consumption rate 90th percentile (g FW kg^{-1} BW day^{-1}) by age class						Dry weight conversion factor (g DW g^{-1} FW)	Home-grown fraction (average)	Home-grown fraction (high end)	Soil loading factor (g g^{-1} DW)	Preparation correction factor
	1	2	3	4	5	6					
Green vegetables	7.12	5.87	5.87	5.87	4.53	4.53	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	10.7	2.83	2.83	2.83	2.14	2.14	0.103	0.06	0.4	1.00E-03	1.00E+00
Tuber vegetables	16	6.6	6.6	6.6	4.95	4.95	0.21	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	1.83	3.39	3.39	3.39	2.24	2.24	0.058	0.06	0.4	1.00E-03	6.00E-01
Shrub fruit	2.23	0.46	0.46	0.46	0.19	0.19	0.166	0.09	0.6	1.00E-03	6.00E-01
Tree fruit	3.82	10.3	10.3	10.3	5.16	5.16	0.157	0.04	0.27	1.00E-03	6.00E-01
Justification	Table 3.4, SP1010 [3]						Table 6.3, SR3[5]	Table 4.19, SR3[5]		Table 6.3, SR3[5]	

Table 3: Residential with home-grown produce – modified and use and receptor data

Parameter	Unit	Age class					
		1	2	3	4	5	6
EF (soil and dust ingestion)	day yr^{-1}	180	365	365	365	365	365
EF (consumption of home-grown produce)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, indoor)	day yr^{-1}	180	365	365	365	365	365
EF (skin contact, outdoor)	day yr^{-1}	170	170	170	170	170	170
EF (inhalation of dust and vapour, indoor)	day yr^{-1}	365	365	365	365	365	365
EF (inhalation of dust and vapour, outdoor)	day yr^{-1}	365	365	365	365	365	365
Justification		Table 3.5, SP1010[3]; Table 3.1, SR3[5]					
Soil to skin adherence factor (outdoor)	mg cm^{-2} day^{-1}	0.1	0.1	0.1	0.1	0.1	0.1
Justification		Table 3.5, SP1010[3]					
Inhalation rate	m^3 day^{-1}	5.4	8.0	8.9	10.1	10.1	10.1
Justification		Mean value USEPA, 2011[12]; Table 3.2, SP1010[3]					
Notes: For **cadmium**, the exposure assessment for a residential land use is based on estimates representative of lifetime exposure AC1-18. This is because the TDI_{oral} and TDI_{inh} are based on considerations of the kidney burden accumulated over 50 years. It is therefore reasonable to consider exposure not just in childhood but averaged over a longer period. See the Environment Agency Science Report SC05002/ TOX 3[1], Science Report SC050021/Cadmium SGV[1] and the project report SP1010[3] for more information.							

Figure 2: GrAC conceptual model for RBCA residential with home-grown produce scenario

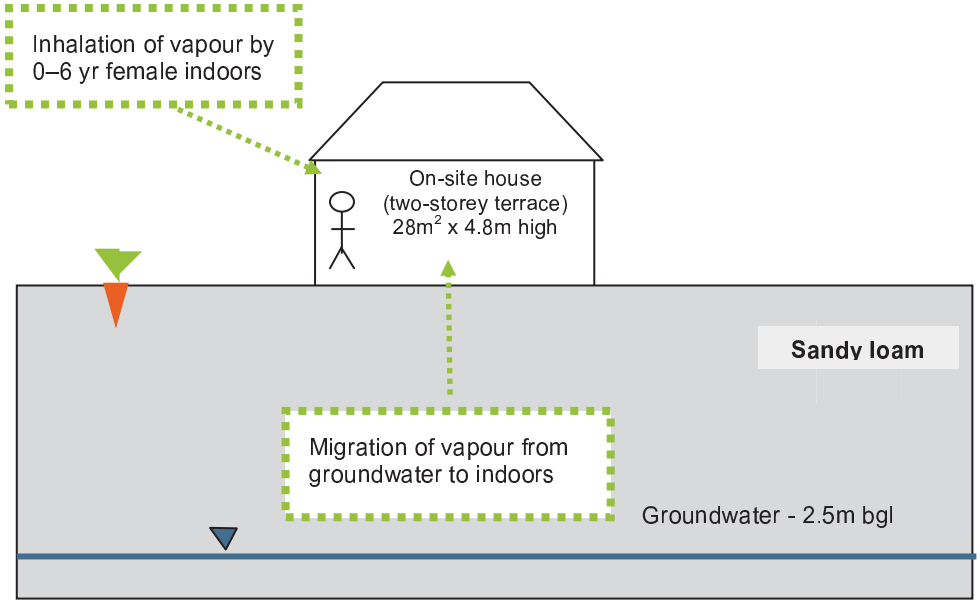

Table 4: Residential with home-grown produce – RBCA inputs

Parameter	Unit	Value	Justification
Receptor			
Averaging time	Years	6	From Box 3.1, SR3[5]
Receptor weight	kg	13.3	Average of CLEA 0–6 year old female data, Table 4.6, SR3[5]
Exposure duration	Years	6	From Box 3.1, report, SR3[5]
Exposure frequency	Days/yr	350	Weighted using occupancy period of 23 hours per day for 365 days of the year
Soil type – sandy loam			
Total porosity	-	0.53	CLEA value for sandy loam. Parameters for sandy loam from Table 4.4, SR3[5]
Volumetric water content	-	0.33	
Volumetric air content	-	0.20	
Dry bulk density	g cm^{-3}	1.21	
Vertical hydraulic conductivity	cm s^{-1}	3.56E-3	CLEA value for saturated conductivity of sandy loam, Table 4.4, SR3[5]
Vapour permeability	m^2	3.05E-12	Calculated for sandy loam using equations in Appendix 1, SR3[5]
Capillary zone thickness	m	0.1	Professional judgement
Fraction organic carbon	%	0.0348	Representative of sandy loam according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[13]
Building			
Building volume/area ratio	m	4.8	Table 3.3, SR3[5]
Foundation area	m^2	28	
Foundation perimeter	m	22	Calculated assuming building measures 7m x 4m to give 28m^2 foundation area
Building air exchange rate	d^{-1}	12	Table 3.3, SR3[5]
Depth to bottom of foundation slab	m	0.15	
Foundation thickness	m	0.15	
Foundation crack fraction	-	0.0151	Calculated from floor crack area of 423 cm^2 and building footprint of 28m^2 in Table 4.21, SR3[5]
Volumetric water content of cracks	-	0.33	Assumed equal to underlying soil type in assumption that cracks become filled with soil over time. Parameters for sandy loam from Table 4.4, SR3[5]
Volumetric air content of cracks	-	0.2	
Indoor/outdoor differential pressure	Pa	3.1	From Table 3.3, SR3[5

References

1. Environment Agency (2009), 'Science Reports SC050021 - SGV and TOX reports for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs'; 'Supplementary information for the derivation of SGV for: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs', and 'Contaminants in soil: updated collation of toxicological data and intake values for humans: benzene, toluene, ethylbenzene, xylene, mercury, selenium, nickel, arsenic, cadmium, phenol, dioxins, furans and dioxin-like PCBs'. Available at: https://www.gov.uk/government/publications/contaminants-in-soil-updated-collation-of-toxicological-data-and-intake-values-for-humans and https://www.gov.uk/government/publications/land-contamination-soil-guideline-values-sgvs (accessed 4 February 2015)

2. Nathanial, C. P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A. G., Ogden, R. C. and Scott, D. (2009), *LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment*, second edition (Nottingham: Land Quality Press).

3. Contaminated Land: Applications in Real Environment (CL:AIRE) (2014). 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination', Revision 2, DEFRA research project SP1010.

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5. Environment Agency (2009), *Science Report – SC050021/SR3. Updated technical background to the CLEA model* (Bristol: Environment Agency).

6. Contaminated Land: Applications in Real Environment (CL:AIRE) (2014). 'Appendices C to H). DEFRA research project SP1010'.

7. Nathanial, C. P., McCaffrey, C., Gillet, A. G., Ogden, R. C. and Nathanial, J. F. (2015), *The LQM/CIEH S4ULs for Human Health Risk Assessment* (Nottingham: Land Quality Press).

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GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE

Table 5

Human Health Generic Assessment Criteria by Pathway for Residential With Home-Grown Produce Scenario

