PHASE II EXPLORATORY INVESTIGATION

Bakers Quay
Gloucester

Rokeby Merchant (Gloucester) Ltd

RDL00415/V1.0

REPORT DETAILS

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EXECUTIVE SUMMARY

Ground Conditions	The site was predominantly surfaced with a mixture of concrete, macadam and a sandy gravel to depths ranging between 0.05m and 0.60m begl. The site surfacing was underlain by Made Ground which typically comprised a sandy gravel or locally a sandy gravelly clay to depths ranging 0.60m and 4.80m begl although the depth of the Made Ground was generally 1m to 2m begl. The Made Ground was generally underlain by strata considered representative of the Tidal Flat Deposits (drift deposits). This was typically encountered as a variable very soft, soft, firm or stiff grey green gravelly silty sandy CLAY locally with plant remains and shell fragments up to a maximum proven depth 6.00m begl. The four most northern boreholes included strata considered typical of the Blue Lias & Charmouth Mudstone Formation which was encountered as a firm to very stiff grey silty CLAY with frequent shell fragments or very weak grey destructured silty MUDSTONE.
Foundation Design	<u>Southern and Central Areas of the Site (restaurant / coffee shop and hotel)</u> The strength of the Natural Strata has been revealed to be variable and locally low across the southern and central areas of the site due to the presence of superficial Tidal Flat Deposits. Alternative foundations such as piles or ground improvement are likely to be required for new buildings in these areas. Notwithstanding the above, it may be possible for the coffee shop in the central area of the site to be founded in the Natural Strata using pad, strip or trench fill foundations assuming an allowable ground bearing pressure of 40kN/m^2 from a minimum founding depth of 0.90m begl. However, deep Made Ground may be created once the underground fuel storage tanks are removed from this area of the site and deepened or alterative foundations required. Buildings / foundations situated in the central area of the site should be constructed as to not excessively load or impact upon the culvert which crosses this area of the site. <u>Northeastern Parcel of the Site</u> Pad, strip or trench fill foundations may be feasible in the northeastern parcel of the site assuming an allowable ground bearing pressure of 120kN/m^2 and a minimum founding depth of 0.90m begl (subject to the results of supplementary site investigation works in the area to the south of the Downings Malthouse currently occupied by a grain silo). <u>Malthouse Extension Building (northwestern extent of the larger parcel of the site)</u> To facilitate the refurbishment of the Malthouse Extension a number of the existing loadbearing columns will be removed and new columns re-sited to accommodate the structural loading. It is understood that the foundations for the new columns will comprise piles as the loadings will be relatively high and the settlement tolerances relatively low (on account of the existing building having completed the majority of its settlement).
Floor Slab	A ground bearing floor slab may be appropriate where a limited depth of geotechnically competent Made Ground is present. However, improvement of the ground by proof rolling of the formation and the inclusion of geotextile reinforcement in capping materials may be necessary depending on settlement requirements. Alternatively, floor slabs may be designed as suspended.
Building Near Trees	Foundation designs will require adjusting when building near existing, recently removed or proposed trees due to the presence of shallow cohesive soils beneath the site with a medium volume change potential. However, trees were generally absent from the site.
Ground Gas Precautions	<u>New Buildings</u> In accordance with CIRIA C665, the site may be may be classified as 'CS2' for commercial properties with the precautions required comprising: • Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with a suitable membrane. • Or alternately, beam and block or pre cast concrete slab and suitable membrane. • All joints and penetrations should be sealed.

	Consideration may be given to the design of gas precautions in accordance with BS8485: 2007 should alternative foundation / floor slab proposals be considered. The gas membrane for buildings constructed in the vicinity of the location of the underground fuel storage tanks (i.e. the coffee shop) in the approximate central area of the site should also be hydrocarbon and vapour proof. <u>Existing Buildings</u> Based on the gas risk assessment, retrofitted ground gas protection measures or appropriate ventilation (e.g. underground car park or naturally ventilated storage) will be required for currently existing buildings. The adequacy of the intrinsic design of the development proposals for the existing buildings could be assessed using the point scheme provided in BS8485: 2007. Where / if assessed as deficient, supplementary ground gas protection measures would be required in the refurbishment of the existing buildings to ensure the appropriate ground gas protection is provided. <u>Further Ground Gas Investigation & Detailed Quantitative Risk Assessment (DQRA)</u> Prior to installing ground gas protection measures further ground gas assessment and DQRA could be undertaken in an effort to minimise the area / scope of the measures required.
Radon	The Sanctus Phase I Desk Study indicates that no radon protection measures are necessary in the construction of new dwellings or extensions.
Water	Shallow excavations are unlikely to require significant dewatering. Minor seepages of water could be controlled by open sump pumping.
Excavations	Shallow excavations are unlikely to require widespread sidewall support across the site.
Sulphate Classification	Design Sulfate Class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1.
CBRs and Pavements	Typical CBR values of <1-3% could be initially anticipated in the Made Ground and <1-4% could be anticipated in the Natural Strata at the site, subject to confirmation by in-situ testing.
Surface Water Drainage	Due to the presence of cohesive soils soakaways are unlikely to be feasible for the proposed redevelopment and we would recommend that alternative methods of surface water disposal are investigated.
Contamination Assessment	The assessment of soil test results for the Made Ground and Natural Strata has revealed that the determinands tested were detected at concentrations below the laboratory LOD, or at individual concentrations below the relevant Tier 1 SAC for a commercial end use. Therefore, the concentrations of determinands detected are considered unlikely to represent a potential risk to human health for the proposed commercial end use. Furthermore, the concentrations detected are considered unlikely to represent a significant risk to controlled waters.
Remediation Proposals	At this stage, no specific remedial measures are considered necessary for the proposed development.
Topsoil	Any imported soils should be tested at source to ensure they are suitably clean (prior to importation) in accordance with CLEA/generic guidance.
Off-site Disposal	In the first instance, the test results from this investigation should be supplied to landfill operators to determine likely disposal costs. However, WAC testing may ultimately be required to facilitate the classification of waste for disposal purposes.
Unforeseen Circumstances	Should any areas of potentially contaminated soil be encountered during site construction works, we would recommend consultation with Jackson Purdue Lever to ensure that our recommendations continue to apply.
Construction Workers	It is recommended that construction personnel involved with direct contact with the soils at the site use appropriate PPE equipment together with welfare facilities in accordance with general health and safety guidelines.
Utilities	We would recommend that this report is supplied to utility companies (including water supply), and that their recommendations relating to appropriate supply pipes are adhered to.
Licenses, Permits, Registrations & Approvals	The Contractor/Developer is responsible for, and must ensure that, all necessary licenses, permits, plans, registrations and approvals are in place prior to commencing with the works at the site.
Further Works	• Deep cable percussive boreholes will be required in the central, southern and northwestern areas of the site to provide geotechnical information where alternative foundations such as piles or ground improvement are proposed.

	• Further site investigation works in the area to the south of the Downings Malthouse building once the concrete silo has been demolished. • Hydrocarbon validation testing will be required for the base and sides of excavations once the underground fuel storage tanks and interceptor have been removed from the central area of the site. • A watching brief during demolition / enabling works for further areas impacted by hydrocarbons. • A watching brief during demolition works for wells / boreholes / pumps followed decommissioning, capping or remediation.

1.0 INTRODUCTION

1.1 Introduction

Jackson Purdue Lever has been instructed by the Client, Rokeby Merchant (Gloucester) Ltd, to undertake a Phase II Exploratory Investigation on a parcel of land located at Bakers Quay, Gloucester.

1.2 Previous Report

Jackson Purdue Lever has been provided with the following report which was prepared for site:

- Sanctus *'Phase I Desktop Study, The Malthouse LLP, Bakers Quay, Gloucester'* Ref: S831 Rev. A, dated 14th September 2009.

The report was produced primarily for environmental purposes. We understand that the client benefits from formal reliance on the above report.

1.3 Scope of Works

The scope of the Phase II Exploratory Investigation works comprised:

- A sub-contracted service scan of proposed exploratory hole locations.
- An exploratory programme of window sample boreholes across the accessible external areas of the site.
- A programme of ground gas monitoring.
- Geotechnical and environmental soil testing.

1.4 Project Understanding

It is understood that the iron framed shed and the concrete silo building in the northeast of the site will be demolished. The remaining existing buildings will be refurbished as car parking (underground) / retail units with overlying residential apartments. A restaurant, coffee shop and six storey hotel will be constructed in the areas surrounding the existing buildings. The remaining areas will be redeveloped as car parking with limited areas of soft landscaping. This understanding (i.e. a commercial end use) has formed the basis of our assessment (see Appendix VII).

Where the proposals are not consistent with our current understanding (for example if the site is proposed to be redeveloped for a residential end use) it would be necessary to review our assessment.

1.5 Site Summary

The following conclusions were provided in the Sanctus Phase I Desktop Study:

- *'The site is situated approximately 0.5 miles from Gloucester City Centre and covers an area of approximately 1.77ha.*
- *The site is underlain by Tidal Flat Deposits overlying the Blue Lias Formation and Charmouth Mudstone Formation (Undifferentiated).*

- *No radon protective measures are deemed necessary by the BGS.*
- *The underlying geology is classified as a non aquifer by the Environment Agency.*
- *The site is not situated within a source protection zone, the closest groundwater abstraction is located some 600m to the north-west.*
- *Five watercourses that had been classified by the Environment Agency for River Quality were recorded within 1km of the site; the closest being the Gloucester / Sharpness Canal, which forms the western boundary of the site and had been classified by the Environment Agency GQA Classification as exhibiting a Grade B (Good) chemical quality. The Environment Agency Indicative Floodplain Map indicated that the site occupied land that is at risk of flooding from rivers or sea without defences (Zone 3).*
- *The site has been operated for dock activities since the earliest available maps (1840). A drywall dock once ran west to east across the centre of the site but was filled in some time between 1843 and 1877. The Midlands Railway (Dock Branch) ran into the site from the mid to late 1800's until between 1973 and 1991. The existing Malthouse, Mill and Engine Room buildings have been present since the late 1800's. An Oil Mill and timberyards were once located on the site. The Sud Brook is thought to run directly beneath the site through a culvert. Underground and above ground fuel storage tanks, with associated fuel dispensers, were formerly located at the site.*
- *Cement bonded asbestos roof sheets and building cladding were identified.*
- *The BGS held records of a three recorded landfill sites within 1km of the site. The nearest recorded landfill site was CEGB Castle Heads Power Station which is located 341m north of the site.*
- *An overall Medium to High risk rating has been assigned to the site, primarily resulting from the former and current industrial land uses and the perceived risk that they pose to the proposed end-users of the site and the sensitive surface water receptors.*

  As the site has been assigned a Medium to High risk rating it is recommended that a non targeted ground investigation and associated chemical testing is undertaken to assess the potential pollutants linkages identified at the site'.

Based on the previous Phase I Desk Study and our works the potential sources of contamination at the site are primarily:

- Metals and metalloids associated with any Made Ground.
- Natural Metal Enrichment (NME) in Natural Strata.
- Polycyclic Aromatic Hydrocarbons (PAHs) in any Made Ground.
- Materials used to fill the drywall dock.
- Possible Made Ground from excavation of the adjacent Canal (anecdotal evidence).
- Ground gas (i.e. Methane and Carbon Dioxide) associated with areas of Made Ground.
- Former oil / fuel storage at the site including:
    - Sites former use as an oil mill.
    - Above ground storage tank to the north of Downing's Malthouse.
    - Decommissioned 2No. underground fuel storage tanks and interceptor in the centre of the site.
    - On site storage of fuel bowsers during the construction of the Gloucester Quays Designer Outlet.
- Mercuric Chloride from off site sources (anecdotal).
- Asbestos containing materials from the demolition of former structures.
- Acid/Sulphate contaminated soils.

1.6 Limitations

The conclusions and recommendations made in this report are limited to those that can be made based on the findings of the investigation.

Where comments are made based on information obtained from third parties, Jackson Purdue Lever assumes that all third party information is true and correct. No independent action has been undertaken to validate the findings of third party information, unless specifically stated.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of its issue.

Jackson Purdue Lever has prepared this report for the sole use and reliance of the Client, Rokeby Merchant (Gloucester) Ltd, in accordance with our standard Conditions and Limitations (a copy of which is included as Appendix X). This report may not be used or relied upon by any third party without the explicit written agreement of Jackson Purdue Lever.

1.7 Confidentiality

The risk assessment undertaken herein remains the intellectual property and trade secret of Jackson Purdue Lever.

The risk assessment undertaken herein remains the intellectual property and trade secret of Jackson Purdue Lever. The information contained within this report must not be disclosed or divulged to any commercial Consultant or other third party without the prior written agreement of Jackson Purdue Lever.

2.0 EXPLORATORY INVESTIGATION

2.1 Description

A full site description is provided in the Santus Desktop Study. However, a site visit was undertaken on 17th March 2015 by a Jackson Purdue Lever Engineer. An updated Annotated Site Plan is included in Appendix II.

We can confirm that the site comprised two adjacent parcels of land located either side of Merchants Road. It is understood from the previous Desktop Study and a web search of the local history of the site (www.gloucesterdocks.me.uk) that the site was operated principally as an oilseed crushing mill. *'Linseed and cotton seed were crushed, heated and then pressed to extract the oil, and the residual slabs of cake were sold as cattle food'.*

The larger parcel of the site located to the west of Merchants Road included a five storey brick built building known as Provender Mill which included a recently fire damaged former Engine Shed in the south (used to house a steam engine which powered seed crushing machinery). A large four storey brick built building known as Malthouse Extension was located in the north of the area. An interceptor and two underground fuel storage tanks (understood to have been decommissioned) were present in the central extent of the area. An iron framed shed was located in the west of the area. A stockpile of suspected road planings was located in the southern area. Concrete bases associated with a number of grain silos were located in the west of the area. The area was generally surfaced with concrete.