Compound	Notes	GrAC (mg/l)	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Metals														
Arsenic	(a,b)	-	3.66E+01	NR	NR	NR	3.66E+01	NR	NR	NR	3.66E+01	NR	NR	NR
Cadmium	(a)	-	NR	NR	2.60E+01	NR	NR	NR	2.60E+01	NR	NR	NR	2.60E+01	NR
Chromium (III) - trivalent	(c)	-	1.84E+04	9.07E+02	8.85E+02	NR	1.84E+04	9.07E+02	8.85E+02	NR	1.84E+04	9.07E+02	8.85E+02	NR
Chromium (VI) - hexavalent	(a,d)	-	NR	2.10E+01	NR	NR	NR	2.10E+01	NR	NR	NR	2.10E+01	NR	NR
Copper		-	2.72E+03	1.41E+04	2.47E+03	NR	2.72E+03	1.41E+04	2.47E+03	NR	2.72E+03	1.41E+04	2.47E+03	NR
Lead	(a)	-	NR	NR	2.0E+02	NR	NR	NR	2.0E+02	NR	NR	NR	2.0E+02	NR
Elemental Mercury (Hg^0)	(d)	9.40E-03	NR	2.35E-01	NR	4.31E+00	NR	5.60E-01	NR	1.07E+01	NR	1.22E+00	NR	2.58E+01
Inorganic Mercury (Hg^{2+})		-	3.95E+01	3.63E+03	3.91E+01	NR	3.95E+01	3.63E+03	3.91E+01	NR	3.95E+01	3.63E+03	3.91E+01	NR
Methyl Mercury (Hg^{4+})		2.00E+01	1.26E+01	1.87E+01	7.52E+00	7.33E+01	1.26E+01	3.62E+01	9.34E+00	1.42E+02	1.26E+01	7.68E+01	1.08E+01	3.04E+02
Nickel	(d)	-	5.47E+02	1.81E+02	1.64E+02	NR	5.47E+02	1.81E+02	1.64E+02	NR	5.47E+02	1.81E+02	1.64E+02	NR
Selenium	(b)	-	2.58E+02	NR	NR	NR	2.58E+02	NR	NR	NR	2.58E+02	NR	NR	NR
Zinc	(b)	-	3.86E+03	3.63E+07	NR	NR	3.86E+03	3.63E+07	NR	NR	3.86E+03	3.63E+07	NR	NR
Cyanide		-	2.74E+01	4.09E+00	3.78E+00	NR	2.74E+01	4.09E+00	3.78E+00	NR	2.74E+01	4.09E+00	3.78E+00	NR
Volatile Organic Compounds														
Benzene	(a)	7.20E+00	2.62E-01	9.01E-01	2.03E-01	1.22E+03	5.39E-01	1.68E+00	4.08E-01	2.26E+03	1.16E+00	3.48E+00	8.72E-01	4.71E+03
Toluene		5.90E+02	1.53E+02	9.08E+02	1.31E+02	8.69E+02	3.49E+02	2.00E+03	2.97E+02	1.92E+03	7.95E+02	4.55E+03	6.77E+02	4.36E+03
Ethylbenzene		1.80E+02	1.10E+02	8.34E+01	4.74E+01	5.18E+02	2.61E+02	1.96E+02	1.12E+02	1.22E+03	6.00E+02	4.58E+02	2.60E+02	2.84E+03
Xylene - m		8.40E+01	2.10E+02	8.25E+01	5.92E+01	6.25E+02	5.01E+02	1.95E+02	1.40E+02	1.47E+03	1.15E+03	4.56E+02	3.27E+02	3.46E+03
Xylene - o		1.00E+02	1.92E+02	8.87E+01	6.07E+01	4.78E+02	4.56E+02	2.08E+02	1.43E+02	1.12E+03	1.05E+03	4.86E+02	3.32E+02	2.62E+03
Xylene - p		8.70E+01	1.98E+02	7.93E+01	5.66E+01	5.76E+02	4.70E+02	1.86E+02	1.33E+02	1.35E+03	1.08E+03	4.36E+02	3.10E+02	3.17E+03
Total xylene		8.40E+01	1.92E+02	7.93E+01	5.66E+01	6.25E+02	4.56E+02	1.86E+02	1.33E+02	1.47E+03	1.05E+03	4.36E+02	3.10E+02	3.46E+03
Methyl tertiary-Butyl ether (MTBE)		2.20E+03	1.54E+02	1.04E+03	1.34E+02	2.04E+04	2.97E+02	1.69E+03	2.53E+02	3.31E+04	6.03E+02	3.21E+03	5.08E+02	6.27E+04
Trichloroethene		1.80E+00	2.83E-01	1.72E-02	1.62E-02	1.54E+03	6.26E-01	3.59E-02	3.40E-02	3.22E+03	1.41E+00	7.98E-02	7.55E-02	7.14E+03
Tetrachloroethene		3.60E+00	4.49E+00	1.79E-01	1.76E-01	4.24E+02	1.04E+01	4.02E-01	3.94E-01	9.51E+02	2.38E+01	9.21E-01	9.04E-01	2.18E+03
1,1,1-Trichloroethane		2.60E+01	3.33E+02	9.01E+00	8.77E+00	1.43E+03	7.26E+02	1.84E+01	1.80E+01	2.92E+03	1.62E+03	4.04E+01	3.94E+01	6.39E+03
1,1,1,2 Tetrachloroethane		1.40E+01	5.39E+00	1.54E+00	1.20E+00	2.60E+03	1.27E+01	3.56E+00	2.78E+00	6.02E+03	2.92E+01	8.29E+00	6.46E+00	1.40E+04
1,1,2,2-Tetrachloroethane		1.40E+01	2.81E+00	3.92E+00	1.64E+00	2.67E+03	6.09E+00	8.04E+00	3.47E+00	5.46E+03	1.36E+01	1.76E+01	7.67E+00	1.20E+04
Carbon Tetrachloride		5.50E-02	3.10E+00	2.58E-02	2.57E-02	1.52E+03	7.11E+00	5.65E-02	5.62E-02	3.32E+03	1.62E+01	1.28E-01	1.27E-01	7.54E+03
1,2-Dichloroethane		3.00E-01	3.17E-02	9.20E-03	7.13E-03	3.41E+03	5.73E-02	1.33E-02	1.08E-02	4.91E+03	1.09E-01	2.28E-02	1.88E-02	8.43E+03
Vinyl Chloride		1.90E-02	3.82E-03	7.73E-04	6.43E-04	1.36E+03	6.87E-03	1.00E-03	8.73E-04	1.76E+03	1.25E-02	1.53E-03	1.36E-03	2.69E+03
1,2,4-Trimethylbenzene		7.50E-02	NR	1.76E+00	NR	4.74E+02	NR	4.26E+00	NR	1.16E+03	NR	9.72E+00	NR	2.76E+03
1,3,5-Trimethylbenzene	(e)	4.70E-02	NR	NR	NR	2.30E+02	NR	NR	NR	5.52E+02	NR	NR	NR	1.30E+03
Semi-Volatile Organic Compounds														
Acenaphthene		3.20E+00	2.27E+02	4.86E+04	2.26E+02	5.70E+01	5.41E+02	1.18E+05	5.38E+02	1.41E+02	1.18E+03	2.68E+05	1.17E+03	3.36E+02
Acenaphthylene		4.20E+00	1.85E+02	4.59E+04	1.84E+02	8.61E+01	4.42E+02	1.11E+05	4.40E+02	2.12E+02	9.78E+02	2.53E+05	9.74E+02	5.06E+02
Anthracene		2.10E-02	2.43E+03	1.53E+05	2.39E+03	1.17E+00	5.53E+03	3.77E+05	5.45E+03	2.91E+00	1.10E+04	8.76E+05	1.09E+04	6.96E+00
Benzo(a)anthracene		3.80E-03	1.01E+01	2.47E+01	7.18E+00	1.71E+00	1.42E+01	4.37E+01	1.07E+01	4.28E+00	1.69E+01	6.26E+01	1.33E+01	1.03E+01
Benzo(b)fluoranthene		2.00E-03	2.96E+00	1.93E+01	2.56E+00	1.22E+00	3.89E+00	2.13E+01	3.29E+00	3.04E+00	4.43E+00	2.22E+01	3.69E+00	7.29E+00
Benzo(g,h,i)perylene		2.60E-04	3.77E+02	1.87E+03	3.14E+02	1.54E-02	4.09E+02	1.94E+03	3.38E+02	3.85E-02	4.23E+02	1.97E+03	3.48E+02	9.23E-02
Benzo(k)fluoranthene		8.00E-04	8.92E+01	5.41E+02	7.66E+01	6.87E-01	1.10E+02	5.76E+02	9.22E+01	1.72E+00	1.21E+02	5.91E+02	1.00E+02	4.12E+00
Chrysene		2.00E-03	1.66E+01	1.19E+02	1.46E+01	4.40E-01	2.54E+01	1.49E+02	2.17E+01	1.10E+00	3.19E+01	1.66E+02	2.67E+01	2.64E+00
Dibenzo(a,h)anthracene		6.00E-04	2.90E-01	1.45E+00	2.41E-01	3.93E-03	3.43E-01	1.64E+00	2.84E-01	9.82E-03	3.69E-01	1.74E+00	3.04E-01	2.36E-02
Fluoranthene		2.30E-01	2.87E+02	3.83E+04	2.85E+02	1.89E+01	5.63E+02	8.87E+04	5.60E+02	4.73E+01	9.00E+02	1.83E+05	8.96E+02	1.13E+02
Fluorene		1.90E+00	1.77E+02	6.20E+03	1.72E+02	3.09E+01	4.19E+02	1.53E+04	4.07E+02	7.65E+01	8.98E+02	3.62E+04	8.76E+02	1.83E+02
Indeno(1,2,3-cd)pyrene		2.00E-04	3.09E+01	2.12E+02	2.70E+01	6.13E-02	4.22E+01	2.38E+02	3.59E+01	1.53E-01	4.92E+01	2.50E+02	4.11E+01	3.68E-01
Phenanthrene		5.30E-01	9.85E+01	7.17E+03	9.72E+01	3.60E+01	2.24E+02	1.76E+04	2.22E+02	8.96E+01	4.48E+02	4.07E+04	4.43E+02	2.14E+02
Pyrene		1.30E-01	6.25E+02	8.79E+04	6.20E+02	2.20E+00	1.25E+03	2.04E+05	1.24E+03	5.49E+00	2.05E+03	4.23E+05	2.04E+03	1.32E+01
Benzo(a)pyrene	(a)	3.80E-03	4.91E+00	3.51E+01	4.30E+00	9.11E-01	4.91E+00	3.77E+01	4.34E+00	2.28E+00	4.91E+00	3.89E+01	4.36E+00	5.46E+00
Naphthalene		1.90E+01	2.78E+01	2.33E+01	1.27E+01	7.64E+01	6.66E+01	5.58E+01	3.04E+01	1.83E+02	1.53E+02	1.31E+02	7.06E+01	4.32E+02
Phenol		-	1.60E+02	4.58E+02	1.20E+02	2.42E+04	2.96E+02	6.95E+02	2.09E+02	3.81E+04	5.86E+02	1.19E+03	3.93E+02	7.03E+04

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE

Table 5

Human Health Generic Assessment Criteria by Pathway for Residential With Home-Grown Produce Scenario

Compound	Notes	GrAC (mg/l)	SAC Appropriate to Pathway SOM 1% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 2.5% (mg/kg)			Soil Saturation Limit (mg/kg)	SAC Appropriate to Pathway SOM 6% (mg/kg)			Soil Saturation Limit (mg/kg)
			Oral	Inhalation	Combined		Oral	Inhalation	Combined		Oral	Inhalation	Combined	
Total Petroleum Hydrocarbons														
Aliphatic hydrocarbons EC_5-EC_6		1.00E+01	4.96E+03	4.24E+01	4.23E+01	3.04E+02	1.12E+04	7.79E+01	7.78E+01	5.58E+02	2.41E+04	1.61E+02	1.60E+02	1.15E+03
Aliphatic hydrocarbons >EC_6-EC_8		5.40E+00	1.46E+04	1.04E+02	1.03E+02	1.44E+02	3.27E+04	2.31E+02	2.31E+02	3.22E+02	6.47E+04	5.29E+02	5.28E+02	7.36E+02
Aliphatic hydrocarbons >EC_8-EC_{10}		2.30E-01	1.45E+03	2.68E+01	2.67E+01	7.77E+01	2.42E+03	6.55E+01	6.50E+01	1.90E+02	3.29E+03	1.56E+02	1.54E+02	4.51E+02
Aliphatic hydrocarbons >EC_{10}-EC_{12}		3.40E-02	3.47E+03	1.33E+02	1.32E+02	4.75E+01	3.98E+03	3.31E+02	3.24E+02	1.18E+02	4.23E+03	7.93E+02	7.52E+02	2.83E+02
Aliphatic hydrocarbons >EC_{12}-EC_{16}		7.60E-04	4.36E+03	1.11E+03	1.03E+03	2.37E+01	4.40E+03	2.78E+03	2.22E+03	5.91E+01	4.41E+03	6.67E+03	3.47E+03	1.42E+02
Aliphatic hydrocarbons >EC_{16}-EC_{35}	(b)	-	5.28E+04	NR	NR	8.48E+00	6.95E+04	NR	NR	2.12E+01	7.94E+04	NR	NR	5.09E+01
Aliphatic hydrocarbons >EC_{35}-EC_{44}	(b)	-	5.28E+04	NR	NR	8.48E+00	6.95E+04	NR	NR	2.12E+01	7.94E+04	NR	NR	5.09E+01
Aromatic hydrocarbons >EC_8-EC_9 (styrene)		7.40E+00	1.07E+01	5.22E+02	1.05E+01	6.26E+02	2.51E+01	1.20E+03	2.46E+01	1.44E+03	5.72E+01	2.79E+03	5.60E+01	3.35E+03
Aromatic hydrocarbons >EC_9-EC_{10}		7.40E+00	5.71E+01	4.74E+01	3.44E+01	6.13E+02	1.35E+02	1.16E+02	8.29E+01	1.50E+03	2.91E+02	2.77E+02	1.89E+02	3.58E+02
Aromatic hydrocarbons >EC_{10}-EC_{12}		2.50E+01	8.17E+01	2.58E+02	7.42E+01	3.64E+02	1.90E+02	6.39E+02	1.74E+02	8.99E+02	3.95E+02	1.52E+03	3.67E+02	2.15E+03
Aromatic hydrocarbons >EC_{12}-EC_{16}		5.80E+00	1.43E+02	2.85E+03	1.41E+02	1.69E+02	3.18E+02	7.07E+03	3.14E+02	4.19E+02	6.09E+02	1.68E+04	6.03E+02	1.00E+03
Aromatic hydrocarbons >EC_{16}-EC_{21}	(b)	-	2.48E+02	NR	NR	5.37E+01	4.84E+02	NR	NR	1.34E+02	7.68E+02	NR	NR	3.21E+02
Aromatic hydrocarbons >EC_{21}-EC_{35}	(b)	-	8.72E+02	NR	NR	4.83E+00	1.10E+03	NR	NR	1.21E+01	1.22E+03	NR	NR	2.90E+01
Aromatic hydrocarbons >EC_{35}-EC_{44}	(b)	-	8.72E+02	NR	NR	4.83E+00	1.10E+03	NR	NR	1.21E+01	1.22E+03	NR	NR	2.90E+01

Notes:

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

Calculated SAC exceeds soil saturation limit and may significantly effect the interpretation of any exceedances since the contribution of the indoor and outdoor vapour pathway to total exposure is >10%. This shading has also been used for the RBCA output where the theoretical solubility limit has been exceeded. The SAC has been set as the model calculated SAC with the saturation limits shown in brackets.

Calculated SAC exceeds soil saturation limit but will not effect the SSV significantly since the contribution of the indoor and outdoor vapour pathway to total exposure is <10%.

Calculated SAC does not exceed the soil saturation limit.

For consistency where the theoretical solubility limit within RBCA has been exceeded in production of the GrAC, these cells have also been hatched red.

The SAC for organic compounds are dependant upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway (Section 10.1.1, SR3)

(a) SAC for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead are derived using the C4SL toxicology data.

(b) SAC for selenium should not include the inhalation pathway as no expert group HCV has been derived; aliphatic and aromatic hydrocarbons >EC16 should not include inhalation pathway due to their non-volatile nature and inhalation exposure being minimal (oral, dermal and inhalation exposure is compared to the oral HCV); arsenic should only be based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The Oral SAC should be adopted for zinc and benzo(a)pyrene.

(c) SAC for CrIII should be based on the lower of the oral and inhalation SAC (see LQM/CIEH 2015 Section 6.8)

(d) SAC for elemental mercury, chromium VI and nickel should be based on the inhalation pathway only.

(e) SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - RESIDENTIAL WITH HOME-GROWN PRODUCE

Table 6
Human Health Generic Assessment Criteria for Residential with home-grown produce

Compound	GrAC for Groundwater (mg/l)	SAC for Soil SOM 1% (mg/kg)	SAC for Soil SOM 2.5% (mg/kg)	SAC for Soil SOM 6% (mg/kg)
Metals				
Arsenic	-	37	37	37
Cadmium	-	30	30	30
Chromium (III) - trivalent	-	910	910	910
Chromium (VI) - hexavalent	-	21	21	21
Copper	-	2,500	2,500	2,500
Lead	-	200	200	200
Elemental Mercury (Hg^0)	0.0094	0.2	0.6	1.2
Inorganic Mercury (Hg^{2+})	-	39	39	39
Methyl Mercury (Hg^{4+})	20	10	10	10
Nickel	-	180	180	180
Selenium	-	258	258	258
Zinc	-	3,900	3,900	3,900
Cyanide	-	3.8	3.8	3.8
Volatile Organic Compounds				
Benzene	7.2	0.20	0.41	0.87
Toluene	590	130	300	680
Ethylbenzene	180	50	110	260
Xylene - m	84	59	140	327
Xylene - o	100	61	143	332
Xylene - p	87	57	133	310
Total xylene	84	57	133	310
Methyl tertiary-Butyl ether (MTBE)	2200	130	250	510
Trichloroethene	1.8	0.02	0.03	0.08
Tetrachloroethene	3.6	0.2	0.4	0.9
1,1,1-Trichloroethane	26	9	18	39
1,1,1,2 Tetrachloroethane	14	1.2	2.8	6.5
1,1,2,2-Tetrachloroethane	14	1.6	3.5	7.7
Carbon Tetrachloride	0.055	0.026	0.056	0.127
1,2-Dichloroethane	0.3	0.007	0.011	0.019
Vinyl Chloride	0.019	0.0006	0.0009	0.0014
1,2,4-Trimethylbenzene	0.075	1.8	4.3	9.7
1,3,5-Trimethylbenzene	0.047	NR	NR	NR
Semi-Volatile Organic Compounds				
Acenaphthene	3.2	230	540	1,170
Acenaphthylene	4.2	180	440	970
Anthracene	0.021	2,400	5,500	10,900
Benzo(a)anthracene	0.0038	7	11	13
Benzo(b)fluoranthene	0.002	2.6	3.3	3.7
Benzo(g,h,i)perylene	0.00026	310	340	350
Benzo(k)fluoranthene	0.0008	77	92	100
Chrysene	0.002	15	22	27
Dibenzo(a,h)anthracene	0.0006	0.24	0.28	0.30
Fluoranthene	0.23	280	560	900
Fluorene	1.9	170	410	880
Indeno(1,2,3-cd)pyrene	0.0002	27	36	41
Phenanthrene	0.53	100	220	440
Pyrene	0.13	620	1,240	2,040
Benzo(a)pyrene	0.0038	5	5	5
Naphthalene	19	13	30	71
Phenol	-	120	210	390
Total Petroleum Hydrocarbons				
Aliphatic hydrocarbons EC_5-EC_6	10	42	78	160
Aliphatic hydrocarbons >EC_6-EC_8	5.4	100	230	530
Aliphatic hydrocarbons >EC_8-EC_{10}	0.23	27	65	154
Aliphatic hydrocarbons >EC_{10}-EC_{12}	0.034	130 (48)	320 (118)	750 (283)
Aliphatic hydrocarbons >EC_{12}-EC_{16}	0.00076	1,000 (24)	2,200 (59)	3,500 (142)
Aliphatic hydrocarbons >EC_{16}-EC_{35}	-	53,000 (8)	70,000 (21)	79,000
Aliphatic hydrocarbons >EC_{35}-EC_{44}	-	53,000 (8)	70,000 (21)	79,000
Aromatic hydrocarbons >EC_8-EC_9 (styrene)	7.4	11	25	56
Aromatic hydrocarbons >EC_9-EC_{10}	7.4	34	83	189
Aromatic hydrocarbons >EC_{10}-EC_{12}	25	74	174	367
Aromatic hydrocarbons >EC_{12}-EC_{16}	5.8	100	300	600
Aromatic hydrocarbons >EC_{16}-EC_{21}	-	200	500	800
Aromatic hydrocarbons >EC_{21}-EC_{35}	-	900	1,100	1,200
Aromatic hydrocarbons >EC_{35}-EC_{44}	-	900	1,100	1,200
Minerals				
Asbestos	-	No asbestos detected with ID or <0.001% dry weight[1]		

Notes:

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.

NR - SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

[1] LOD for weight of asbestos per unit weight of soil calculated on a dry weight basis using PLM, handpicking and gravimetry.

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58.
1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

(VALUE IN BRACKETS) The SAC has been set as the model calculated SAC with the saturation limit shown in brackets.
RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets.

(VALUE IN BRACKETS) For consistency where the GrAC exceeds the solubility limit, GrAC has been set at the solubility limit. The GrAC is conservative since concentrations of the chemical are very unlikely to be at sufficient concentration to result in an exceedance of the health criteria value at the point of exposure (i.e. indoor air) provided free-phase product is absent.

APPENDIX I
COMPARISON OF LABORATORY RESULTS TO RELEVANT GENERIC ASSESSMENT CRITERIA

313035 - Chesterton Phase 2 - Human Health Risk Assessment Soil Results Summary Table and Direct Comparison

Sample Identity		Residential with Plant Uptake (1% SOM)	TP01	TP01	TP02	TP02	TP04	TP06	TP06	TP08	WS01	WS03	WS05	WS06	FP01	FP02	FP03	FP04	CBR06
Depth		SGV/GACs	0.20	0.90	0.10	0.80	0.50	0.10	0.50	0.15	0.15	1.50	0.70	0.30	0.15	0.20	0.10	0.10	0.15
Strata																			
Determinants	**Units**																		
Visual Fibre Screen			NAD		NAD			NAD		NAD	NAD				NAD	NAD	NAD	NAD	NAD
pH	pH			8.5		8.35	8.44		8.58	7.82		8.78	8.58	8.26		8.4			
Total Organic Carbon	% w/w			0.09		0.29	0.27		0.09	2.79		0.1	0.2	1.02		1.42			
Metals																			
Arsenic	mg/kg	37		8		2	4		3	10		3	3	5		9			
Boron (water soluble)	mg/kg			<1.0		<1.0	<1.0		<1.0	<1.0		<1.0	<1.0	<1.0		<1.0			
Cadmium	mg/kg	30		<0.5		<0.5	<0.5		<0.5	<0.5		<0.5	<0.5	<0.5		<0.5			
Copper	mg/kg	2500		5		4	3		3	24		1	3	7		20			
Chromium	mg/kg	910		8		5	5		4	17		2	6	10		27			
Chromium (hexavalent)	mg/kg	21		<1		<1	<1		<1	<1		<1	<1	<1		<1			
lead (C4SL)	mg/kg	200		4		5	5		3	60		1	4	12		22			
Mercury	mg/kg	39		1.08		0.54	0.61		0.41	0.33		0.94	1.12	0.61		0.37			
Nickel	mg/kg	180		13		6	5		5	17		2	6	10		16			
Selenium	mg/kg	258		<1		<1	<1		<1	2		<1	<1	<1		<1			
Zinc	mg/kg	3900		15		16	12		6	76		<5	19	30		91			
Total Petroleum Hydrocarbons Criteria Working Group (TPHCWG)																			
Ali >C5-C6	mg/kg	42		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Ali >C6-C8	mg/kg	100		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Ali >C8-C10	mg/kg	27		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Ali >C10-C12	mg/kg	130		<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Ali >C12-C16	mg/kg	1000		<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Ali >C16-C21	mg/kg	Assess as sum		<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Ali >C21-C35	mg/kg	below		<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Ali >C16-C35	mg/kg	53,000		<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Total Aliphatics	mg/kg			<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Aro >C5-C7	mg/kg	0.2		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Aro >C7-C8	mg/kg	130		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Aro >C8-C9	mg/kg	11		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Aro >C9-C10	mg/kg	34		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Aro >C10-C12	mg/kg	74		<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Aro >C12-C16	mg/kg	100		<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	<0.1		<0.1			
Aro >C16-C21	mg/kg	200		<0.1		<0.1	<0.1		<0.1	17.8		<0.1	<0.1	<0.1		9.4			
Aro >C21-C35	mg/kg	900		<0.1		<0.1	<0.1		<0.1	35.7		<0.1	<0.1	<0.1		2.4			
Total Aromatics	mg/kg			<0.1		<0.1	<0.1		<0.1	53.5		<0.1	<0.1	<0.1		11.8			
TPH (Ali & Aro)	mg/kg			<0.1		<0.1	<0.1		<0.1	53.5		<0.1	<0.1	<0.1		11.8			
BTEX - Benzene	mg/kg	0.2		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
BTEX - Toluene	mg/kg	130		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
BTEX - Ethyl Benzene	mg/kg	50		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
BTEX - m & p Xylene	mg/kg	57		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
BTEX - o Xylene	mg/kg	61		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
MTBE	mg/kg	130		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
PAHs (Polycyclic Aromatic Hydrocarbons)																			
Acenapthene	mg/kg	230		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		0.03			
Acenapthylene	mg/kg	180		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		<0.01			
Anthracene	mg/kg	2400		<0.02		<0.02	<0.02		<0.02	<0.02		<0.02	<0.02	<0.02		0.03			
Benzo(a)anthracene	mg/kg	7		<0.04		<0.04	<0.04		<0.04	0.09		<0.04	<0.04	<0.04		0.28			
Benzo(a)pyrene	mg/kg			<0.04		<0.04	<0.04		<0.04	0.09		<0.04	<0.04	<0.04		0.38			
Benzo(b)fluoranthene	mg/kg	2.6		<0.05		<0.05	<0.05		<0.05	0.15		<0.05	<0.05	<0.05		0.7			
Benzo(ghi)perylene	mg/kg	310		<0.05		<0.05	<0.05		<0.05	0.05		<0.05	<0.05	<0.05		0.29			
Benzo(k)fluoranthene	mg/kg	77		<0.07		<0.07	<0.07		<0.07	<0.07		<0.07	<0.07	<0.07		0.26			
Chrysene	mg/kg	15		<0.06		<0.06	<0.06		<0.06	0.11		<0.06	<0.06	<0.06		0.41			
Dibenzo(ah)anthracene	mg/kg	0.24		<0.04		<0.04	<0.04		<0.04	<0.04		<0.04	<0.04	<0.04		0.06			
Fluoranthene	mg/kg	280		<0.08		<0.08	<0.08		<0.08	0.22		<0.08	<0.08	<0.08		0.79			
Fluorene	mg/kg	170		<0.01		<0.01	<0.01		<0.01	<0.01		<0.01	<0.01	<0.01		0.02			
Indeno(123-cd)pyrene	mg/kg	27		<0.03		<0.03	<0.03		<0.03	0.06		<0.03	<0.03	<0.03		0.36			
Napthalene	mg/kg	13		<0.03		<0.03	<0.03		<0.03	<0.03		<0.03	<0.03	<0.03		<0.03			
Phenanthrene	mg/kg	100		<0.03		<0.03	<0.03		<0.03	0.08		<0.03	<0.03	<0.03		0.33			
Pyrene	mg/kg	620		<0.07		<0.07	<0.07		<0.07	0.19		<0.07	<0.07	<0.07		0.61			
Total PAH	mg/kg			<0.08		<0.08	<0.08		<0.08	1.06		<0.08	<0.08	<0.08		4.54			
Nitrogen Pesticides (NP)																			
Ametryn	ug/kg				<50														
Atraton	ug/kg				<50														
Atrazine	ug/kg				<50														
Prometon	ug/kg				<50														
Prometryn	ug/kg				<50														
Propazine	ug/kg				<50														
Simazine	ug/kg				<50														
Simetryn	ug/kg				<50														
Terbuthylazine	ug/kg				<50														
Terbutryn	ug/kg				<50														
Organo Chlorine Pesticides (OCP) and Organo Phosphorous Pesticides (OPP)																			
Dichlorvos	ug/kg				<50														
Mevinphos	ug/kg				<50														
Alpha-BHC (Lindane)	ug/kg				<50														
Beta-BHC (Lindane)	ug/kg				<50														
Gamma-BHC (Lindane)	ug/kg				<50														
Diazinon	ug/kg				<50														
Methyl Parathion	ug/kg				<50														
Heptachlor	ug/kg				<50														
Fenitrothion	ug/kg				<50														
Malathion	ug/kg				<50														
Aldrin	ug/kg				<50														
Parathion	ug/kg				<50														
Heptachlor Epoxide	ug/kg				<50														
Endosulphan I	ug/kg				<50														
p,p'-DDE	ug/kg				<50														
Dieldrin	ug/kg				<50														
Endrin	ug/kg				<50														
Endosulphan II	ug/kg				<50														
p,p'-TDE(DDD)	ug/kg				<50														
Ethion	ug/kg				<50														
p,p'-DDT	ug/kg				<50														
Endosulphan sulphate	ug/kg				<50														
p,p'-Methoxychlor	ug/kg				<50														
Azinphos methyl	ug/kg				<50														

= Exceedence of GAC for a residential (with plant uptake) end-

All GACs calculated by RSK or taken from EIC/AGS/CLAIRE Generic Assessment Criteria; and LQM/CIEH Generic Assessment Criteria

APPENDIX J
GENERIC ASSESSMENT CRITERIA FOR POTABLE WATER SUPPLY PIPES

A range of pipe materials is available and careful selection, design and installation is required to ensure that water supply pipes are satisfactorily installed and meet the requirements of the Water Supply (Water Fittings) Regulations 1999 in England and Wales, the Byelaws 2000 in Scotland and the Northern Ireland Water Regulations. The regulations include a requirement to use only suitable materials when laying water pipes and laying water pipes without protection is not permitted at contaminated sites. The water supply company has a statutory duty to enforce the regulations.