The parcel to the east of Merchants Road included a concrete silo, an adjoined building known as Downings Malthouse and a row of terraced cottages. The base of a former above ground fuel tank was observed in a vacant gravel surfaced yard in the north of the area.

The site is located adjacent to the east of Gloucester & Sharpness Canal. The site is located in a general commercial setting including Gloucester Quays Outlet Centre to the east.

2.2 Introduction

Sub-Surface Utility Avoidance Scan

Prior to the commencement of our intrusive works at the site a sub-contracted sub-surface utility scan was undertaken to attempt to avoid buried services during the intrusive works. Based on the results of the service scan the exploratory holes were positioned to provide site coverage, whilst attempting to avoid any buried services.

At the time of the works access was only available to the external areas of the site.

Window Sample Boreholes

A total of 19No. window sample boreholes (WS1 to WS18 including WS11A) were advanced across the site in accessible external areas between 13th and 15th April 2015 to depths ranging between 0.70m (refusal on an obstruction) and 6.00m below existing ground level (begl).

Exploratory Hole Locations and Logs

A plan indicating the approximate locations of the exploratory holes is included in Appendix III, with exploratory hole logs included as Appendix IV. The approximate depth of the Made Ground is indicated on the plan included in Appendix V. General views of window sample borehole arisings are included in Appendix IX.

2.3 Ground Conditions

2.3.1 Made Ground

The site was predominantly surfaced with a mixture of concrete, macadam and a sandy gravel to depths ranging between 0.05m and 0.60m begl.

The site surfacing was underlain by Made Ground which typically comprised a sandy gravel or locally a sandy gravelly clay (gravel is fine to medium ash, clinker, limestone, brick, quartzite, concrete and sandstone) to depths ranging between 0.60m and 4.80m begl although the depth of the Made Ground was generally between 1m to 2m begl.

2.3.2 Tidal Flat Deposits

The Made Ground was generally underlain (excluding WS17 and WS18 in the far north of the site) by strata considered representative of the Tidal Flat Deposits (drift deposits). This was typically encountered as a variable very soft, soft, firm or stiff grey green gravelly silty sandy CLAY (gravel is fine to coarse quartzite, flint, limestone, sandstone and calcareous deposits) locally with plant remains and shell fragments up to a maximum proven depth 6.00m begl.

Blue Lias & Charmouth Mudstone Formation

The four most northern boreholes included strata considered typical of the Blue Lias & Charmouth Mudstone Formation (below the Tidal Flat Deposits in WS15 / WS16 and below the Made Ground in WS17 and WS18). The Blue Lias & Charmouth Mudstone Formation was encountered as a firm to very stiff grey silty CLAY with frequent shell fragments or very weak grey destructured silty MUDSTONE and was proven to a maximum depth of 5.00m begl but not fully penetrated.

2.4 Summary

The findings from the window sample boreholes are summarised in Table 1.

TABLE 1 – SUMMARY OF EXPLORATORY HOLE FINDINGS

Stratum	Exploratory Holes Encountered	Depth to Base of Stratum (m begl)	Typical Description
MADE GROUND (Surfacing)	All exploratory holes	0.05-0.60	Concrete, macadam and a sandy gravel
MADE GROUND (General)	All exploratory holes	0.60-4.80	Made Ground which typically comprised a sandy gravel or locally a sandy gravelly clay
Tidal Flat Deposits	All exploratory holes	Up to 6.00m+	Variable very soft, soft, firm or stiff grey green gravelly silty sandy CLAY

TABLE 1 – SUMMARY OF EXPLORATORY HOLE FINDINGS			
Stratum	**Exploratory Holes Encountered**	**Depth to Base of Stratum (m begl)**	**Typical Description**
Blue Lias & Charmouth Mudstone Formation	WS15-WS18	(full depth not penetrated)	Firm to very stiff grey silty CLAY with frequent shell fragments or very weak grey destructured silty MUDSTONE

2.5 Water

Water was encountered in five of the nineteen window sample boreholes advanced during the intrusive works at depths ranging between 2.00m and 4.00m begl.

2.6 Stability and Excavations

The sides of the boreholes were observed to be stable for the short period of time they were open.

2.7 Visual and Olfactory Evidence of Contamination

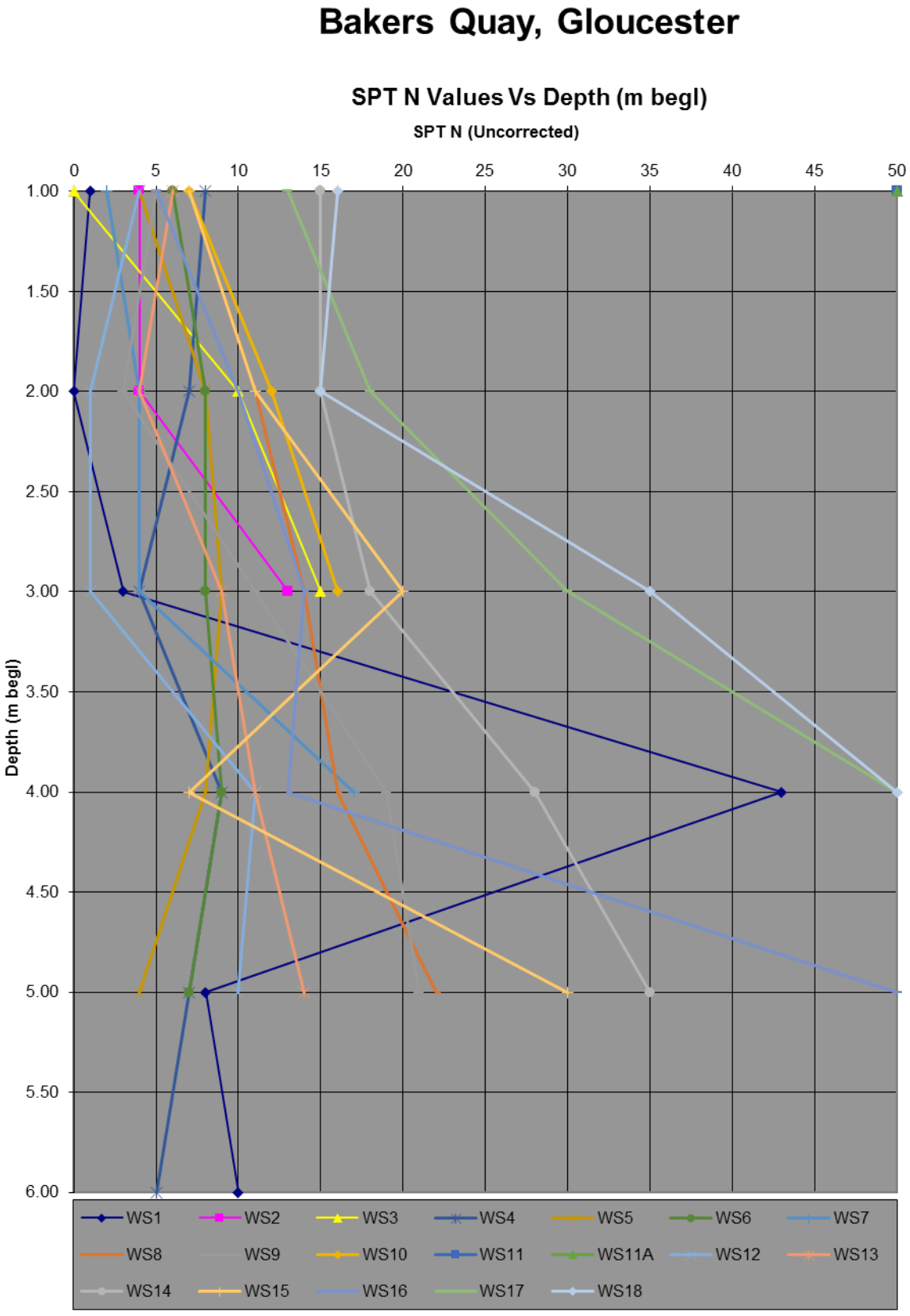
Visual and olfactory evidence of hydrocarbon contamination was observed during the advancement of a single exploratory hole:

- WS7 2.00m to 4.00m+ - Slight to moderate hydrocarbon odour.

2.8 Standard Penetration Test (SPT) Results

In order to establish a strength/depth profile of the strata beneath the site, SPT testing was undertaken in all window sample boreholes generally at 1m intervals. The uncorrected SPT 'N' values within the Natural Strata were variable and ranged between 0 (very soft) and 50 (hard).

An SPT Vs Depth Chart of the data obtained from the boreholes advanced at the site is shown below.



3.0 GROUND GAS & WATER MONITORING

3.1 Introduction

The Sanctus Phase I Desk Study information identified the potential presence of Made Ground (originating from previous development at the site and a backfilled drywall dock) which may represent possible sources of hazardous ground gas (i.e. Methane and Carbon Dioxide). The Sanctus Desktop Study also indicated that landfills represent a ground gas risk to the site. However, given that the nearest landfill is located from 341m north of the site (outwith the industry standard 250m influencing distance from the boundary of the site) the proposed development is unlikely to be impacted by ground gas originating from the identified registered landfills.

A total of 5No. window sample boreholes were installed with combined ground gas and groundwater monitoring wells (WS4, WS9, WS12, WS15 and WS17).

Following the installation of monitoring wells, six weekly visits were made to the site to monitor gas levels in the 5No. wells on the site. All 6No. ground gas monitoring visits have been included in the following assessment.

3.2 Results of the Gas Monitoring

Gas monitoring results are presented in Appendix VIII and summarised in Table 2 below.

TABLE 2 – SUMMARY OF GAS MONITORING DATA

Parameter	Minimum % by volume (v/v)	Maximum % by volume (v/v)
Methane	0.0	3.7
Carbon Dioxide	0.0	2.6
Oxygen	8.1	20.6
Flow (l/h)	0.0	0.0

- Groundwater level monitoring has revealed groundwater levels at depths ranging between 0.35m and 2.77m begl (water was absent from WS17 on the first monitoring visit). However, the shallow water encountered is likely to be associated with leakage of surface water into the borehole from the surface or minor water seepages accumulating in the well being contained by the relatively impermeable strata (i.e. not representative of a body of groundwater).

- Barometric pressure ranged between 1008mb and 1023mb during the monitoring visits.

3.3 Appropriate Guidance

The results of the gas monitoring have been reviewed with reference to the following documentation:

- CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' (2007).
- NHBC & RSK Group publication *'Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present'* (March 2007).

CIRIA Report C665 recommends a risk-based methodology to ground gas assessment, which includes the calculation of a site-specific Gas Screening Value (GSV). The GSV of a particular ground gas regime equates to:

GSV (l/hr) = maximum borehole flow rate (l/hr) x maximum gas concentration (expressed as a fraction).

The GSV should be used to assess the risks posed by gassing sites for both residential and commercial/industrial developments.

CIRIA Report C665 presents a total of six Characteristic Situations (CS) to assist with the relevant ground gas protection measures that should be installed to mitigate the risk posed by ground gases for a residential building and commercial/industrial developments. The CS classifications represent a revised approach to the CS tables detailed within CIRA 149 *'Protecting development from methane'*.

Table 8.5 (below) is reproduced from CIRIA C665 which indicates how a Characteristic Situation is determined.

	Characteristic situation (CIRIA R149)	Comparable classification in DETR *et al* (1999)	Risk classification	Gas screening value (GSV) (CH_4 or CO_2) (l/hr)[1] Threshold	Additional factors	Typical source of generation
	1	A	Very low risk	<0.07	Typically methane ≤1 % and/or carbon dioxide ≤5 %. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
	2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
	3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
	4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking – susceptible to flooding, completed landfill (WMP 26B criteria)
	5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
	6	F	Very high risk	>70		Recent landfill site

Table 8.6 (below) is also reproduced from CIRIA C665 which details typical protection measures associated with each Characteristic Situation.

Characteristic situation	Residential building (not those which belong to Situation B)[1]		Office/commercial/industrial development	
(From Table 8.5)	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions
2	2	a. Reinforced concrete cast *in situ* floor slab (suspended, non-suspended or raft) with at least 1200 g DPM[2] and underfloor venting. b. Beam and block or pre-cast concrete and 2000 g DPM/ reinforced gas membrane and underfloor venting. All joints and penetrations sealed.	1 to 2	a) Reinforced concrete cast *in situ* floor slab (suspended, non-suspended or raft) with at least 1200 g DPM[2]. b) Beam and block or pre cast concrete slab and minimum 2000 g DPM/reinforced gas membrane. c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use. All joints and penetrations sealed.
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space.	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000 g/reinforced gas proof membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space
	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated underfloor subspace or positively pressurised underfloor sub-space, oversite capping or blinding and in-ground venting layer.	2 to 3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility.
	4	Reinforced concrete cast *in situ* floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised underfloor sub-space, oversite capping and in-ground venting layer and in-ground venting wells or barriers.	3 to 4	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility. In ground venting wells or barriers.
	5	Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design.	4 to 5	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and actively ventilated or positively pressurised underfloor sub-space with monitoring facility, with monitoring. In ground venting wells and reduction of gas regime.

The GSV should be calculated for both Methane and Carbon Dioxide and the worst case adopted in order to establish the appropriate protection measures for the site. The higher the classification the greater the risk posed by the presence of ground gas. Both the above guidance documents note that *'…the GSV is a guideline value and not an absolute threshold'.*

3.4 Ground Gas Analysis

Methane

The programme of ground gas monitoring detected Methane up to a maximum concentration of 3.7% v/v (expressed as 0.037 as a fraction) with no measurable flow rate detected. As no flow rate was recorded during the monitoring visits the gas monitors minimum limit of detection for flow (0.1l/hr) will be utilised for calculating the GSV.