Contaminants in the ground can pose a risk to human health by permeating potable water supply pipes. To fulfil their statutory obligation, UK water supply companies require robust evidence from developers to demonstrate either that the ground in which new plastic supply pipes will be laid is free from specific contaminants, or that the proposed remedial strategy will mitigate any existing risk. If these requirements cannot be demonstrated to the satisfaction of the relevant water company, it becomes necessary to specify an alternative pipe material on the whole development or in specific zones.

In 2010, UK Water Industry Research (UKWIR) published *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* (Report Ref. No. 10/WM/03/21). This report reviewed previously published industry guidelines and threshold concentrations adopted by individual water supply companies.

The focus of the UKWIR research project was to develop clear and concise procedures, which provide consistency in the pipe selection decision process. It was intended to provide guidance that can be used to ensure compliance with current regulations and to prevent water supply pipe failing prematurely due to the presence of contamination.

The report concluded that in most circumstances only organic contaminants pose a potential risk to plastic pipe materials and Table 3.1 of the report provides threshold concentrations for polyethylene (PE) and polyvinyl chloride (PVC) pipes for the organic contaminants of concern. The report also makes recommendations for the procedures to be adopted in the design of site investigations and sampling strategies, and the assessment of data, to ensure that the ground through which water supply pipes will be laid is adequately characterised.

Risks to water supply pipes have therefore been assessed against the threshold concentrations for PE and PVC pipe specified in Table 3.1 of Report 10/WM/03/21, which have been adopted as the GAC for this linkage and are reproduced in Table A3 below.

Since water supply pipes are typically laid at a minimum depth of 0.75m below finished ground levels, sample results from depths between 0.5m and 1.5m below finished level are generally considered suitable for assessing risks to water supply. Samples outside these depths can be

used, providing the stratum is the same as that in which water supply pipes are likely to be located. The report specifies that sampling should characterise the ground conditions to a minimum of 0.5m below the proposed depth of the pipe.

It should be noted that the assessment provided in this report is a guide and the method of assessment and recommendations should be checked with the relevant water supply company.

Table A3: Generic assessment criteria for water supply pipes

		Pipe material	
		GAC (mg/kg)	
	Parameter group	PE	PVC
1	Extended VOC suite by purge and trap or head space and GC-MS with TIC (Not including compounds within group 1a)	0.5	0.125
1a	• BTEX + MTBE	0.1	0.03
2	SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C_5–C_{10}) (Not including compounds within group 2e and 2f)	2	1.4
2e	• Phenols	2	0.4
2f	• Cresols and chlorinated phenols	2	0.04
3	Mineral oil C_{11}–C_{20}	10	Suitable
4	Mineral oil C_{21}–C_{40}	500	Suitable
5	Corrosive (conductivity, redox and pH)	Suitable	Suitable
Specific suite identified as relevant following site investigation			
2a	Ethers	0.5	1
2b	Nitrobenzene	0.5	0.4
2c	Ketones	0.5	0.02
2d	Aldehydes	0.5	0.02
6	Amines	Not suitable	Suitable
Notes: where indicated as ‘suitable’, the material is considered resistant to permeation or degradation and no threshold concentration has been specified by UKWIR.			

APPENDIX K
CERTIFICATES OF GEOTECHNICAL ANALYSIS

STRUCTURAL SOILS LTD

INSITU TESTING REPORT

Report No. 745612R.01(00)

Date	26-May-2015	Contract	Green Lane, Chesterton

Client RSK Environmental Ltd
Address Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR
For the Attention of Michael Lawson

Order received	12-May-2015	Client Reference	313035
Testing Started	19-May-2015	Client Order No.	PO249498
Testing Completed	20-May-2015	Instruction Type	Written

Test(s) undertaken (Not UKAS Accredited)

8no. Insitu CBR tests carried out at locations specified by the client.
3no. Insitu soakaway tests carried out at locations specified by the client

Testing undertaken in the Laboratory

Environmental conditions (if relevant)

The results represent the ground conditions at the specified locations and depths at the time of testing.

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of .
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd 1a Princess Street Bedminster Bristol BS3 4AG Tel.0117 9471000 Fax.0117 9471004 e-mail justin.barrett@soils.co.uk

TESTING VERIFICATION CERTIFICATE

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with Structural Soils Ltd Laboratory Quality Assurance Manual, Issue 6, January 2010 all results sheets and summaries of results issued by the laboratory are checked by an approved signatory. This check will also involve checking of at least 10% of calculations for each test type to ensure that data has been correctly entered into the computer and calculated. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Assurance Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **22/05/2015 16:02:07**.

Testing reported after this date is not covered by this Verification Certificate.

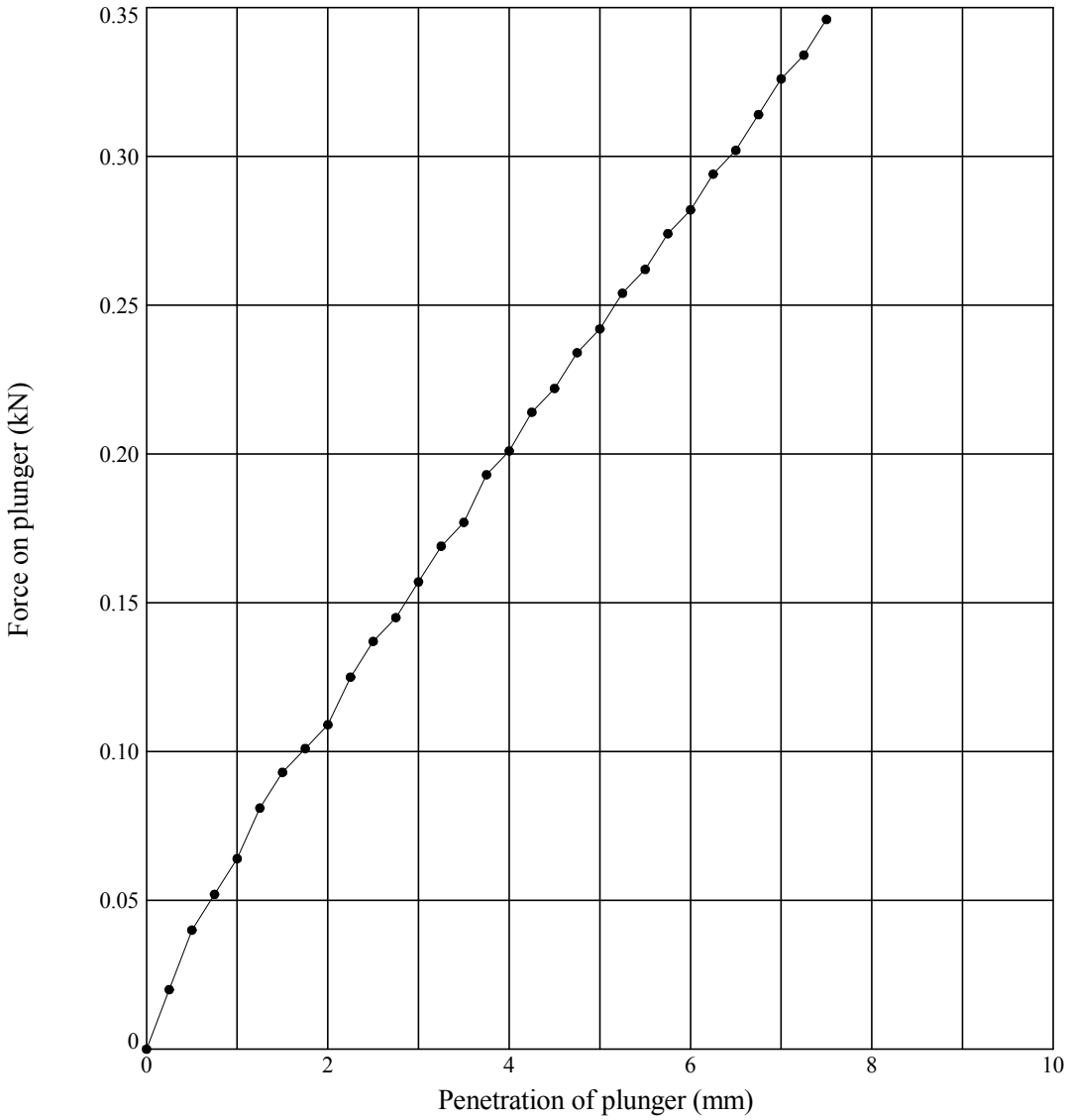
Approved Signatory
Sam Handcock (Site Testing Manager)

STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG	Contract: **Green Lane, Chesterton**	Job No: **745612**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR1** Depth (m): **0.80** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**15**	CBR Value (%) : **1.2**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**5**	

Sample Description	Remarks
Brownish yellow slightly sandy gravelly CLAY	

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP J.SHALLCROSS M.STROWGER J.MAJOR

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
MDStrowger	**MICHAEL STROWGER**	**22/05/15**

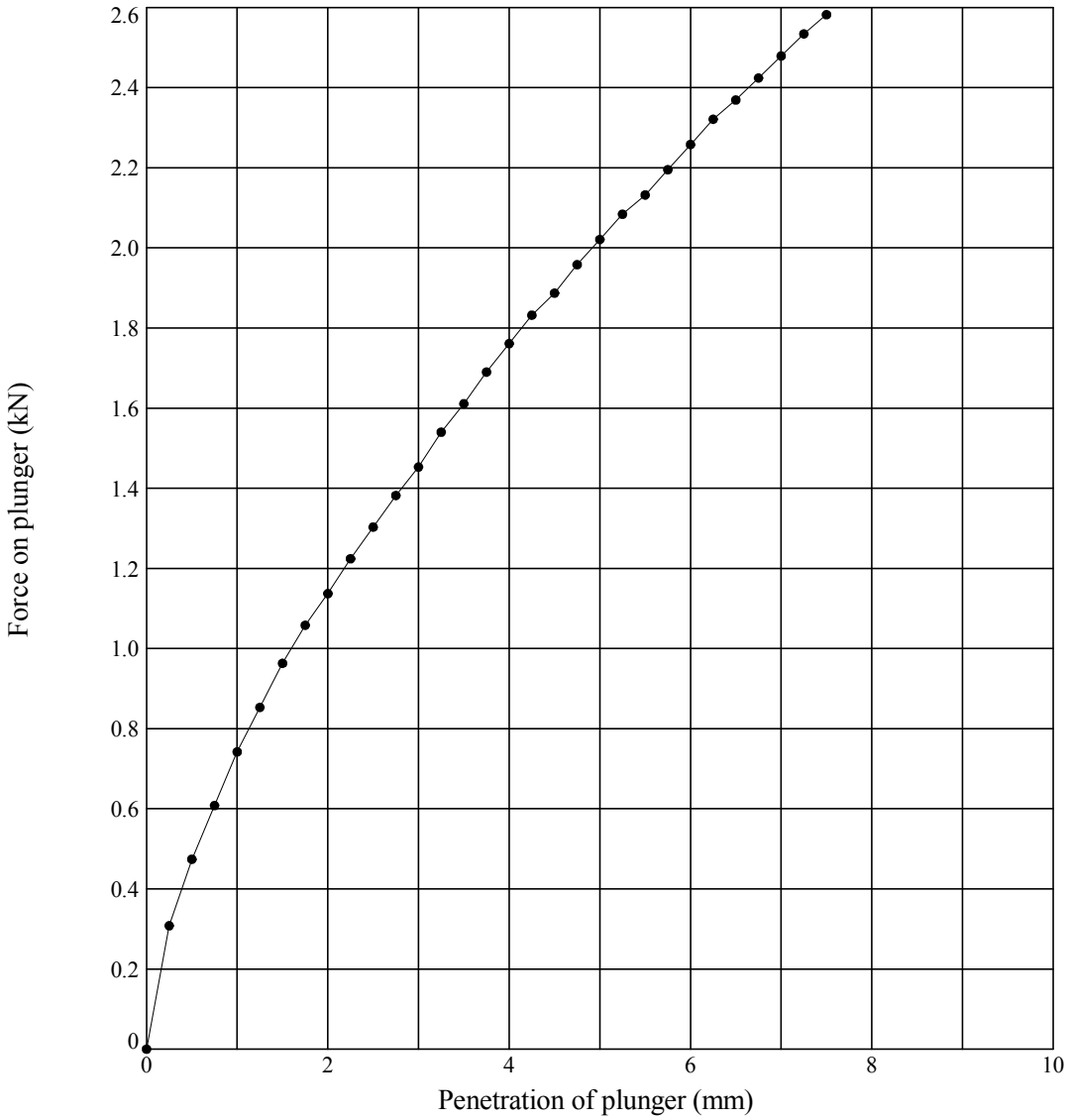
Contract	Contract Ref:
Green Lane, Chesterton	**745612**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR2** Depth (m): **0.20** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**13**	CBR Value (%) : **10**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**5**	