The maximum GSV for Methane is calculated as follows:

- 0.037 x 0.1 = 0.0037l/h

Carbon Dioxide

The programme of ground gas monitoring detected Carbon Dioxide up to a maximum concentration of 2.6% v/v (expressed as 0.026 as a fraction) with no measurable flow rate detected. As no flow rate was recorded during the monitoring visits the gas monitors minimum limit of detection for flow (0.1l/hr) will be utilised for calculating the GSV.

The maximum GSV for Carbon Dioxide is calculated as follows:

- 0.026 x 0.1 = 0.0026l/h

3.5 Ground Gas Precautions

Ground gas has been detected at the site at concentrations up to 3.7% v/v Methane and 2.6% v/v Carbon Dioxide. However, Methane was only detected above 1.0% v/v on a single occasion (first visit) in a one borehole (WS12) and no ground gas flow was recorded in any boreholes during any of the visits undertaken. The source of the ground gas may be associated with either a potentially elevated organic content of the Natural Strata (evidenced by black colouration) or the reported backfilled drywall dock which existed in this area of the site.

By virtue of the maximum Methane concentration of 3.7% v/v the site has been classified as CIRIA C665 CS2.

4.0 LABORATORY TESTING & CONTAMINATION ASSESSMENT

4.1 Introduction

The following environmental soil testing was carried out on visually representative samples recovered from the exploratory holes in order to provide a general indication of the contamination status of the soils at the site:

- 12No. Standard Contamination Suites (including speciated PAH and TOC).
- 12No. Total Petroleum Hydrocarbon analyses to Criteria Working Group specification. (TPHCWG).
- 4No. Asbestos Screen tests.
- 6No. Inorganic Mercury tests.
- 6No. Chloride tests.

Geotechnical soil testing comprised the following:

- 5No. Plasticity Index (PI) tests.
- 3No. Water soluble sulphate tests.
- 15No. pH tests.

The environmental and geotechnical laboratory soil test results are presented in Appendix VI of this report.

4.2 Geotechnical Soil Test Results

Water Soluble Sulphate/pH

Water soluble sulphate testing undertaken on three samples of Natural Strata revealed concentrations ranging between 0.04g/l SO_4 and 0.07g/l SO_4. The pH values of the soil samples analysed ranged between 7.5 and 9.7.

In accordance with the Building Research Establishment publication Special Digest 1 '*Concrete in Aggressive Ground*' (2005) the sulphate assessment should be based on the highest sulphate concentration (0.07g/l) and the lowest 20% of the pH results (7.6) based on the dataset available. Therefore, the site falls into Design Sulphate Class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1. The foregoing designation assumes a brownfield location and mobile groundwater conditions (due to the presence of water seepage).

Plasticity Index Testing

Plasticity Index (PI) testing was undertaken on three samples of visually cohesive Natural Strata. In accordance with NHBC Standards Chapter 4.2 and BRE Digest 240 '*Low-rise buildings on shrinkable clay soils: Part 1*' (1993) the reported PI value may be modified based on the portion of the sample retained on the 425μm sieve.

The results of the PI analysis are summarised in Table 3.

TABLE 3 – SUMMARY OF PLASTICITY INDEX (PI) DATA				
Sample Ref.	**Reported PI Value (%)**	**Portion Passing 425µm Sieve**	**Modified PI Value (%)**	**Volume Change Potential**
WS4 2.10-2.50	36	99	36	Medium
WS5 1.00-1.40	35	100	35	Medium
WS12 1.30-1.70	33	100	33	Medium
WS14 0.70-1.00	34	100	34	Medium
WS18 2.50-2.80	32	100	32	Medium

In accordance with BRE guidance, the adjusted PI values reveal that the clay soils analysed may be classified as having a medium volume change potential.

4.3 Contamination Assessment Rationale

The assessment of contamination test results has been undertaken assuming a commercial end use.

4.4 Appropriate Guidance

Reference has been made to documents reflecting current best practice, including (but not limited to) the following:

- Department of Environment, Food and Rural Affairs (DEFRA) and the Environment Agency publication – '*Contaminated Land Exposure Assessment (CLEA) model*' (March 2002).
- R & D Publication SGV 10 Lead (March 2002).
- Environment Agency Science Report, '*Using Soil Guideline Values*', SC050021/SGV, March 2009.
- Environment Agency Science Reports Arsenic SGV (May 2009), Nickel SGV, Mercury SGV, Selenium SGV, Benzene SGV, Toluene SGV, Ethylbenzene SGV, Xylene SGV (all March 2009), Phenol and Cadmium (June 2009), Dioxins and Furans (September 2009).
- R & D Draft Technical Report P5-079/TR1 '*Review of the Fate and Transport of Selected Contaminants in the Soil Environment*' dated 2003.
- Chartered Institute of Environmental Health (CIEH) and Land Quality Management (LQM) publication '*Generic Assessment Criteria for Human Health Risk Assessment*' 2nd Edition, July 2009, ISBN 0-9547474-7-X.
- CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*' (May 2008).
- Environment Agency Science Report SC050021/SR7 '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', dated November 2008, ISBN 978-84432-964-9.
- Environment Agency Science Report Final SC050021/SR2 '*Human health toxicological assessment of contaminants in soil*', dated January 2009, ISBN 978-84432-858-1.
- Environment Agency Science Report SC050021/SR3 '*Updated technical background to the CLEA model*', dated January 2009, ISBN 978-84432-856-7.
- Environment Agency Science Report SC050021/SR4 'CLEA *Software (Version 1.05) Handbook*', dated September 2009, ISBN 978-1-84911-105-8.

4.4.1 Selection of Appropriate Tier 1 Screening Values

The assessment of contaminated land in the UK was historically undertaken with reference to ICRCL Guidance Note 59/83 together with successive versions of the CLEA model (inc. CLEA2002 (2002), CLEA UK (2005), CLEA V1.03 beta (2008), CLEA V1.04 (January 2009), CLEA V1.05 (September 2009) and CLEA V1.06 (October 2009)).

The CLEA V1.06 model is a deterministic quantitative risk assessment (QRA) model which is proposed to be used to derive revised Soil Guideline Values (SGVs) for a range of contaminants. To date, CLEA derived SGVs have been published for the following contaminants: Arsenic, Cadmium, Nickel, Mercury, Selenium, Benzene, Toluene, Ethylbenzene, Xylene, Phenol, Dioxins and Furans. SGVs are derived adopting a Sandy Loam soil with 6% Soil Organic Matter (SOM).

In accordance with general industry best practice, these published generic CLEA SGVs have been referred to in the first instance (where available) and have been adopted at initial screening and Tier 1 level.

Whilst the CLEA 2002 model has been formally withdrawn, the model currently provides the only publicly available Lead model adopted as UK policy/practice, consequently, the original SGV for Lead is retained herein.

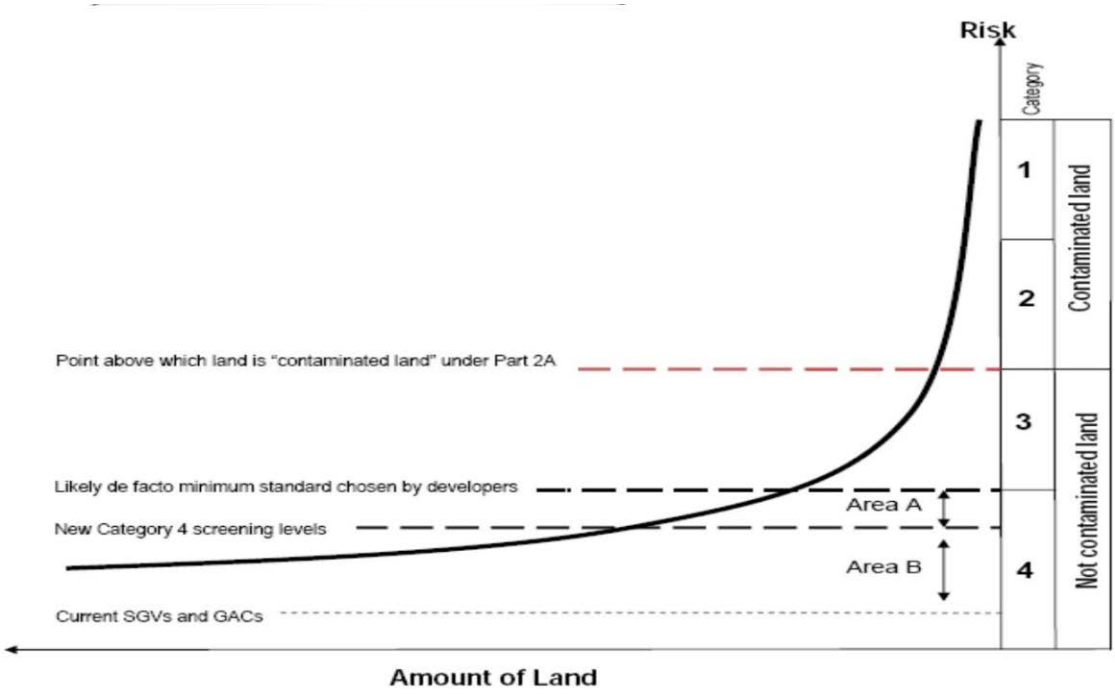
In the absence of published SGVs, Jackson Purdue Lever has adopted Generic Assessment Criteria (GAC) derived by CIEH/LQM. These are based on CLEA V1.04 final.

4.4.2 Category 4 Screening Levels

Revised Statutory guidance for the assessment of land under Part 2A of the Environmental Protection Act 1990 was published by the Department for Environment, Food and Rural Affairs (Defra) in April 2012. The guidance introduced a new four-part category system for classifying land under Part 2A; Section 4.17 of the Guidance states:

'In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the categorisations described in paragraphs 4.19 – 4.30...Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on the grounds of significant possibility of harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds'.

The foregoing categories are depicted in diagrammatical form in the following graph (taken from Defra publication SP1010):



Defra has subsequently commissioned the production of Category 4 Screening Levels (C4SLs) for a total of six substances (cadmium, benzo(a)pyrene, benzene, arsenic, lead and chromium VI), which are detailed within the SP1010 document titled '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*', dated March 2014. The C4SL values represent a level below which a contaminant concentration is considered to have a 'Low' risk to human health. The C4SL values are stated within the SP1010 document (page 7) as still remaining '*strongly precautionary*' and represent a more pragmatic approach to contaminated land risk assessment than the minimal risk values represented by the SGV/GAC levels.

In addition to the use of C4SLs in contaminated land risk assessment, the SP1010 document states the following with respect to background levels of contaminants:

'The outputs of Defra-funded research to determine 'normal' background concentrations of various contaminants in England and Wales and the outputs of this research project to develop new screening levels for contaminants in soil, are both designed as tools to be used by contaminated land risk assessors to inform decisions about whether or not it is necessary to proceed to a Detailed Quantitative Risk Assessment (DQRA) on a particular site taking into account the broad aims of the regime as set out in Section 1 of the Statutory Guidance. Questions have been raised about how these tools relate and interact.

41. Ultimately, it is up to individual risk assessors to make the most appropriate decisions on a site-by-site basis and to use the most appropriate tools in each case. However, with reference to the Part 2A Statutory Guidance, which states that 'normal' background concentrations should not be considered to cause a site to be determined as contaminated under Part 2A unless there is a reason to consider otherwise, it is envisaged that, where available, Category 4 Screening Levels should be the initial value against which site concentrations can be compared.

Where a value on a particular site exceeds the Category 4 Screening Level for that substance, reference can then be made to the normal background concentration for that contaminant in that area.

If concentrations are higher than the relevant Category 4 Screening Level but within 'normal' background concentrations for that area, it is not envisaged that a site would be determined as contaminated under Part 2A (unless there was a reason to consider otherwise).

42. The British Geological Survey has derived 'normal' background concentrations for lead for England and Wales. In England, the 'normal' background concentrations of lead are 180 mg/kg for the 'principal' domain, 2,400 mg/kg for the 'mineralisation' domain and 820 mg/kg for the 'urban' domain (Defra, 2012) (see table below). In Wales the 'normal' background concentrations are 230 mg/kg for the 'principal' domain, 280 mg/kg for the 'mineralisation' domain and 890 - 1300 mg/kg for the 'urban' domain (Defra, 2013). Current advances in our understanding of the toxicology of lead have resulted in Category 4 Screening Levels for Residential, Allotments and Public Open Space 1 that are lower than the 'normal' background concentration of lead in ***urban*** *areas. This was also the case for the (now withdrawn) Soil Guideline Value for lead of 450 mg/kg.*

43. The report identifies other relevant considerations that may have a bearing on the final choice of Category 4 Screening Levels and the background level in soil is one of these. A pragmatic approach for lead would be to recommend the use of the 'normal' background concentration when the land use and domain permit (for example, providing other site and contaminant specific characteristics such as chemical form, bioavailability, soil depth, site use, etc. are comparable between the background and the site under investigation) so as not to disproportionately target land where there is widespread diffuse pollution of lead.

Normal background concentrations of contaminants in England

Substance	Principal domain	Urban domain	Mineralisation domain 1	Mineralisation domain 2	Ironstone	Chalk South
Arsenic	32 mg/kg		290 mg/kg		220 mg/kg	
Benzo-a-pyrene	0.5 mg/kg	3.6 mg/kg				
Cadmium	1.0 mg/kg	2.1 mg/kg	17 mg/kg	2.9 mg/kg		2.5 mg/kg
Lead	180 mg/kg	820 mg/kg	2400 mg/kg			

Where a valid Soil Guideline Value exists for a contaminant where a Category 4 Screening Level has also been derived, it is anticipated that risk assessors will use the Category 4 Screening Level in line with the Part 2A Statutory Guidance. In the absence of a suitable C4SL, risk assessors should identify and select appropriate generic assessment criteria in accordance with established good practice....'

The approach indicated in the SP1010 document has been adopted in this report (as appropriate).