Sample Description	Remarks
Brown slightly sandy gravelly CLAY	

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP J.SHALLCROSS M.STROWGER J.MAJOR

STRUCTURAL SOILS
1a Princess Street
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Compiled By		Date
MDStrowger	**MICHAEL STROWGER**	**22/05/15**

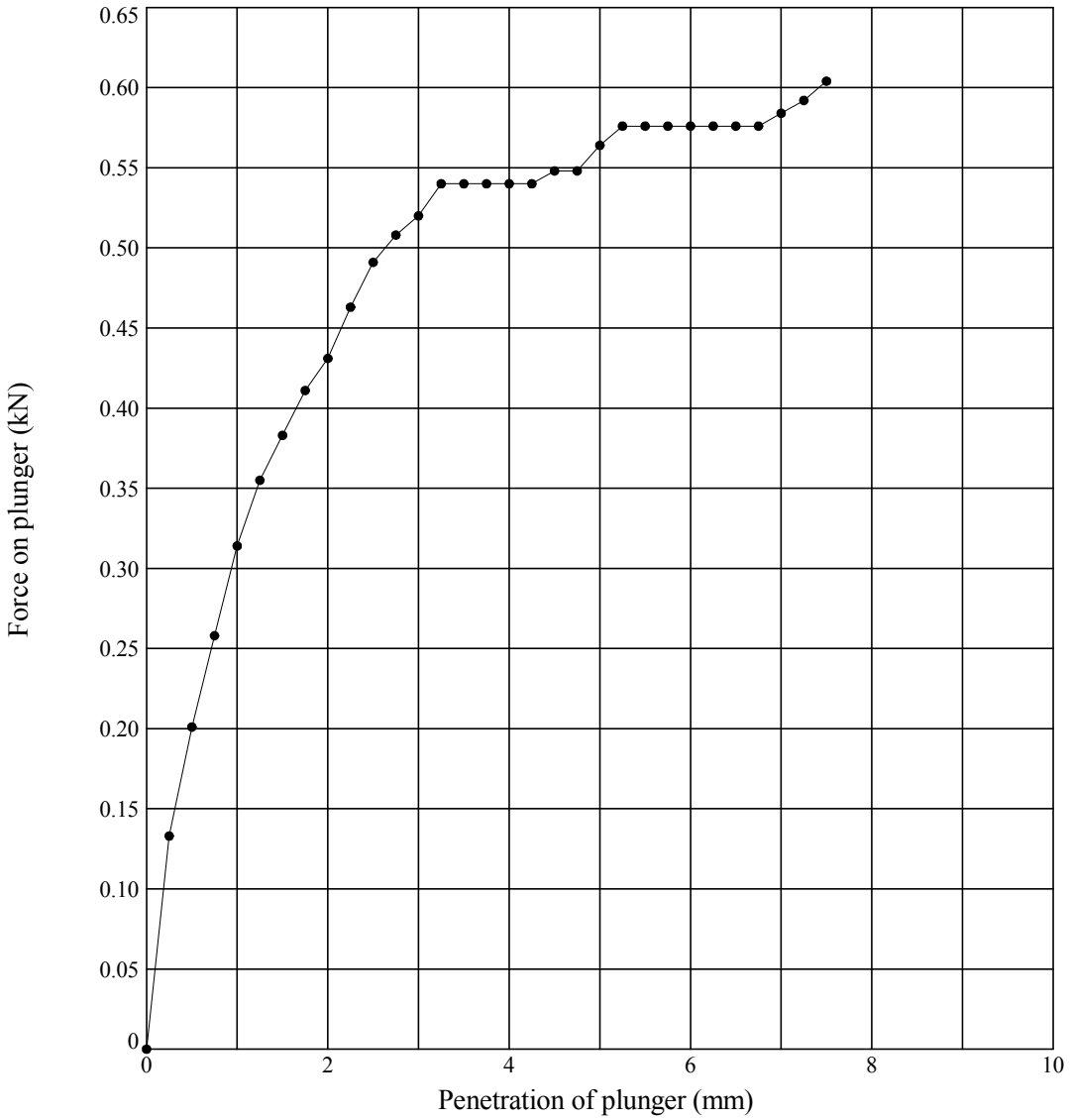
Contract	Contract Ref:
Green Lane, Chesterton	**745612**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR3** Depth (m): **0.60** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**7.2**	CBR Value (%) : **3.7**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**10**	

Sample Description	Remarks
Brown slightly sandy gravelly SILT	

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP J.SHALLCROSS M.STROWGER J.MAJOR

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
MDStrowger	**MICHAEL STROWGER**	**22/05/15**

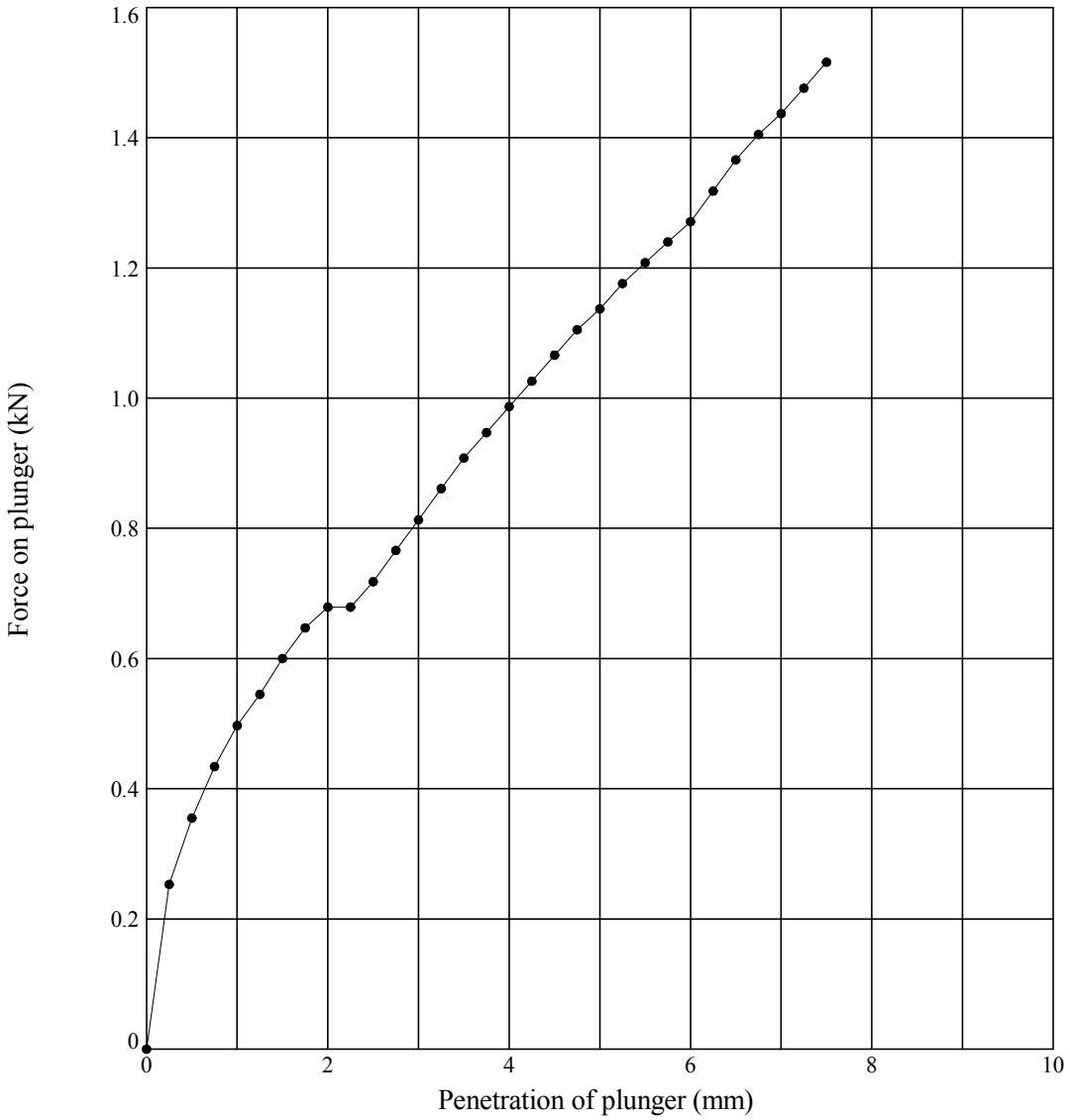
Contract	Contract Ref:
Green Lane, Chesterton	**745612**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR4** Depth (m): **0.40** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**13**	CBR Value (%) : **5.7**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**2**	

Sample Description	Remarks
Brown slightly sandy gravelly CLAY	

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP J.SHALLCROSS M.STROWGER J.MAJOR

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
MDStrowger	**MICHAEL STROWGER**	**22/05/15**