4.4.3 National Planning Policy Framework (NPPF)

In relation to the requirements of a contaminated land risk assessment, the Department for Communities and Local Government publication titled '*National Planning Policy Framework*' (NPPF), dated March 2012, provides the following commentary:

'*121. 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.'*

The Defra SP1010 document states: '***The Part 2A Statutory Guidance and accompanying Impact Assessment were developed on the basis that Category 4 Screening Levels could be used under the planning regime, as they would be in Part 2A investigations directly***' [Jackson Purdue Lever emphasis added].

4.4.4 Summary

Taking account of the foregoing, we consider that industry good practice is currently best represented by CIEH/LQM GAC together with SGV values where these remain current and applicable. In the case of Lead, the relevant C4SL value has been adopted, as this incorporates the most up-to-date toxicological information in the derivation of the various end-use specific screening criteria.

In relation to the remaining C4SL values, these have been adopted as a second tier of generic assessment criteria, and will be utilised where the GAC/SGV has been exceeded at Tier 1 generic level. The C4SL values are considered to represent a suitably conservative assessment tool, given that they fall comfortably within Category 4.

In the following sections, the SGV/GAC values have been collectively referred to as *'Site Acceptance Criteria'* (SAC). The C4SL values have been referenced as such. The SAC/C4SL adopted herein, i.e. commercial, are detailed on the tables included in Section 3.5.

4.4.5 Selection of Soil Organic Matter (SOM) Content

The SOM content and soil type are used to provide an assessment of the applicability of the Tier 1 SAC adopted (the CLEA SGV are based on the default assumption of a UK Sandy Loam soil with 6% SOM, whilst the LQM GAC values are based upon SOM of 1%, 2.5% and 6%, as applicable).

Determinands have in the first instance, been compared to standard CLEA SGVs together with CIEH/LQM GAC (adopting a conservative SOM of 1%). For BTEX determinands, Jackson Purdue Lever has utilised CLEA V1.04 final to derive SGVs relevant to 1% and 2.5% SOM. Where the determinand exceeds the relevant SAC at 1% SOM, a site specific SOM may be adopted as appropriate to derive new GAC and the dataset reassessed.

4.4.6 Assessment Methodology

Taking account of the foregoing an initial qualitative Tier 1 Soil Assessment has been undertaken to assess the soils at the site. We have adopted a policy whereby determinands within the dataset are individually compared to the relevant Tier 1 SAC values.

Where determinands within the dataset are less than the appropriate Tier 1 SAC value the determinand is considered to be present at an acceptable concentration and no further assessment is required.

However, where a determinand exceeds the relevant Tier 1 SAC value on at least one occasion further assessment is required and will be undertaken in accordance with CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*'.

Further assessment will comprise a quantitative Tier 1 assessment to examine the contamination data set in more detail. The methodology for undertaking the statistical assessment is provided below.

4.4.7 Statistical Considerations

Statistical tests relating to contaminated land, typically referred to as Mean and Maximum Value Tests, were detailed in Department for Environment, Food and Rural Affairs and The Environment Agency publication CLR 7 '*Assessment of Risks to Human Health From Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research*', dated 2002, ISBN 1-857-05732-5. This guidance was superseded by publication of CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*' dated May 2008.

4.4.8 Null and Alternative Hypothesis

In consideration of statistical guidance jointly published by CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*', statistical convention requires consideration of the Null Hypothesis (expressed as Ho) or an Alternative Hypothesis (expressed as H1). Appropriate statistical tests are then applied to the data to assess whether the strength of evidence favours the Null or the Alternative Hypothesis.

For the purpose of the following contamination assessments and in accordance with the CL:AIRE/CIEH guidance the key question for the site is as follows.

Question - '*Is there sufficient evidence that the true mean concentration of a contaminant in soil (μ) is less than some critical concentration (Cc)?*'

The Null and Alternative hypotheses are therefore defined as follows.
The Null Hypothesis (Ho)

$\mu \geq Cc$ (i.e. Tier 1 or 2 Assessment Criteria).

The Alternative Hypothesis (H1) (the question the selected statistical test is designed to answer)

$\mu < Cc$ (i.e. Tier 1 or 2 Assessment Criteria).

4.4.9 95th Percentile Upper Confidence Level Mean Values

The selected relevant statistical assessment undertaken to evaluate the Null and Alternative Hypotheses requires consideration of the 95th Percentile Upper Confidence Level Mean value (this is abbreviated as the UCL).

The UCL value takes account the number of samples tested, the data set mean and the standard deviation of the data set and applies a correction factor to take account of the uncertainty of the data set.

CL:AIRE/CIEH guidance states that *'…since the 95% UCL is at most times greater than the true population mean, it follows that if the 95% UCL is less than Cc, the assessor will know (with a defined high level of confidence) that the true population mean (μ, the value which is not known) is also likely to be less than Cc*'.

4.4.10 Considerations for Appropriate Dataset(s)

The CL:AIRE/CIEH statistical guidance requires consideration of the appropriateness of the dataset being subjected to the statistical testing and notes the following three key elements to be considered.

- Consideration of any non-detects within the dataset.
- Consideration of potential outliers within the dataset.
- Consideration of the statistical distribution of the data (i.e. normality/non normality).

4.4.11 Consideration of Normality of Dataset

CL:AIRE/CIEH statistical guidance notes that the choice of statistical test to be applied to the dataset will depend on the assumptions about the distribution of the data being tested. The assumptions of the statistical test adopted therefore must be appropriate to the distribution assumptions of the data being considered.

The CL:AIRE/CIEH statistical guidance details the following two key statistical tests.

- **The one-sample t test** - assumes the data being assessed is approximately normally distributed.
- **The one-sided Chebychev Theorem** - assumes the data being assessed does not demonstrate normality (method makes no assumption about the shape of the distribution).

CL:AIRE/CIEH statistical guidance, however notes '*…with large datasets, minor deviations from normality may be flagged as statistically significant even though small deviations from a normal distribution will not affect the reliability of the one sample t-test*'. The guidance goes on to note '*Conversely, datasets with a small sample size more easily pass normality tests.* ***Failing, however to detect non-normality in a small dataset is unlikely to compromise the validity of the one sample t-test***'.

CL:AIRE/CIEH statistical guidance further notes '*When considering which of the two tests to use, however, assessors should bear in mind that, in general, the one-sample t-test is more powerful that the method based on the Chebychev Theorem…****Given that the one sample t-test is also not sensitive to moderate departures from normality, it is recommended that assessors use the t-test unless there is good evidence that the dataset departs significantly from normality***'.

On the basis of the above, an assumption of data normality has been made and the one-sample t-test adopted accordingly.

4.4.12 Consideration of Non-Detects within the Dataset.

The dataset may reveal the presence of non-detects for a number of the determinands tested. Where this occurs, we have adopted the LOD as the chemical concentration, which provides a suitably conservative approach.

However, please note that SACs have only been used for determinands where they are present at concentrations in excess of the LOD on at least one occasion.

4.4.13 Consideration of Outliers

The CL:AIRE/CIEH statistical guidance advises that '*…if outliers are identified, assessors have to decide whether they represent genuine soil concentrations or are the result of an error*'.

The guidance further notes that outliers should only be excluded from a dataset where they '*…are obviously and demonstrably the result of an error that can be identified and explained*' or '*…clearly indicate that more than one soil population exists within the dataset and this can be justified by (or informs the further development of) the conceptual model- in which case the different population expressed by the outlier(s) should be explored in more detail*'.

Taking account of the foregoing, we have adopted a policy of interrogating the relevant dataset to assess where any individual concentration of each determinand exceed the Tier 1 SAC, and where applicable to calculate the UCL to ascertain the possible presence of statistical outliers (where relevant). At this point the possible relevance of statistical outliers to the interpretation of the data is considered, in accordance with the following matrix.

TABLE 4 – OUTLIER DECISION MATRIX

	UCL < SAC	UCL > SAC
Outlier Test reveals No Hotspot(s)	Determinant present at acceptable concentrations.	Pervasive contamination present in soil at unacceptable concentrations.
Outlier Test reveals Hotspot(s)	Determinant present at acceptable concentrations. Possible second population identified. Only of potential concern where outlier is at an individual concentration in excess of the Tier 1 SAC.	Pervasive contamination present in soil at unacceptable concentrations with possible hotspots of contamination identified.

It should be noted that where the UCL of a determinand, or all individual determinand concentrations, are below the SAC the Outlier test has not been interrogated/interpreted.

4.4.14 CLEA Averaging Area

The CLEA Model requires consideration of an averaging area, i.e. an area within which the UCL is calculated and compared to the Tier 1 SAC. Within our assessments we have calculated the UCL value when any individual concentrations exceed the Tier 1 SAC value, and when applicable the entire site area has been adopted as the averaging area in the first instance.

4.4.15 Sampling Strategy

Our sampling strategy for the site is based on the land use assessment and proposed site use, together with the current setting of the site and the ground conditions encountered during Phase II works.

The ground conditions encountered during our Phase II works revealed the presence of two main soil types i) Made Ground, ii) underlying Natural Strata. Samples of both soil types have been tested and assessed during these works.

4.5 Contamination Soil Test Results

4.5.1 Standard Contamination Suite

Our Tier 1 contamination assessment for the soils at the site is summarised in Table 5. Please note that only those determinants elevated above the limit of detection of the laboratory method of analysis have been included in our Tier 1 assessment.

Furthermore, the UCL mean value has not been calculated as the Tier 1 SAC value was not exceeded.

TABLE 5 – SUMMARY OF TIER 1 SITE ACCEPTANCE CRITERIA DATA ASSESSMENT COMMERCIAL END-USE

Contaminants – Potentially Harmful to Human Health	No. of Samples Tested	Concentration Range (mg/kg)	Tier 1 GAC (mg/kg)	C4SL (mg/kg)	UCL (mg/kg)	Tier 1 GAC Exceeded @ UCL (Yes/No)
Metals						
Arsenic	12	6-46	640 $_{S4UL}$	640	-	No
Cadmium	12	<1-1	190 $_{S4UL}$	410	-	No
Chromium	12	5-49	8600 $_{S4UL}$	-	-	No
Copper	12	4-210	68000 $_{S4UL}$	-	-	No
Lead	12	7-450	2300 $_{C4SL}$	2330	-	No
Mercury	12	<1-72	1100 $_{S4UL}$	-	-	No
Inorganic Mercury	6	<1 - 120	1100 $_{S4UL}$	-		No
Nickel	12	5-51	980 $_{S4UL}$	-	-	No
Zinc	12	13-380	730000 $_{S4UL}$	-	-	No
PAHs						
Naphthalene	12	<0.1 – 9.6	190 $_{S4UL}$	-	-	No
Acenaphthylene	12	<0.1- 0.6	190 $_{S4UL}$	-	-	No
Acenaphthene	12	<0.1 – 2.5	190 $_{S4UL}$	-	-	No
Fluorene	12	<0.1 – 3.9	190 $_{S4UL}$	-	-	No
Phenanthrene	12	<0.1 – 15	22000 $_{S4UL}$	-	-	No
Anthracene	12	<0.1 – 5.2	520000 $_{S4UL}$	-	-	No
Benzo(a)anthracene	12	<0.1 – 13	170 $_{S4UL}$	-	-	No
Benzo(a)pyrene	12	<0.1 – 9.7	35 $_{S4UL}$	76	-	No
Benzo(b)fluoranthene	12	<0.1 – 13	44 $_{S4UL}$	-	-	No
Benzo(ghi)perylene	12	<0.1 – 6.5	3900 $_{S4UL}$	-	-	No
Benzo(k)fluoranthene	12	<0.1 – 6.6	1200 $_{S4UL}$	-	-	No
Chrysene	12	<0.1 – 11	350 $_{S4UL}$	-	-	No
Dibenzo(ah)anthracene	12	<0.1 – 1.1	3.5 $_{S4UL}$	-	-	No
Fluoranthene	12	<0.1 – 42	23000 $_{S4UL}$	-	-	No
Indeno(123cd)pyrene	12	<0.1 – 4.9	500 $_{S4UL}$	-	-	No
Pyrene	12	<0.1 – 36	54000 $_{S4UL}$	-	-	No
Speciated TPHs / BTEX						
Benzene	12	<0.001 – 0.021	27 $_{S4UL}$	-	-	No
Toluene	12	<0.001 – 0.024	56000 $_{S4UL}$	-	-	No
Ethyl Benzene	12	<0.001 – 0.086	5700 $_{S4UL}$	-	-	No
O Xlyene	12	<0.001 – 0.280	6600 $_{S4UL}$	-	-	No
M/P Xylene	12	<0.001 – 0.120	5900 $_{S4UL}$	-	-	No
Aliphatic C16-C21	12	<1 – 5	1600000 $_{S4UL}$	-	-	No

TABLE 5 – SUMMARY OF TIER 1 SITE ACCEPTANCE CRITERIA DATA ASSESSMENT COMMERCIAL END-USE						
Contaminants – Potentially Harmful to Human Health	No. of Samples Tested	Concentration Range (mg/kg)	Tier 1 GAC (mg/kg)	C4SL (mg/kg)	UCL (mg/kg)	Tier 1 GAC Exceeded @ UCL (Yes/No)
Aromatic C8-C10	12	<0.1 – 0.65	3500 $_{S4UL}$	-	-	No
Aromatic C10-C12	12	<1 – 2	16000 $_{S4UL}$	-	-	No
Aromatic C12-C16	12	<1 – 3	36000 $_{S4UL}$	-	-	No
Aromatic C16-C21	12	<1 – 42	28000 $_{S4UL}$	-	-	No
Aromatic C21-C35	12	<1 – 210	28000 $_{S4UL}$	-	-	No
Aromatic C35-C44	12	<1 – 12	28000 $_{S4UL}$	-	-	No
Key S4UL – LQM/CIEH S4ULs for Human Health Risk Assessment, 2015. Copyright Land Quality Management Limited reproduced with permission; publication number S4UL3026. C4SL – Category 4 Screening Level. Detailed within DEFRA SP1010 Policy Companion Document dated December 2014.						

4.6 Mercuric Chloride

It is understood that Mercuric Chloride may have been locally used in some of the processes which were undertaken in the area surrounding the site. Its historical uses (as evidenced via a general internet based search) include a pesticide, antiseptic and a preservative for wood. Its presence on site was assessed via undertaking a test for Inorganic Mercury (a screening suite which included a number of mercury compounds including Mercuric Chloride) on 6No. samples collected from across the site. The concentrations of Inorganic Mercury were all significantly less than the respective Tier 1 SAC (1100mg/kg).

4.7 Asbestos Testing

Four samples of Made Ground were tested for the presence of asbestos fibres. No Asbestos fibres were encountered within any of the samples analysed.

4.8 Contamination Assessment Summary

The assessment of soil test results for the Made Ground and Natural Strata has revealed that the determinands tested were detected at concentrations below the laboratory LOD, or at individual concentrations below the relevant Tier 1 SAC for a commercial end use.

Therefore, the concentrations of determinands detected are considered unlikely to represent a potential risk to human health based on the proposed commercial end use. Furthermore, the concentrations detected are considered unlikely to represent a significant risk to controlled waters.

5.0 CONCEPTUAL SITE MODEL

5.1 General

The DEFRA publication '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*' (dated April 2012) states the following with regards to the production of a Conceptual Site Model (CSM) for a site:

'*The process of risk assessment involves understanding the risks presented by land, and the associated uncertainties. In practice, this understanding is usually developed and communicated in the form of a "conceptual model"*'. The development of a CSM is typically undertaken in an iterative process, reflecting the changes in understanding as more detailed site information becomes available.

In developing a CSM, and specifically in the context of land contamination, consideration needs to be given to three essential elements; which form the basis of any risk present. The statutory guidance sections 3.8 and 3.9 (April 2012) states the following with respect to Part 2A.

'*Under Part 2A, for a relevant risk to exist there needs to be one or more contaminant-pathway-receptor* [CPR] *linkages – "contaminant linkage" – by which a relevant receptor might be affected by the contaminants in question. In other words, for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters. For the purposes of this guidance:*

(a) A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.
(b) A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, and ecosystem, property, or controlled waters. The various types of receptors that are relevant under the Part 2A regime are explained in later sections.
(c) A "pathway" is a route by which a receptor is or might be affected by a contaminant.

The term "contaminant linkage" means the relationship between a contaminant, a pathway and a receptor. All three elements of a contaminant linkage must exist in relation to a particular land before the land can be considered potentially to be contaminated land under Part 2A, including evidence of the actual presence of contaminants. The term "significant contaminant linkage", as used in this Guidance, means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. The term "significant contaminant" means the contaminant which forms part of a significant contaminant linkage.'

With respect to the presence of background levels of contaminants, sections 3.21 to 3.23 states '*The Part 2A regime was introduced to help identify and deal with land which poses unacceptable levels of risk. It was not intended to apply to land with levels of contaminants in soil that are commonplace and widespread throughout England or parts of it, and for which in the very large majority of cases there is no reason to consider that there is an unacceptable risk.*

Normal levels of contaminants in soil should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise. Therefore, if it is established that land is at or close to normal levels of particular contaminants, it should usually not be considered further in relation to the Part 2A regime...

For the purpose of this Guidance, "normal" levels of contaminants in soil may result from:

(a) The natural presence of contaminants (e.g. caused by soil formation processes and underlying geology) at levels that might reasonably be considered typical in a given area and have not been shown to pose an unacceptable risk to health or the environment.
(b) The presence of contaminants caused by low level diffuse pollution, and common human activity other than specific industrial processes. For example, this would include diffuse pollution caused by historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts, and the spreading of domestic ash in gardens at levels that might reasonably be considered typical.'

In selecting appropriate generic assessment criteria Section 3.27 of the Guidance states:

'*It is common practice in contaminated land risk assessment to use "generic assessment criteria" (GACs) as screening tools in generic quantitative human health risk assessment to help assessors decide when land can be excluded from the need for further inspection and assessment, or when further work would be warranted*'.

With respect to assessing contaminated land, section 4.17 of the Guidance states:

'*In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the categorisations described in paragraphs 4.19 – 4.30 below. Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on the grounds of significant possibility of harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds.*'

In relation to the use of GAC values in the assessment of contaminated land, section 3.29 of the Guidance states:

'*GACs relating to human health risk assessment represent cautious estimates of levels of contaminants in soil at which there is considered to be no risk to health or, at most, a minimal risk to health. With regards to such GACs:*

(a) They may be used to indicate when land is very unlikely to pose a significant possibility of significant harm to human health. This is on the basis that they are designed to estimate levels of contamination at which risks are likely to be negligible or minimal and far from posing a significant possibility of significant harm to human health.
(b) They should not be used as direct indicators of whether a significant possibility of significant harm to human health may exist. Also, the local authority should not view the degree by which the GACs are exceeded (in itself) as being particularly relevant to this consideration, given that the degree of risk posed by land would normally depend on many factors other than simply the amount of contaminants in soil.

(c) *They should not be seen as screening levels which describe the boundary between Categories 3 and 4 in terms of Section 4 (i.e. the two Categories in which land would not be contaminated land on grounds of risk to human health). In the very large majority of cases, these SGVs/GACs describe levels of contamination from which risks should be considered to be comfortably within Category 4.*

(d) *They should not be viewed as indicators of levels of contamination above which detailed risk assessment would automatically be required under Part 2A.*

(e) *They should not be used as generic remediation targets under the Part 2A regime. Nor should they be used in this way under the planning system, for example in relation to ensuring that land affected by contaminated does not meet the Part 2A definition of contaminated land after it has been developed.*'

In undertaking a risk assessment and deriving a CSM for the purposes of the redevelopment of a site (i.e. planning and development control) reference has been made to both the Model Procedures for the Management of Land Contamination, as well as the National Planning Policy Framework (NPPF, dated March 2012). Reference has also been made to the Contaminated Land Statutory Guidance (referenced above), although this is primarily concerned with Local Government determinations of Statutory '*Contaminated Land*', which is separate to planning framework requirements.

5.2 Contaminant-Pathway-Receptor Considerations

The following CPR assessment has been undertaken based on the assumption that the site will be redeveloped with commercial buildings.

5.3 Consideration of Potential Sources of Contamination (C)

Based on the previous Phase I Desk Study and our works the potential sources of contamination at the site are primarily:

- Metals and metalloids associated with any Made Ground.
- Natural Metal Enrichment (NME) in Natural Strata.
- Polycyclic Aromatic Hydrocarbons (PAHs) in any Made Ground.
- Materials used to fill the drywall dock.
- Possible Made Ground from excavation of the adjacent Canal (anecdotal evidence).
- Ground gas (i.e. Methane and Carbon Dioxide) associated with areas of Made Ground.
- Former oil / fuel storage at the site including:
    - Sites former use as an oil mill.
    - Above ground storage tank to the north of Downing's Malthouse.
    - Decommissioned 2No. underground fuel storage tanks and interceptor in the centre of the site.
    - On site storage of fuel bowsers during the construction of the Gloucester Quays Designer Outlet.
- Mercuric Chloride from off site sources (anecdotal).
- Asbestos containing materials from the demolition of former structures.
- Acid/Sulphate contaminated soils.

5.4 Consideration of Potential Pathways (P)

The potential pathways at the site are primarily:

- Direct ingestion of soil.
- Inhalation of dust and vapours.
- Direct skin contact with the ground.
- Direct contact with building materials.
- Vertical and lateral migration of contamination.

5.5 Consideration of Potential Receptors (R)

The potential receptors at the site are:

- The construction personnel (i.e. site workers) involved with the development of the site (typically short term (acute) exposure).
- The final end users i.e. site users/workers (typically long term (chronic) exposure).
- Controlled waters (i.e. groundwater and surface water).
- Buildings/construction materials.
- Building envelope.

5.6 Summary

A conceptual site model summarising the possible CPR pollutant linkages is presented in Table 6.

TABLE 6 – SUMMARY OF CPR ASSESSMENT

Contaminant	Receptor	Pathway	Comments	Plausible Pollutant Linkage	Possible Mitigation	Possible Statutory 'Contaminated Land' following mitigation
Contaminated Soils	*Site Workers*	*Direct Ingestion & Direct Contact*	Elevated concentrations of determinands have not been detected in the underlying soils.	X	Site workers to wear appropriate PPE for usual health and safety reasons.	X
Contaminated Soils	*Site Workers*	*Inhalation of Dust*	Elevated concentrations of determinands have not been detected in the underlying soils.	X	Site workers to wear appropriate PPE for usual health and safety reasons.	X
Contaminated Soils	*End Users – Site Users*	*Direct Ingestion & Direct Contact*	Elevated concentrations of determinands have not been detected in the underlying soils.	X	Mitigation considered unnecessary based on the results of the chemical soil testing	X
Contaminated Soils	*End Users – Site Users*	*Inhalation of Dust*	Elevated concentrations of determinands have not been detected in the underlying soils.	X	Mitigation not considered necessary based on the results of the chemical soil testing	X
Contaminated Soils	*Controlled Waters*	*Vertical and lateral migration*	Elevated concentrations of determinands have not been detected in the underlying soils.	X	Mitigation not considered necessary based on the results of the chemical soil testing	X

TABLE 6 – SUMMARY OF CPR ASSESSMENT						
Contaminant	Receptor	Pathway	Comments	Plausible Pollutant Linkage	Possible Mitigation	Possible Statutory 'Contaminated Land' following mitigation
Contaminated Soils	*Flora and End Users – Site Users*	*Plant Uptake*	Elevated concentrations of determinands have not been detected in the underlying soils.	X	Mitigation not considered necessary based on the results of the chemical soil testing	X
Contaminated Soils	*Building Materials*	*Direct contact*	Design Class DS-1/ACEC Class AC-1 (BRE Spec. Digest 1:2005).	X	Adopt appropriate concrete mix to all buried concrete.	X
Radon	*Vertical and lateral migration*	*End Users & Building Envelope*	The site is located within an area which does not require radon protection measures in the construction of new buildings (see Sanctus Desktop Study).	X	No radon precautions required in proposed buildings.	X
Ground Gases	*Site End users & Building Envelopes*	*Vertical and lateral migration*	CH4 3.7%v/v and CO2 2.6v/v. No flow detected. CIRIA C665 CS2 ground gas precautions required.	✔	Adopt appropriate ground gas precautions in new buildings. Retrofitted ground gas protection measures or appropriate ventilation will be required for currently existing buildings. Possible ground gas DQRA to further asses the requirement for ground gas protection in buildings.	✔

KEY

Where text is in *Bold Italic* item is potentially present. Where normal text is used item is not present/plausible.
X - Pollutant linkage not plausible.
✔ - Pollutant linkage plausible, mitigation required.
? - Insufficient information, further work necessary.

In the foregoing CPR assessment, determinants identified by chemical analysis are only considered to be contaminated with respect to generic guidance where the determinant is present at UCL concentrations above their respective Tier 1 SAC.

6.0 CONCLUSIONS & RECOMMENDATIONS

6.1 Ground Conditions

The site was predominantly surfaced with a mixture of concrete, macadam and a sandy gravel to depths ranging between 0.05m and 0.60m begl.

The site surfacing was underlain by Made Ground which typically comprised a sandy gravel or locally a sandy gravelly clay to depths ranging 0.60m and 4.80m begl although the depth of the Made Ground was generally 1m to 2m begl.

The Made Ground was generally underlain (excluding WS17 and WS18 in the far north of the site) by strata considered representative of the Tidal Flat Deposits (drift deposits). This was typically encountered as a variable very soft, soft, firm or stiff grey green gravelly silty sandy CLAY locally with plant remains and shell fragments up to a maximum proven depth 6.00m begl.

The four most northern boreholes included strata considered typical of the Blue Lias & Charmouth Mudstone Formation (below the Tidal Flat Deposits in WS15 / WS16 and below the Made Ground in WS17 and WS18). The Blue Lias & Charmouth Mudstone Formation was encountered as a firm to very stiff grey silty CLAY with frequent shell fragments or very weak grey destructured silty MUDSTONE.

6.2 Foundation Design

Southern and Central Areas of the Site (restaurant / coffee shop and hotel)

The strength of the Natural Strata has been revealed to be variable and locally low across the southern and central areas of the site (including the areas of the proposed hotel and restaurant – see Masterplan in Appendix VII) due to the presence of superficial Tidal Flat Deposits. Alternative foundations such as piles or ground improvement are likely to be required for new buildings in these areas.

Notwithstanding the above, it may be possible for the coffee shop in the central area of the site to be founded in the Natural Strata using pad, strip, trench fill or raft foundations assuming an allowable ground bearing pressure of 40kN/m^2 from a minimum founding depth of 0.90m begl. However, deep Made Ground may be created once the underground fuel storage tanks are removed from this area of the site and deepened or alterative foundations required.

Buildings / foundations situated in the central area of the site should be constructed as to not excessively load or impact upon the culvert which crosses this area of the site.

Northeastern Parcel of the Site

The strength of the ground in the vicinity of the northeastern parcel of the site appears to be higher than the central / southern areas of the site due to the absence, or only limited thickness of, Tidal Flat Deposits and the presence of the Blue Lias and Charmouth Mudstone Formation. Consequently pad, strip or trench fill foundations may be feasible in the northeastern parcel of the site assuming an allowable ground bearing pressure of 120kN/m^2 and a minimum founding depth of 0.90m begl.

However, no boreholes have been advanced to the immediate south of the Downings Malthouse buildings to date due to the presence of the silo building. Further ground investigation works should be undertaken in this area to confirm ground conditions once access is available post demolition. However, given the presence of a basement in this area and the likely generation of deep Made Ground during the removal of the significantly sized existing building, alternative foundations may be required for buildings constructed in this area (subject to the results of supplementary site investigation works).