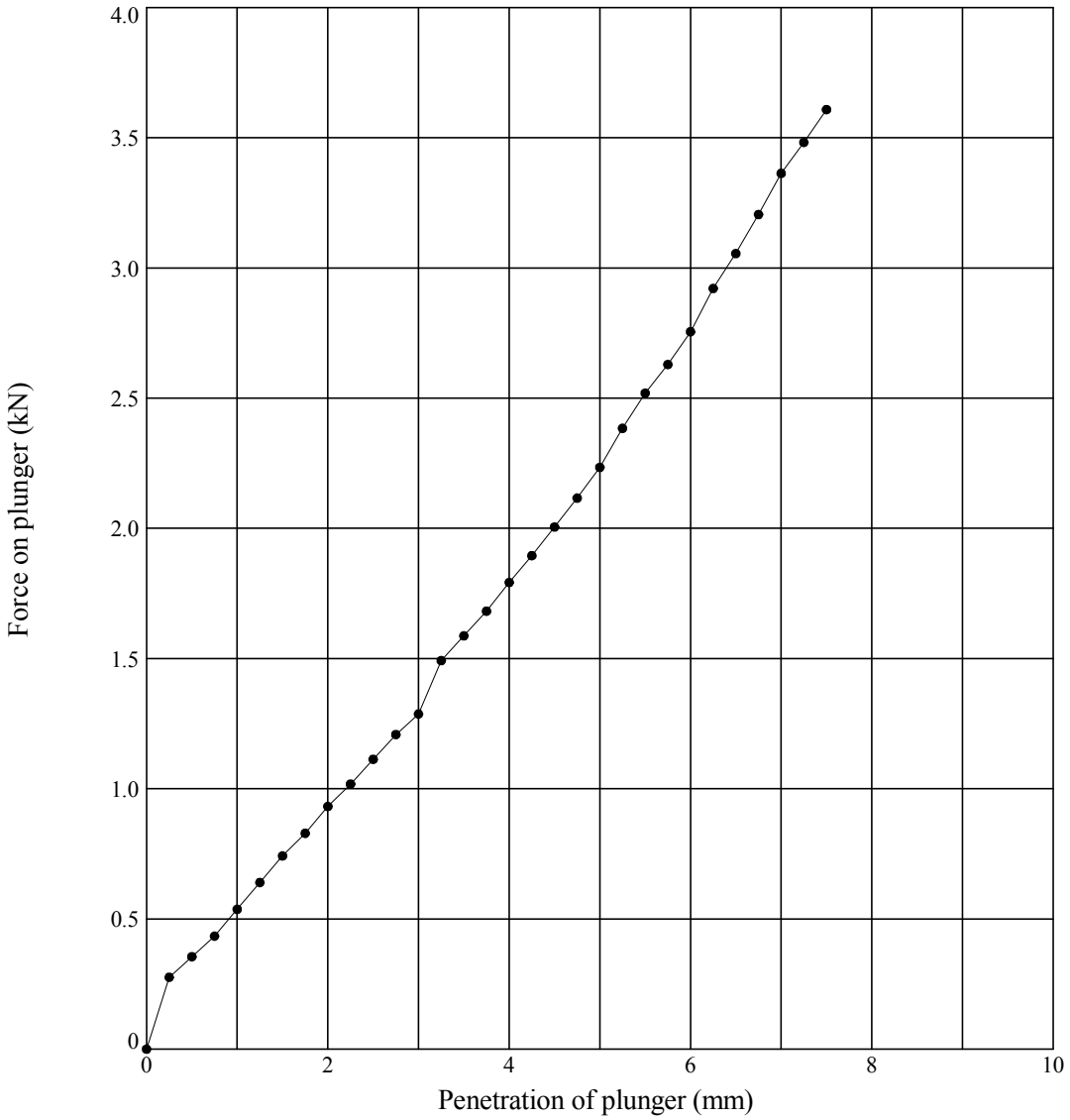
Contract	Contract Ref:
Green Lane, Chesterton	**745612**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR5** Depth (m): **0.25** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**11**	CBR Value (%) : **11**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**5**	

Sample Description	Remarks
Brown slightly sandy gravelly SILT	

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Compiled By		Date
MDStrowger	**MICHAEL STROWGER**	**22/05/15**

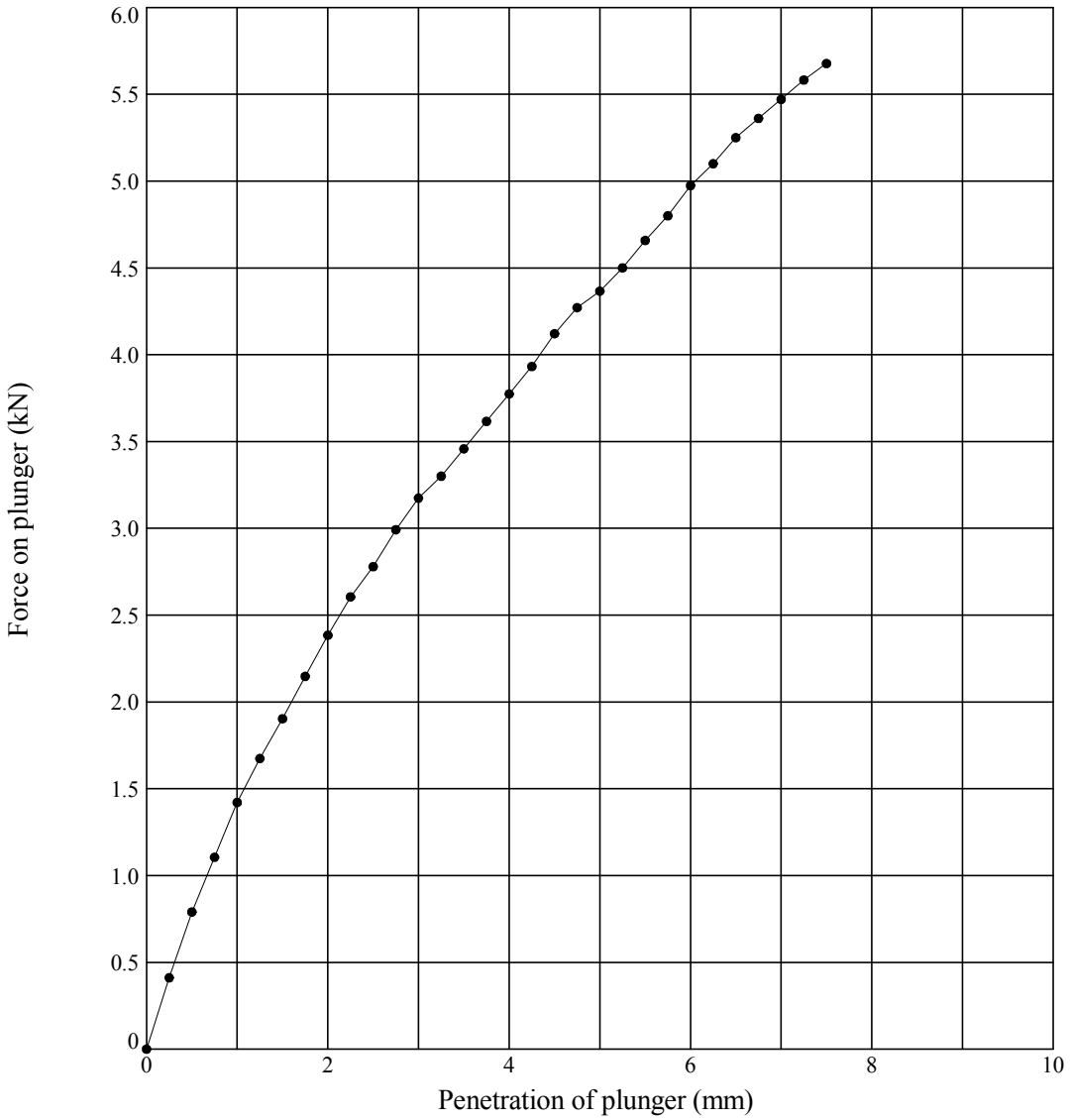
Contract	Contract Ref:
Green Lane, Chesterton	**745612**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR6** Depth (m): **0.30** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**9.2**	CBR Value (%) : **22**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**10**	

Sample Description	Remarks
Brown slightly sandy gravelly SILT	

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Compiled By		Date
MDStrowger	**MICHAEL STROWGER**	**22/05/15**

Contract	Contract Ref:
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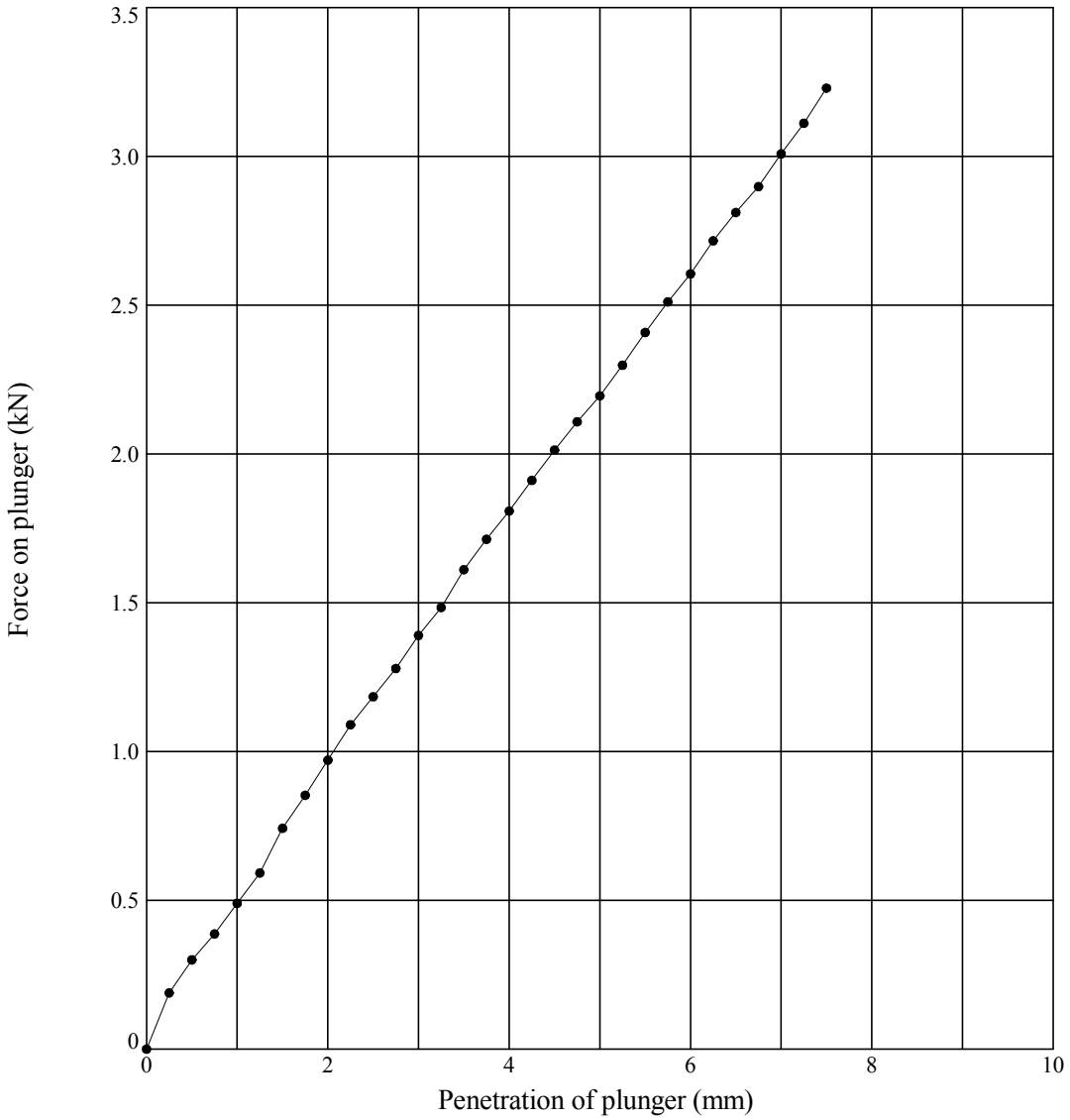
AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR7** Depth (m): **0.30** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**13**	CBR Value (%) : **11**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**5**	

Sample Description	Remarks
Brown slightly sandy gravelly SILT	

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MDStrowger	**MICHAEL STROWGER**	**22/05/15**

Contract	Contract Ref:
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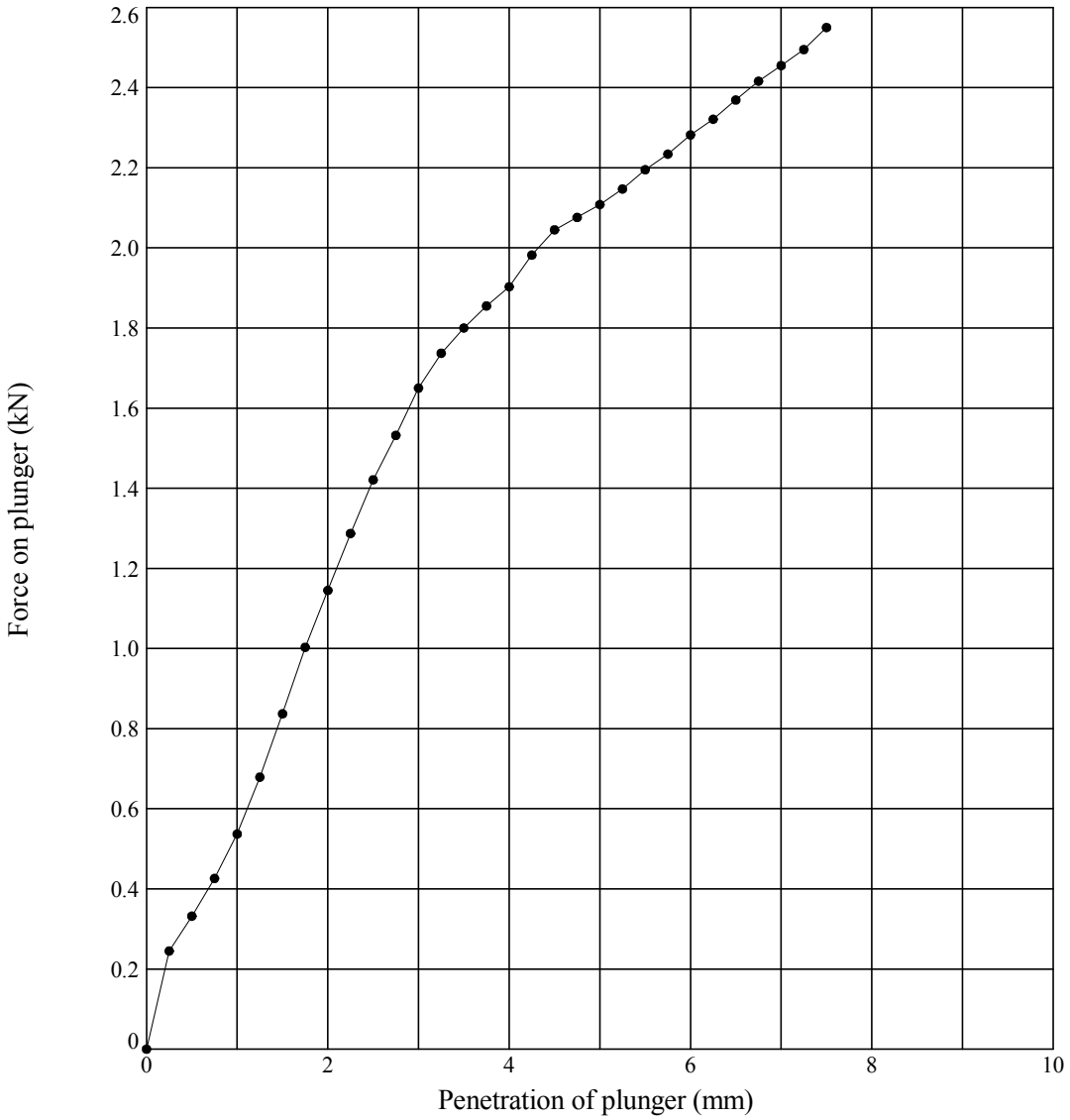
AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR8** Depth (m): **0.20** Date: **20/05/15**