Malthouse Extension Building (northwestern extent of the larger parcel of the site)

Development proposals include the refurbishment of the Malthouse Extension building in the northwest of the larger parcel of the site. To facilitate the refurbishment a number of the existing loadbearing columns will be removed and new columns re-sited to accommodate the structural loading. It is understood that the foundations for the new columns will comprise piles as the loadings will be relatively high and the settlement tolerances relatively low (on account of the existing building having completed the majority of its settlement).

General

The use of alternative foundations is subject to an assessment by a specialist contractor.

All foundations should be advanced to encounter undisturbed suitably geotechnically competent Natural Strata. Should any Made Ground, relic foundations, disturbed ground or soft spots be encountered (including backfilled drywall dock, crane bases and silo bases) at founding depth, foundations will require further deepening to encounter underlying undisturbed suitably competent Natural Strata.

6.3 Floor Slab

A ground bearing floor slab may be appropriate where a limited depth of geotechnically competent Made Ground is present. This would be subject to confirmation by detailed design taking account of loading characteristics and tolerable settlements etc. However, improvement of the ground by proof rolling of the formation and the inclusion of geotextile reinforcement in capping materials may be necessary depending on settlement requirements. Alternatively, floor slabs may be designed as suspended.

Suspended slabs with a void will be necessary where foundations require deepening in excess of 1.50m due to the influence of existing trees.

6.4 Building Near Trees

Foundation designs will require adjusting when building near existing, recently removed or proposed trees due to the presence of shallow cohesive soils beneath the site. Laboratory testing has revealed soils with a medium volume change potential and we would recommend that this classification is adopted for design purposes. Trees were generally absent from the site with the exception of the northeasten parcel.

6.5 Ground Gas Precautions

Ground gas has been detected at the site at concentrations up to 3.7% v/v Methane and 2.6% v/v Carbon Dioxide. However, Methane was only detected above 1.0% v/v on a single occasion (first visit) in a one borehole (WS12) and no ground gas flow was recorded in any boreholes during any of the visits undertaken.
The source of the ground gas may be associated with either a potentially elevated organic content of the Natural Strata (evidenced by black colouration) or the reported backfilled drywall dock which existed in this area of the site.

By virtue of the maximum Methane concentration of 3.7% v/v the site has been classified as CIRIA C665 CS2.

New Buildings

In accordance with CIRIA C665, the site may be may be classified as 'CS2' for commercial properties with the precautions required comprising:

- Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with a suitable membrane.

- Or alternately, beam and block or pre cast concrete slab and suitable membrane.

In both cases a certificated, ground gas resistant membrane from a suitable manufacturer/supplier should be used at the site. The membrane should have suitable tensile strength and puncture resistance, may include an aluminium core (as appropriate) and be of a sufficient thickness to allow any welding to take place without damaging the membrane.

All joints and penetrations should be sealed.

Consideration may be given to the design of gas precautions in accordance with BS8485: 2007 should alternative foundation / floor slab proposals be considered.

The gas membrane for buildings constructed in the vicinity of the location of the underground fuel storage tanks (i.e. the coffee shop) in the approximate central area of the site should also be hydrocarbon and vapour proof. Any buildings constructed over additional areas of hydrocarbon impaction (if encountered) will also require the installation of a gas / hydrocarbon vapour proof membrane.

Existing Buildings

It is understood that development proposals include the refurbishment of the Mill/Malthouse buildings and the cottages (see WCEC Architects Drawing No. SK-MP-01) in Appendix VII. Based on the above gas risk assessment, retrofitted ground gas protection measures or appropriate ventilation (e.g. underground car park or naturally ventilated storage) will be required for currently existing buildings.

The adequacy of the intrinsic design of the development proposals for the existing buildings could be assessed using the point scheme provided in BS8485: 2007. Where / if assessed as deficient, supplementary ground gas protection measures would be required in the refurbishment of the existing buildings to ensure the appropriate ground gas protection is provided.

Further Ground Gas Investigation & Detailed Quantitative Risk Assessment (DQRA)

Prior to installing ground gas protection measures further ground gas assessment and DQRA could be undertaken in an effort to minimise the area / scope of the measures required. However, this would be subject to a cost / benefit appraisal prior to commissioning any further works.

6.6 Radon

The Sanctus Phase I Desk Study indicates that *'the site is not located in a radon affected area, as less than 1% of homes are above the action level. The BGS further indicate that no radon protection measures are necessary in the construction of new dwellings or extensions'.*

6.7 Water

Water was encountered in five of the nineteen window sample boreholes advanced during the intrusive works at a depths ranging between 2.00m and 4.00m begl. Groundwater level monitoring has revealed groundwater levels at depths ranging between 0.35m and 2.77m begl (water was absent from WS17 on the first monitoring visit). However, the water encountered is likely to be associated with leakage of surface water into the borehole from the surface or minor seepages (i.e. not representative of a body of groundwater).

Based on the foregoing, it is considered that shallow excavations are unlikely to require significant dewatering. Minor seepages of water could be controlled by open sump pumping.

6.8 Excavations

The sides of the boreholes were observed to be stable for the short period of time they were open. Therefore, shallow excavations are unlikely to require widespread sidewall support across the site. However, the stability of excavations would be better assessed via the excavation of pits / trenches. The requirement for trench support should be assessed by the groundworks contractor prior to commencing site works.

In addition, cohesive soils are liable to deteriorate if exposed to prolonged periods of wet weather. Care should be taken to avoid unnecessary exposure of formation soils if wet weather prevails. Any softened soils resulting from exposure to wet weather should be removed from the formation level prior to foundation construction.

6.9 Sulphate Classification

Based on the laboratory soil test results, and in accordance with the Building Research Establishment publication Special Digest 1 '*Concrete in Aggressive Ground*' (2005), the site falls into Design Sulfate Class DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1.

An appropriate concrete mix should be adopted in accordance with BRE Special Digest 1 for all buried concrete in contact with the ground.

6.10 CBRs and Pavements

Typical CBR values of <1-3% could be initially anticipated in the Made Ground and <1-4% could be anticipated in the Natural Strata at the site, subject to confirmation by in-situ testing.

6.11 Surface Water Drainage

Due to the presence of cohesive soils soakaways are unlikely to be feasible for the proposed redevelopment and we would recommend that alternative methods of surface water disposal be investigated.

6.12 Contamination Assessment

The assessment of soil test results for the Made Ground and Natural Strata has revealed that the determinands tested were detected at concentrations below the laboratory LOD, or at individual concentrations below the relevant Tier 1 SAC for a commercial end use.

Therefore, the concentrations of determinands detected are considered unlikely to represent a potential risk to human health for the proposed end use. Furthermore, the concentrations detected are considered unlikely to represent a significant risk to controlled waters.

No significant concentrations of hydrocarbons were detected in the window sample boreholes advanced adjacent to the underground fuel storage tanks, interceptor, former location of the above ground fuel tank or in the external areas surrounding the building where oils / vehicles are indicated to have been stored (southern area of Provender Mill / Engine House).

6.13 Remediation Proposals

At this stage, no specific remedial measures are considered necessary for the proposed development. However, due to the historical operation of the site as a grain / oil mill (including oil / fuel storage) the potential existence of areas of hydrocarbon contamination which require remediation cannot be discounted at this stage. A watching brief should be maintained by demolition / groundworks contractors for additional visual / olfactory evidence of hydrocarbon contamination.

The decommissioned underground fuel storage tanks / interceptor will require removal where they conflict with development proposals. Upon their removal (during the demolition / enabling works) hydrocarbon validation testing should be undertaken on the base and sides of the resultant excavations once the tanks / structure has been removed to confirm that the remaining soils are not significantly impacted by hydrocarbons.

The potential requirement for hydrocarbon remediation works cannot be excluded at this stage if significant hydrocarbon contamination is encountered.

6.14 Topsoil

Topsoil appeared to be absent from the site. Consequently, it will be necessary to import topsoil to site for use in areas of soft landscaping. Any imported soils should be tested at source to ensure they are suitably clean (prior to importation) in accordance with CLEA/generic guidance. Any imported topsoil should confirm to BS3882: 2015 'Specification for topsoil and requirements for use', with respect to the presence of foreign objects, and ideally nutrient levels etc.

6.15 Asbestos

An asbestos survey should be undertaken prior to the demolition / refurbishment of any buildings. All asbestos containing materials should be removed from the building by specialist contractors prior to demolition / refurbishment.

6.16 Wells / Boreholes / Pumps

The presence of a pump was identified on the historical mapping in the northeast of the site by Sanctus. This may represent the presence of a former well. We would recommend that a watching brief is maintained during demolition and construction works in relation to the presence of the well. If encountered, we would recommend that the well is backfilled with inert granular material and foundations for dwellings are designed to span the well structure.

A circular water filled feature which may have comprised a borehole / well was observed inside the southeastern corner of the Engine Shed / Prevender Mill. The presence of a well / borehole should be confirmed during enabling works. Where / if present wells / boreholes should be decommissioned, capped or remediated as appropriate.

6.17 Off-site Disposal & Reuse of Materials

If off-site disposal is required the chemical testing regime can be different to the chemical testing required to assess the suitability of the soils for retention on site and the risks to human health and controlled waters. Therefore, effectively a new contamination assessment may be required to classify the soils for off-site disposal with testing criteria to assess whether the soil is hazardous, non-hazardous or inert waste. We would be pleased to undertake Waste Acceptance Criteria (WAC) testing of any soils proposed for disposal to landfill if requested.

In the first instance, the test results from this investigation should be supplied to landfill operators to determine likely disposal costs before WAC testing is carried out, if off site disposal is being considered.

Due to the uncontaminated nature of the soils tested (based on a commercial end use) we would recommend that any excess soils could potentially be re-used at an off-site commercial location. The re-use of soil at an off-site commercial location would be subject to the approval of the Local Authority Environmental Health Department for the receiving site and possible additional testing and/or assessment.

6.18 Unforeseen Circumstances

Should any areas of potentially contaminated soil be encountered during site construction works, we would recommend consultation with Jackson Purdue Lever to ensure that our recommendations continue to apply.

Any potentially contaminated soils should be left in-situ and subjected to further assessment, to potentially include further chemical testing and risk assessment.

The following procedure should be adhered to if any areas of previously unidentified suspected contamination are encountered during the development of the site:

i. Suspected contaminated material will remain in-situ.
ii. Jackson Purdue Lever to be notified, and will inform the Local Authority Environmental Health Department (if appropriate).
iii. Jackson Purdue Lever will undertake a visual assessment of the possible contamination, followed by appropriate sampling/testing (as necessary).
iv. If necessary, an appropriate strategy to remove/remediate the contamination will be submitted to the Local Authority.

6.19 Construction Workers

It is recommended that construction personnel involved with direct contact with the soils at the site use appropriate PPE equipment together with welfare facilities in accordance with general health and safety guidelines.

6.20 Utilities

We would recommend that this report is supplied to utility companies (including water supply), and that their recommendations relating to appropriate supply pipes are adhered to.

6.21 Licenses, Permits, Registrations and Approvals

The Contractor/Developer is responsible for, and must ensure that, all necessary licenses, permits, plans, registrations and approvals are in place prior to commencing with the works at the site. These will include any Site Waste Management Plans/Materials Management Plans, Mobile Treatment Licenses (MTLs) and/or Waste Management Licenses/Exemptions as necessary to enable the completion of the proposed works.

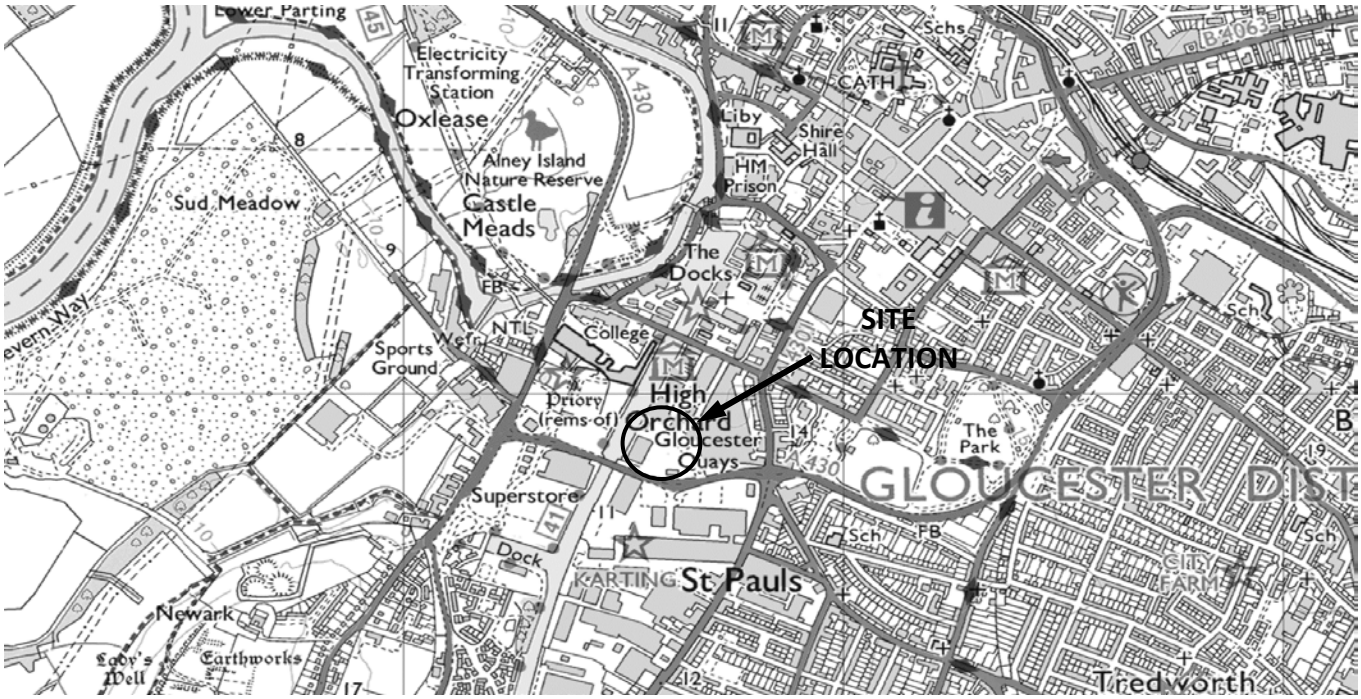
6.22 Further Works

- Deep cable percussive boreholes will be required in the central, southern and northwestern areas of the site to provide geotechnical information where alternative foundations such as piles or ground improvement are proposed.
- Further site investigation works in the area to the south of the Downings Malthouse building once the concrete silo has been demolished.
- Hydrocarbon validation testing will be required for the base and sides of excavations once the underground fuel storage tanks and interceptor have been removed from the central area of the site.