Test Details			Initial Ground Conditions			Test Results
Kentledge	:	**Landrover**	Initial Moisture Content (%)	:	**13**	CBR Value (%) : **11**
Surcharge (kg)	:	**4.54**	Percentage greater than 20 mm	:	**5**	

Sample Description	Remarks
Brown slightly sandy gravelly SILT	

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MDStrowger	**MICHAEL STROWGER**	**22/05/15**

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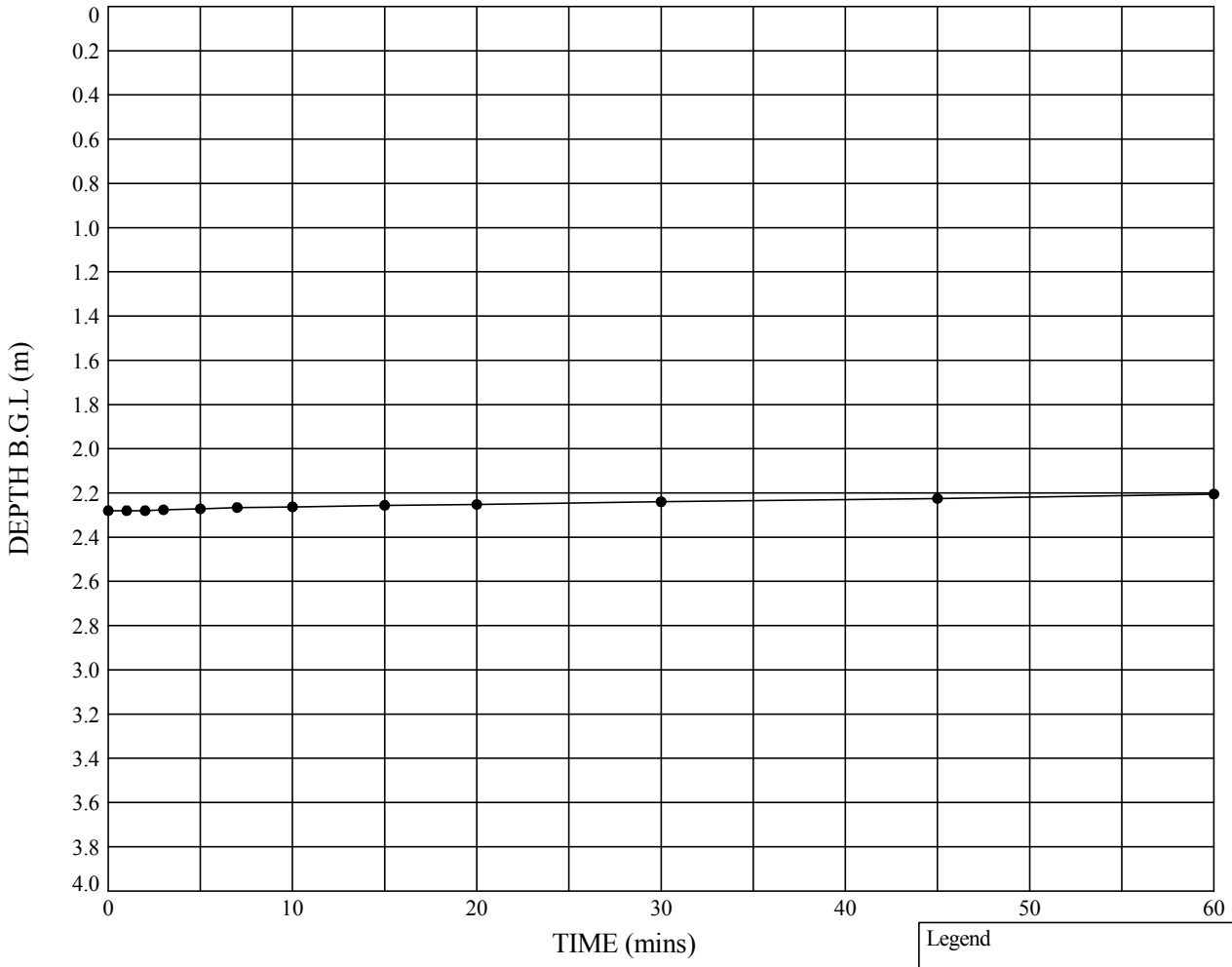
AGS

FULL SCALE SOAKAWAY TEST

Non standard test

Soakaway Test - Position ID : **TP01**

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



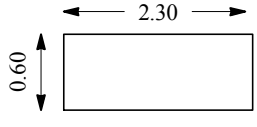
Legend

● Test 1 (19.05.15)

Pit start depth:	=	**3.50**	m
Pit final depth:	=	**3.49**	m
Effective depth, De	=	**1.21**	m
Effective storage volume, $V_{p75\text{-}25}$	=	**0.8315**	m^3
Surface area, a_{p50}	=	**4.8745**	m^2
Time, $t_{p75\text{-}25}$	=	**N/A**	secs
Infiltration rate, f	=	**N/A**	m/s

Notes: Test 1 - Rise in water level. Unable to calculate infiltration rate.

Plan (Not to scale)



No Bearing Taken

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP M.STROWGER J.MAJOR

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1a Princess Street
Bedminster
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Compiled By	Date	Checked By	Date
MDStrowger	22/05/15	S.Handcock	22/05/15

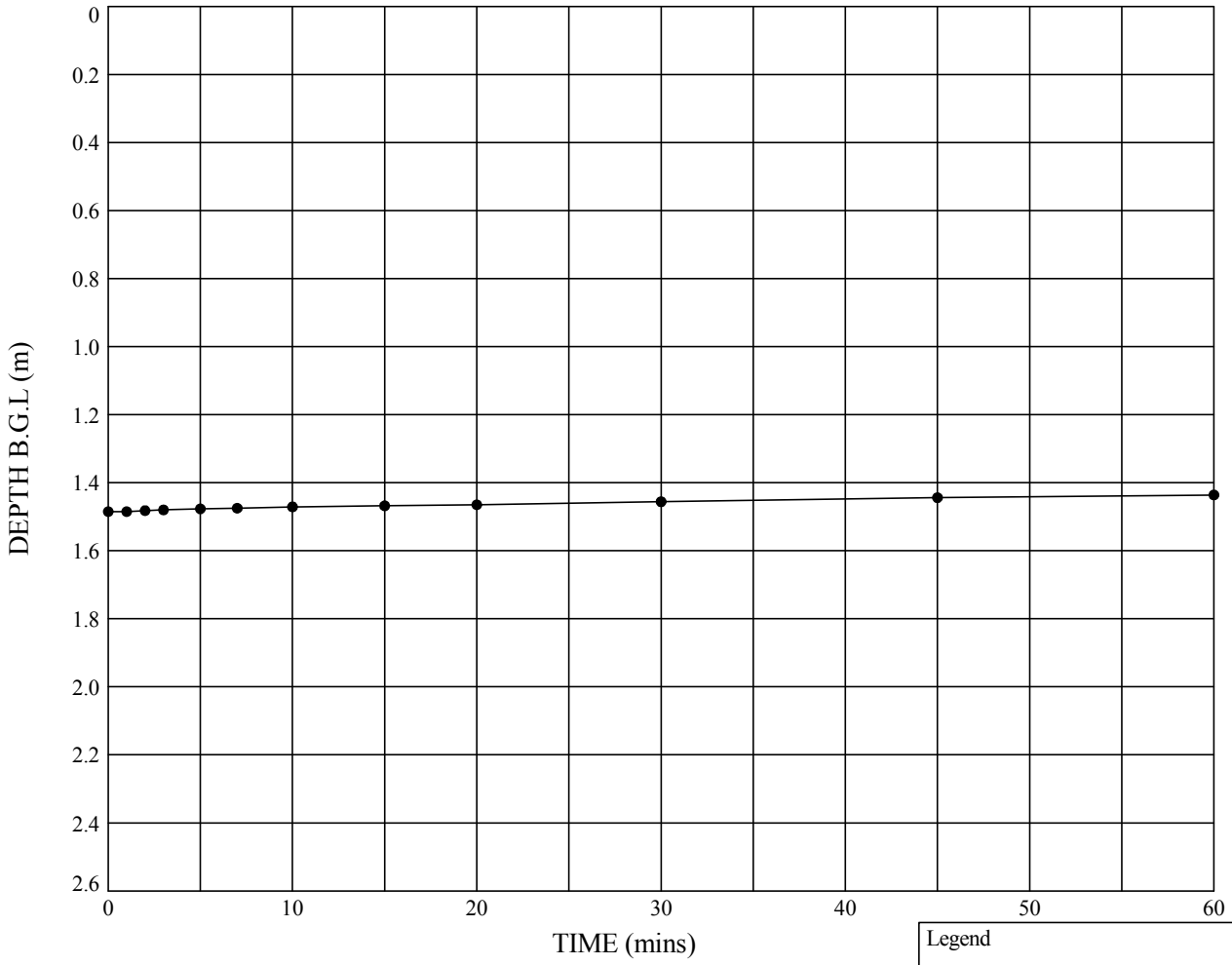
Contract	Contract Ref:
Green Lane, Chesterton	**745612**

FULL SCALE SOAKAWAY TEST

Non standard test

Soakaway Test - Position ID : **TP03**

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Legend

● Test 1 (19.05.15)

Pit start depth:	=	**2.66**	m
Pit final depth:	=	**2.61**	m
Effective depth, De	=	**1.13**	m
Effective storage volume, $V_{p75\text{-}25}$	=	**0.6750**	m^3
Surface area, a_{p50}	=	**4.1250**	m^2
Time, $t_{p75\text{-}25}$	=	**N/A**	secs
Infiltration rate, f	=	**N/A**	m/s

Notes: Test 1 - Standing water in pit at start of test. Rise in water level. Unable to calculate infiltration rate.