- A watching brief during demolition / enabling works for further areas impacted by hydrocarbons.
- A watching brief during demolition works for wells / boreholes / pumps followed by decommissioning, capping or remediation.

APPENDIX I

Site Location Plan



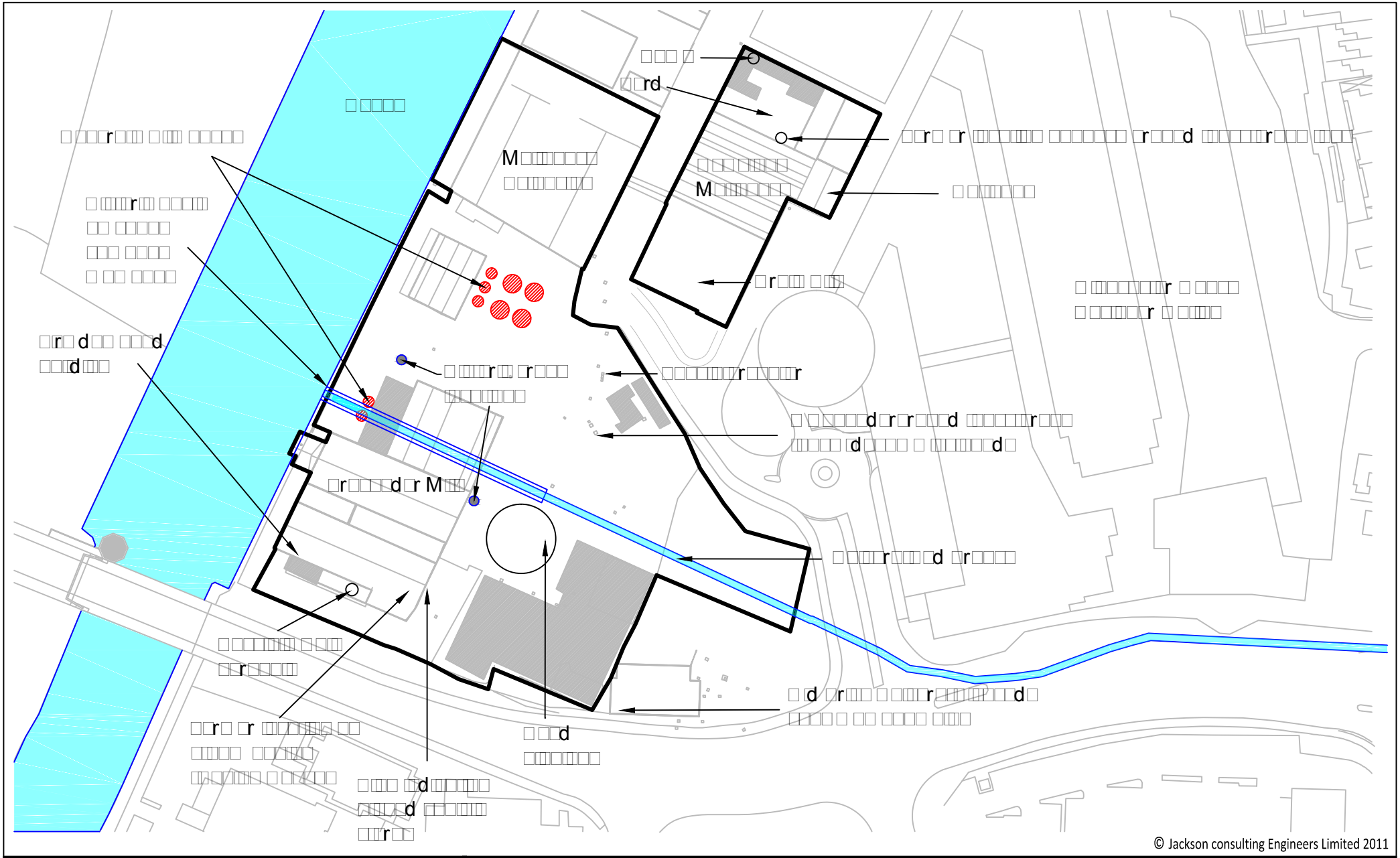
Project No.	RDL00415	Drawn	GJS
Client	Rokeby Merchant (Gloucester) Ltd	Checked	
Project	Bakers Quay Gloucester	Approved	
		Scale	NTS
		Date Drawn	09/06/2015
Title	Site Location Plan	Rev.	

Figure No.
RDL00415/01

Jackson purdue lever

APPENDIX II

Annotated Site Plan



Project Title: BAKERS QUAY. GLOUCESTER	Job No: RDL00415	Drawing No: 002	Scale: NTS @ A4	Revision: -	Drawn: HW
Drawing Title: ANNOTATED SITE PLAN	Date: 17/06/2015	Status: EXISTING SURVEY			Authorised: -

Jackson purdue lever

APPENDIX III

Exploratory Hole Location Plan

Key

WS1 Window Sample Borehole

(G) Gas Monitoring Borehole

NB: All locations shown are approximate.

Extract of *'Existing Site Layout Plan'* Ref. SK-EX-01 dated 04/12/14

Project No.	RDL00415	Drawn	GJS
Client	Rokeby Merchant (Gloucester) Ltd	Checked	
Project	Bakers Quay Gloucester	Approved	
		Scale	NTS
		Date Drawn	09/06/2015
Title	Exploratory Hole Location Plan	Rev.	

Figure No.RDL00415/03

Jackson purdue lever

APPENDIX IV

Borehole Logs

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS1

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
0.20	D	T1		Macadam surfacing (MADE GROUND)		0.03 0.13			
				Concrete (MADE GROUND)		0.40 (0.60)			
0.80	D/J/V	T2/J1/V1							
1.00-1.45	C		1	Loose black sandy gravel. Gravel is predominantly fine to medium ash and clinker with a bituminous odour (MADE GROUND)		1.00			
1.10	D/J/V	T3/J2/V2				(0.70)			
				Loose grey becoming yellow-brown sandy clayey gravel. Gravel is predominantly fine to coarse igneous and limestone (MADE GROUND)		1.70 (0.30)		▽	
2.00-2.45	C		0			2.00			
				Very soft grey-brown sandy gravelly clay. Gravel is predominantly fine to medium brick, sandstone and occasional ash (MADE GROUND)		(1.00)			
3.00-3.45	C		3	Loose red-brown clayey sandy gravel. Gravel is predominantly fine to coarse brick (MADE GROUND)		3.00			
				No Recovery (MADE GROUND)					
4.00-4.45	C		43	Very loose variable wet sandy silty gravel (MADE GROUND) ...20% recovery ...Possible Made Ground below 4.00m		(1.80)			
						4.80			
5.00-5.45	C		8	Firm brown grey mottled slightly silty slightly sandy CLAY (TIDAL FLAT DEPOSITS)		5.00			
				Firm grey-green sandy very gravelly CLAY with rare shell fragments. Gravel is predominantly fine subangular limestone (TIDAL FLAT DEPOSITS)		(1.00)			
6.00-6.45	C		10	...15% recovery		6.00			
6.00	J	J3		End of Borehole at 6.00 m					

Remarks:
1.Borehole sides stable.
2.Water encountered at 2.00m.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client: Rokeby Merchant (Gloucester) Ltd**	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 13/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS1

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS2

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete (MADE GROUND)		(0.60)			
						0.60			
0.70	D	T1		Loose black sandy gravel. Gravel is predominantly fine to medium ash and clinker (MADE GROUND)		0.80			
0.90	J/V	J1/V1				1.00			
1.00-1.45	C		4						
1.10	D/J/V	T2/J2/V2		Loose red-brown gravelly sand. Gravel is predominantly fine to medium quartzite (MADE GROUND)					
2.00-2.45	C		4	Firm brown becoming grey-green silty CLAY with root remains (TIDAL FLAT DEPOSITS)		(2.00)			
3.00-3.45	C		13			3.00			
				End of Borehole at 3.00 m					

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client: Rokeby Merchant (Gloucester) Ltd**	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 13/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS2

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS3

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete		(0.35)			
				(MADE GROUND)		0.35			
				Loose brown sandy clayey gravel. Gravel is predominantly fine to coarse brick and limestone		(0.45)			
0.70	D/J/V	T1/J1/V1		(MADE GROUND)		0.80			
1.00-1.45	C		0			1.00			
1.10	D/V	T2/T3/V2		Loose black sandy gravel. Gravel is predominantly fine to medium ash, clinker and brick		(0.80)			
				(MADE GROUND)		1.80			
2.00-2.45	C		10	Very soft brown slightly gravelly silty sandy CLAY. Gravel is predominantly fine to medium quartzite and flint					
				(TIDAL FLAT DEPOSITS)		(1.20)			
				Stiff grey-green silty CLAY					
				(TIDAL FLAT DEPOSITS)					
3.00-3.45	C		15			3.00			
				End of Borehole at 3.00 m					

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 13/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS3

Jackson purdue lever

8 Pride Point Drive
Pride Park
Derby
DE24 8BX

Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS4

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete (MADE GROUND)		(0.60)			
0.70	D	T1		Loose black-brown sandy gravel. Gravel is predominantly fine to medium ash		0.60			
1.00-1.45	C		8	(MADE GROUND)		(0.70)			
1.40	D	T2		Firm brown slightly gravelly silty clay. Gravel is predominantly fine to medium flint and occasional brick (MADE GROUND)		1.30 (0.70)			
2.00-2.45	C		7			2.00			
2.10-2.50	B	B1		Firm brown slightly gravelly silty CLAY. Gravel is predominantly fine to medium flint (TIDAL FLAT DEPOSITS)		(0.50)			
				Soft to firm grey-green silty CLAY (TIDAL FLAT DEPOSITS)		2.50			
3.00-3.45	C		4						
3.60	D	T3							
4.00-4.45	C		9			(3.50)			
5.00-5.45	C		7						
6.00-6.45	C		5	End of Borehole at 6.00 m		6.00			

Remarks:

1.Borehole sides stable.
2.No water encountered.
3.Plain pipe with bentonite seal installed from ground level to 1.00m, slotted pipe with gravel surround installed from 1.00 to 5.00m.
4.Bung, valve and protective cover installed.

Key:

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client: Rokeby Merchant (Gloucester) Ltd**	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 13/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS4

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS5

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Loose grey sandy gravel. Gravel is predominantly fine to medium concrete (MADE GROUND)		0.20			
0.40	D	T1				(0.40)			
				Firm brown silty sandy gravelly clay. Gravel is predominantly fine to medium brick and ash (MADE GROUND)		0.60			
						(0.40)			
1.00-1.45	C		4			1.00			
1.00-1.40	B	B1		Loose black sandy gravel. Gravel is predominantly fine to medium ash (MADE GROUND)					
1.10	D	T2							
				Firm brown becoming grey-green slightly gravelly sandy CLAY with rare to occasional root remains. Gravel is predominantly fine to medium subangular to subrounded quartzite and flint (TIDAL FLAT DEPOSITS)					
2.00-2.45	C		8						
3.00-3.45	C		9			(4.00)			
4.00-4.45	C		8					▽	
				...becoming soft sandy and wet between 4.00m to 4.50m					
5.00-5.45	C		4			5.00			
5.00	D	T3		End of Borehole at 5.00 m					

Remarks:
1.Borehole sides stable.
2.Water encountered at 4.00m.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 13/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS5

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS6

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Macadam surfacing (MADE GROUND)		0.05			
						0.30			
0.50	D	T1		Loose grey sandy clayey gravel. Gravel is predominantly fine to medium concrete (MADE GROUND)		0.40 (0.50)			
1.00-1.45	C		6			0.90			
1.00	D	T2		Limestone cobbles (MADE GROUND)					
				Loose red-brown sandy gravel. Gravel is predominantly fine to medium brick and ash (MADE GROUND)					
2.00-2.45	C		8	Firm brown becoming grey-green slightly gravelly silty CLAY with rare to occasional root remains. Gravel is predominantly fine to medium subrounded quartzite (TIDAL FLAT DEPOSITS) ...with rare to occasional shell fragments between 2.00m and 3.00m					
3.00-3.45	C		8			(4.10)		▽	
				...becoming sandy and with wet sand bands below 3.50m					
4.00-4.45	C		9						
5.00-5.45	C		7	End of Borehole at 5.00 m		5.00			

Remarks:
1.Borehole sides stable.
2.Water encountered at 3.50m.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client: Rokeby Merchant (Gloucester) Ltd**	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 13/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS6