Plan (Not to scale)

No Bearing Taken

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP M.STROWGER J.MAJOR

STRUCTURAL SOILS
1a Princess Street
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Compiled By	Date	Checked By	Date
MDStrowger	**22/05/15**	S.Handcock	**22/05/15**

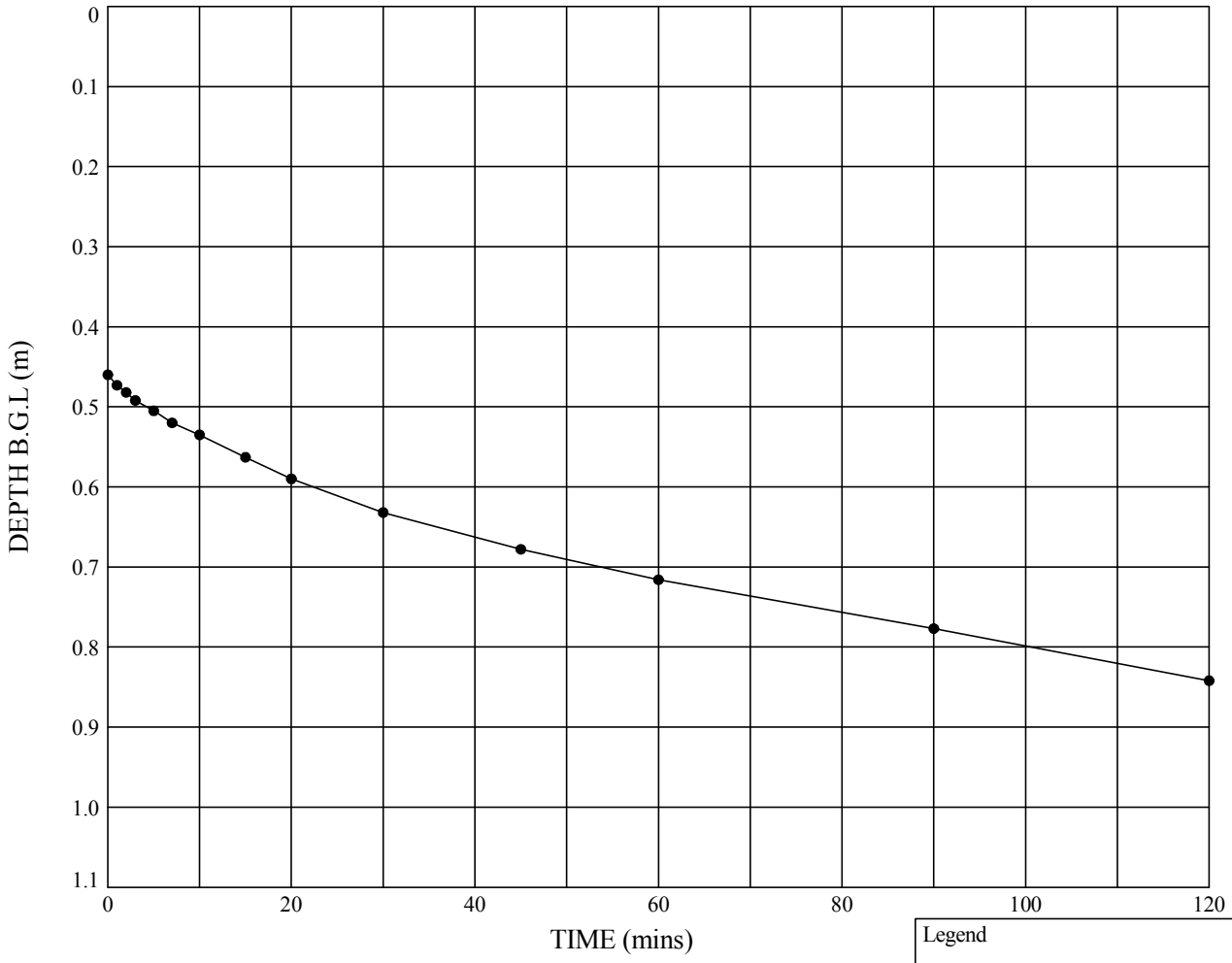
Contract	Contract Ref:
Green Lane, Chesterton	**745612**

FULL SCALE SOAKAWAY TEST

Non standard test

Soakaway Test - Position ID : **TP06**

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



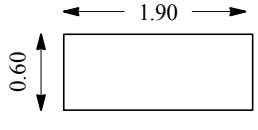
Legend

● Test 1 (19.05.15)

Pit start depth:	=	**1.08**	m
Pit final depth:	=	**1.06**	m
Effective depth, De	=	**0.60**	m
Effective storage volume, V_{p75-25}	=	**0.3392**	m^3
Surface area, a_{p50}	=	**2.6275**	m^2
Time, t_{p75-25}	=	**7568**	secs
Infiltration rate, f	=	**1.71x10^{-5}**	m/s

Please note test data was extrapolated to obtain tp75-tp25.

Plan (Not to scale)



No Bearing Taken

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP M.STROWGER J.MAJOR

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Compiled By	Date	Checked By	Date
MDStrowger	**22/05/15**	S.Handcock	**22/05/15**

Contract	Contract Ref:
Green Lane, Chesterton	**745612**

APPENDIX L
WASTE ASSESSMENT TABLES

Envirolab, Sandpits Business Park, Mottram Road, Hyde, Cheshire SK14 3AR.

envirolab

Site Code and Name									
TP/WS/BH	TP01	TP02	TP04	TP06	TP08	WS03	WS05	WS06	FP02
Depth (m)	0.90	0.80	0.50	0.50	0.15	1.50	0.70	0.30	0.20
Envirolab reference									
	mg/kg	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
% Moisture									
pH (soil)	8.50	8.35	8.44	8.58	7.82	8.78	8.58	8.26	8.40
pH (leachate)									
Arsenic	8	2	4	3	10	3	3	5	9
Cadmium	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Copper	5	4	3	3	24	1	3	7	20
CrVI or Chromium	1	1	1	1	1	1	1	1	1
Lead	4	5	5	4	17	2	6	12	22
Mercury	1.08	0.54	0.61	0.41	0.33	0.94	1.12	0.61	0.37
Nickel	13	6	5	5	17	2	6	10	16
Selenium	1	1	1	1	2	1	1	1	1
Zinc	15	16	12	6	76	5	19	30	91
Barium									
Beryllium									
Vanadium									
Cobalt									
Manganese									
Molybdenum									
PAH (Input Total PAH **OR** individual PAH results)									
Acenaphthene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
Acenaphthylene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Anthracene	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
Benzo(a)anthracene	0.04	0.04	0.04	0.04	0.09	0.04	0.04	0.04	0.28
Benzo(a)pyrene	0.04	0.04	0.04	0.04	0.09	0.04	0.04	0.04	0.38
Benzo(b)fluoranthene	0.05	0.05	0.05	0.05	0.15	0.05	0.05	0.05	0.70
Benzo(ghi)perylene	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.29
Benzo(k)fluoranthene	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.26
Chrysene	0.06	0.06	0.06	0.06	0.11	0.06	0.06	0.06	0.41
Dibenzo(ah)anthracene	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.06
Fluoranthene	0.08	0.08	0.08	0.08	0.22	0.08	0.08	0.08	0.79
Fluorene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Indeno(123cd)pyrene	0.03	0.03	0.03	0.03	0.06	0.03	0.03	0.03	0.36
Naphthalene	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Phenanthrene	0.03	0.03	0.03	0.03	0.08	0.03	0.03	0.03	0.33
Pyrene	0.07	0.07	0.07	0.07	0.19	0.07	0.07	0.07	0.61
Coronene									
Total PAHs (16 or 17)									
TPH									
Petrol									
Diesel									
Lube Oil									
White Spirit / Kerosene									
Creosote									
Unknown TPH with ID									
Unknown TPHCWG	0.1	0.1	0.1	0.1	53.5	0.1	0.1	0.1	11.8
Total Sulphide									
Complex Cyanide									
Free (or Total) Cyanide									
Elemental/Free Sulphur									
Phenols Input Total Phenols HPLC **OR** individual Phenol results.									
Phenol									
Cresols									
Xylenols									
Resourcinol									
Phenols Total by HPLC									
BTEX Input Total BTEX **OR** individual BTEX results.									
Benzene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Toluene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ethylbenzene	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Xylenes	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total BTEX									
POPs									
PCBs Total (eg EC7/WHO12)									

Envirolab, Sandpits Business Park, Mottram Road, Hyde, Cheshire SK14 3AR.

envirolab

Site Code and Name									
TP/WS/BH	TP01	TP02	TP04	TP06	TP08	WS03	WS05	WS06	FP02
Depth (m)	0.90	0.80	0.50	0.50	0.15	1.50	0.70	0.30	0.20
Envirolab reference									
	mg/kg	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
Asbestos in Soil	Thresholds								
Asbestos detected in Soil (enter Y or N)	Y					N			N	
Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7									
Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)	see "Carc HP7 % Asbestos in Soil (Fibres)" below								
Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)	≥0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You cannot use Asbestos % results when visual identifiable pieces are present.									
Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)	Y								
If visual identifiable pieces of asbestos are present, you cannot use Asbestos % results and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 05. Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.									
Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.									
All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.									
Hazardous Property	Thresholds	Cut Off Value								
Corrosive HP8	≥5%	<1%	0.00106	0.00026	0.00053	0.00040	0.00132	0.00040	0.00040	0.00066	0.00119
Irritant HP4	≥20%	<1%	0.00265	0.00124	0.00104	0.00104	0.00349	0.00043	0.00124	0.00205	0.00342
Specifc Target Organ Toxicity HP5 conservative	≥10%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specifc Target Organ Toxicity HP5 conservative	≥20%		0.00001	0.00001	0.00001	0.00001	0.00002	0.00001	0.00001	0.00001	0.00006
Specifc Target Organ Toxicity HP5 conservative	≥1%		0.00263	0.00121	0.00101	0.00101	0.00343	0.00040	0.00121	0.00202	0.00323
Specifc Target Organ Toxicity HP5 conservative	≥10%		0.00014	0.00014	0.00014	0.00014	0.00535	0.00014	0.00014	0.00014	0.00118
Aspiration Toxicity HP5	≥10%		0.00001	0.00001	0.00001	0.00001	0.00535	0.00001	0.00001	0.00001	0.00118
Acute Toxicity HP6 conservative ""	≥0.1%	<0.1%	0.00495	0.00268	0.00263	0.00238	0.00953	0.00140	0.00285	0.00493	0.00911
Acute Toxicity HP6 conservative ""	≥25%	<1%	0.00002	0.00002	0.00002	0.00002	0.00005	0.00002	0.00002	0.00002	0.00017
Acute Toxicity HP6 conservative ""	≥0.25%	<0.1%	0.00016	0.00011	0.00011	0.00009	0.00009	0.00015	0.00016	0.00011	0.00009
Acute Toxicity HP6 conservative ""	≥0.1%	<0.1%	0.00333	0.00196	0.00177	0.00165	0.00550	0.00089	0.00212	0.00348	0.00566
Acute Toxicity HP6 conservative ""	≥0.5%	<0.1%	0.00001	0.00001	0.00001	0.00001	0.00002	0.00001	0.00001	0.00001	0.00006
Acute Toxicity HP6 conservative ""	≥22.5%	<1%	0.00002	0.00002	0.00002	0.00002	0.00004	0.00002	0.00002	0.00002	0.00014
Carcinogenic HP7	≥0.1%		0.00263	0.00121	0.00101	0.00101	0.00535	0.00040	0.00121	0.00202	0.00323
Carcinogenic HP7	≥1%		0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00004
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only)	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.50	8.35	8.44	8.58	7.82	8.78	8.58	8.26	8.40
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.50	8.35	8.44	8.58	7.82	8.78	8.58	8.26	8.40
Toxic for Reproduction HP10	≥0.3%		0.00263	0.00121	0.00101	0.00101	0.00343	0.00040	0.00121	0.00202	0.00323
Toxic for Reproduction HP10	≥3%		0.00001	0.00001	0.00001	0.00001	0.00535	0.00001	0.00001	0.00001	0.00118
Mutagenic HP11	≥0.1%		0.00001	0.00001	0.00001	0.00001	0.00535	0.00001	0.00001	0.00001	0.00118
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only)	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Mutagenic HP11	≥1%		0.00263	0.00121	0.00101	0.00101	0.00343	0.00040	0.00121	0.00202	0.00323
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HP13 Sensitising	≥10%		0.00263	0.00121	0.00101	0.00101	0.00343	0.00040	0.00121	0.00202	0.00323
Ecotoxic HP14	≥1.0	<0.1%	0.02870	0.02010	0.01793	0.01392	0.07988	0.00950	0.02231	0.03610	0.08514
Ecotoxic HP14	≥25%	<0.1%	0.00718	0.00503	0.00448	0.00348	0.01944	0.00238	0.00558	0.00903	0.02120
Ecotoxic HP14	≥25%	<0.1%	0.00718	0.00504	0.00449	0.00349	0.02478	0.00239	0.00559	0.00904	0.02235
Ecotoxic HP14 individual substance specific thresholds	≥0.0025%		0.000004	0.000004	0.000004	0.000004	0.000009	0.000004	0.000004	0.000004	0.000028
Ecotoxic HP14 individual substance specific thresholds	≥0.025%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Persistant Organic Pollutant	>0.005%		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000