Jackson purdue lever

8 Pride Point Drive
Pride Park
Derby
DE24 8BX

Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS7

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete (MADE GROUND)		0.20			
						(0.40)			
				Loose yellow sandy gravel. Gravel is predominantly fine to coarse limestone (MADE GROUND)		0.60			
0.80	D	T1				(0.40)			
1.00-1.45	C		2	Loose red-brown sandy gravel. Gravel is predominantly fine to medium brick (MADE GROUND)		1.00			
1.30	J/V	J1/V1							
				Very soft black slightly gravelly sandy silty clay with a slight to moderate hydrocarbon odour. Gravel is predominantly fine to medium brick, siltstone and quartzite (MADE GROUND)		(1.00)			
2.00-2.45	C		4			2.00			
2.30	J/V	J2/V2		Soft to firm black sandy silty CLAY with a slight hydrocarbon odour (TIDAL FLAT DEPOSITS)					
3.00-3.45	C		4	...becoming damp sandy and very silty below 3.00m		(2.00)			
3.30	J/V	J3/V3							
4.00-4.45	C		17	End of Borehole at 4.00 m		4.00			

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client: Rokeby Merchant (Gloucester) Ltd**	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 13/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS7

Jackson purdue lever

8 Pride Point Drive
Pride Park
Derby
DE24 8BX

Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS8

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete (MADE GROUND)		0.20			
0.40	D	T1		Loose yellow sandy gravel. Gravel is predominantly fine to coarse limestone (MADE GROUND)		(0.40) 0.60			
0.80	J/V	J1/V1				0.70			
1.00-1.45	C		7	Firm black-brown sandy gravel. Gravel is predominantly fine to medium brick and ash (MADE GROUND)		0.90			
1.00	D	T2							
1.60	J/V	J2/V2		Loose brown wet sandy gravel. Gravel is predominantly fine to medium quartzite (MADE GROUND)					
2.00-2.45	C		11	Firm becoming stiff grey-green slightly gravelly silty CLAY. Gravel is predominantly fine to medium subrounded quartzite with root remains (TIDAL FLAT DEPOSITS) ...becoming less gravelly below 2.00m					
2.00	D	T3							
3.00-3.45	C		14			(4.10)			
4.00-4.45	C		16	...with occasional shell remains below 4.00m					
5.00-5.45	C		22			5.00			
				End of Borehole at 5.00 m					

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester

Client: Rokeby Merchant (Gloucester) Ltd

Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig	**Drawing Ref:** WS8
Date: 14/04/2015	**Approved:**		**Scale:** 1:50	

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS9

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete (MADE GROUND)		0.18			
						0.30			
0.60	J/V	J1/V1		Loose yellow-brown sandy gravel of limestone (MADE GROUND)		(0.30)			
						0.60			
				Loose brown sandy gravel. Gravel is predominantly fine to medium sandstone, quartzite, brick and ash (MADE GROUND)		(0.40)			
1.00-1.45	C		5			1.00			
1.10	J/V	J2/V2		Firm brown silty clay with pockets of ash (MADE GROUND)					
2.00-2.45	C		3	Soft to firm becoming stiff grey-green silty CLAY (TIDAL FLAT DEPOSITS) ...becoming blue-grey below 2.00m ...with frequent wood remains between 2.00m and 3.50m					
2.10-2.50	J/V	J3/V3							
3.00-3.45	C		11			(4.00)			
3.10	J/V	J4/V4							
4.00-4.45	C		19					▽	
				...with shell remains below 4.50m					
5.00-5.45	C		21			5.00			
				End of Borehole at 5.00 m					

Remarks:

1.Borehole sides stable.
2.Water encountered at 4.00m
3.Plain pipe with bentonite seal installed from ground level to 1.00m, slotted pipe with gravel surround installed from 1.00 to 5.00m.
4.Bung, valve and protective cover installed.

Key:

- D = Disturbed Sample
- U = Undisturbed Sample
- B = Bulk Sample
- J = Jar Sample
- W = Water Sample
- S = Standard Penetration Test (Split Spoon)
- C = Standard Penetration Test (Cone)
- ▽ = Water Strike (m)
- ▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 14/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS9

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS10

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete (MADE GROUND)		0.20			
				Loose black-brown sandy gravel. Gravel is predominantly fine to coarse ash and clinker (MADE GROUND)		(0.80)			
1.00-1.45	C		7			1.00			
1.20	J/V	J1/V1		Firm becoming stiff dark grey becoming grey-brown silty sandy CLAY (TIDAL FLAT DEPOSITS)					
				...becoming less sandy below 1.60m					
2.00-2.45	C		12			(2.00)			
3.00-3.45	C		16			3.00			
				End of Borehole at 3.00 m					

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client: Rokeby Merchant (Gloucester) Ltd**		
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig	**Drawing Ref:** WS10
Date: 14/04/2015	**Approved:**		**Scale:** 1:50	

Jackson purdue lever

8 Pride Point Drive
Pride Park
Derby
DE24 8BX

Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS11

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
0.60-1.05	C		50	Concrete (MADE GROUND) Loose black to red-brown sandy gravel with brick cobbles (MADE GROUND) End of Borehole at 0.70 m		0.20 (0.50) 0.70			

Remarks:
1.Borehole sides stable.
2.No water encountered.
3.Borehole terminated at 0.70m due to an obstruction.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client: Rokeby Merchant (Gloucester) Ltd**		
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig	**Drawing Ref:** WS11
Date: 14/04/2015	**Approved:**		**Scale:** 1:50	

Jackson purdue lever

8 Pride Point Drive
Pride Park
Derby
DE24 8BX

Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS11A

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete (MADE GROUND)		0.20			
						(0.50)			
0.70-1.15	C		50	Loose black to red-brown sandy gravel with brick cobbles (MADE GROUND)		0.70			
				End of Borehole at 0.70 m					

Remarks:
1.Borehole sides stable.
2.No water encountered.
3.Borehole terminated at 0.70m due to an obstruction.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 14/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS11A

Jackson purdue lever

8 Pride Point Drive
Pride Park
Derby
DE24 8BX

Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS12

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete		0.20			
0.40	D	T1		(MADE GROUND)					
				Loose black sandy gravel. Gravel is predominantly fine to medium ash, clinker and occasional quartzite		(0.70)			
1.00-1.45	C		4	(MADE GROUND)		0.90			
1.00	D	T2							
1.30-1.70	B	B1		Very soft black to grey slightly gravelly silty CLAY. Gravel is predominantly fine to medium subangular to subrounded quartzite and sandstone					
				(TIDAL FLAT DEPOSITS)					
2.00-2.45	C		1					▽	
3.00-3.45	C		1			(4.10)			
4.00-4.45	C		11						
4.00	D	T3							
5.00-5.45	C		10			5.00			
				End of Borehole at 5.00 m					

Remarks:

1.Borehole sides stable.
2.Water encountered at 2.00m
3.Plain pipe with bentonite seal installed from ground level to 1.00m, slotted pipe with gravel surround installed from 1.00 to 5.00m.
4.Bung, valve and protective cover installed.

Key:

- D = Disturbed Sample
- U = Undisturbed Sample
- B = Bulk Sample
- J = Jar Sample
- W = Water Sample
- S = Standard Penetration Test (Split Spoon)
- C = Standard Penetration Test (Cone)
- ▽ = Water Strike (m)
- ▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 14/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS12

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS13

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
0.30	D	T1		Reinforced concrete (MADE GROUND)		0.20 (0.30)			
0.60	D	T2		Loose black-brown sandy gravel. Gravel is predominantly fine to medium ash, clinker and quartzite (MADE GROUND)		0.50 (0.40)			
1.00-1.45	C		6			0.90			
1.00	D	T3		Firm grey-brown to black silty gravelly clay. Gravel is predominantly fine to medium ash, brick and quartzite (MADE GROUND)					
2.00-2.45	C		4	Firm becoming stiff grey-green slightly gravelly silty CLAY with localised root remains. Gravel is predominantly fine to medium and calcareous (TIDAL FLAT DEPOSITS)					
3.00-3.45	C		9			(4.10)			
3.00	D	T4		...with rare shell fragments below 3.00m					
4.00-4.45	C		11					▽	
5.00-5.45	C		14			5.00			
				End of Borehole at 5.00 m					

Remarks:
1.Borehole sides stable.
2.Water encountered at 4.00m.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester

Client: Rokeby Merchant (Gloucester) Ltd

Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 14/04/2015	**Approved:**		**Scale:** 1:50

Drawing Ref: WS13

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS14

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Concrete		0.20			
				(MADE GROUND)					
0.40	D	T1		Loose black sandy gravel. Gravel is predominantly fine to medium ash, clinker with occasional quartzite and brick (MADE GROUND)		(0.40)			
0.70-1.00	B	B1				0.60			
0.80	D	T2							
1.00-1.45	C		15						
				Stiff becoming very stiff brown-grey mottled slightly sandy silty CLAY (BLUE LIAS & CHARMOUTH MUDSTONE FORMATION)					
1.80	D	T3							
2.00-2.45	C		15						
						(4.40)			
3.00-3.45	C		18						
4.00-4.45	C		28						
5.00-5.45	C		35			5.00			
				End of Borehole at 5.00 m					

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester

Client: Rokeby Merchant (Gloucester) Ltd

Logged:	Checked:	Field Book Ref:	Plant:	Drawing Ref:
GJS		GJS15/01	Competitor Rig	WS14
Date: 14/04/2015	Approved:		Scale: 1:50	

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS15

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
0.30	D	T1		Concrete (MADE GROUND)		0.20			
				Soft to firm brown gravelly sandy silty clay. Gravel is predominantly fine to medium brick, sandstone and quartzite (MADE GROUND)		(0.70)			
1.00-1.45	C		7			0.90			
1.00	D	T2		Firm becoming stiff green-brown to grey slightly gravelly silty sandy CLAY with occasional root remains. Gravel is predominantly fine to medium and calcareous (TIDAL FLAT DEPOSITS)					
2.00-2.45	C		11			(2.10)			
2.00	D	T3							
3.00-3.45	C		20			3.00			
				Firm to very stiff dark grey silty CLAY with frequent fine shell fragments (BLUE LIAS & CHARMOUTH MUDSTONE FORMATION)					
4.00-4.45	C		7			(2.00)			
5.00-5.45	C		30			5.00			
5.00	D	T4		End of Borehole at 5.00 m					

Remarks:
1.Borehole sides stable.
2.No water encountered.
3.Plain pipe with bentonite seal installed from ground level to 1.00m, slotted pipe with gravel surround installed from 1.00 to 5.00m.
4.Bung, valve and protective cover installed.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 14/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS15

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS16

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Loose grey sandy gravel. Gravel is predominantly fine to medium and igneous with ash and brick (MADE GROUND)		(0.40)			
0.50	D	T1				0.40			
				Firm to stiff brown to grey-brown silty clay (MADE GROUND)		(0.60)			
1.00-1.45	C		5			1.00			
1.10	D	T2		Firm becoming stiff grey-green to grey silty CLAY (TIDAL FLAT DEPOSITS)					
1.50-2.00	B	B1							
2.00-2.45	C		10			(2.00)			
3.00-3.45	C		14			3.00			
3.10	D	T3		Stiff grey silty CLAY with shell fragments (BLUE LIAS & CHARMOUTH MUDSTONE FORMATION)					
4.00-4.45	C		13			(2.00)			
5.00-5.45	C		50/275mm	End of Borehole at 5.00 m		5.00			

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 15/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS16

Jackson purdue lever

8 Pride Point Drive
Pride Park
Derby
DE24 8BX

Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS17

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
0.20	D	T1		Loose black sandy clayey gravel. Gravel is predominantly fine to medium ash and occasional brick (MADE GROUND)		(0.30) 0.30			
0.60	D/J/V	T2/J1/V1		Firm to stiff grey-green silty clay with ash pockets (MADE GROUND)		(0.70) 1.00			
1.00-1.45	C		13						
1.30-1.70 1.30	B D/J/V	B1 T3/J2/V2		Stiff grey-green to grey silty CLAY with occasional root remains (BLUE LIAS & CHARMOUTH MUDSTONE FORMATION)		(1.30) 2.30			
2.00-2.45	C		18						
2.40	D	T4		Very weak grey destructured silty MUDSTONE (BLUE LIAS & CHARMOUTH MUDSTONE FORMATION)					
3.00-3.45	C		30	...becoming distinctly weathered below 3.50m		(1.70) 4.00			
4.00-4.45	C		50/230mm	End of Borehole at 4.00 m					

Remarks:

1.Borehole sides stable.
2.No water encountered.
3.Plain pipe with bentonite seal installed from ground level to 1.00m, slotted pipe with gravel surround installed from 1.00 to 4.00m.
4.Bung, valve and protective cover installed.

Key:

- D = Disturbed Sample
- U = Undisturbed Sample
- B = Bulk Sample
- J = Jar Sample
- W = Water Sample
- S = Standard Penetration Test (Split Spoon)
- C = Standard Penetration Test (Cone)
- ▽ = Water Strike (m)
- ▼ = Steady Water Level (m)

Project: Bakers Quay, Gloucester		**Client:** Rokeby Merchant (Gloucester) Ltd	
Logged: GJS	**Checked:**	**Field Book Ref:** GJS15/01	**Plant:** Competitor Rig
Date: 15/04/2015	**Approved:**		**Scale:** 1:50
			Drawing Ref: WS17

Jackson purdue lever
8 Pride Point Drive
Pride Park
Derby
DE24 8BX
Tel: 01332 364675
Fax: 01332 344780
Email: enquiries@jacksonpl.co.uk
Web: www.jacksonpl.co.uk

WS18

Project No. RDL00415

Sheet 1 of 1

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Red brick (MADE GROUND)		(0.40)			
						0.40			
0.50	D	T1		Loose sandy gravel. Gravel is predominantly fine to medium concrete and occasional brick (MADE GROUND)		(0.40)			
0.90	D	T2				0.80			
1.00-1.45	C		16	Stiff grey to brown silty CLAY with mudstone lithorelicts (BLUE LIAS & CHARMOUTH MUDSTONE FORMATION)					
						(1.70)			
2.00-2.45	C		15						
2.50-2.80	B	B1		Very weak grey destructured silty MUDSTONE (BLUE LIAS & CHARMOUTH MUDSTONE FORMATION)		2.50			
3.00-3.45	C		35						
						(1.50)			
	C		50/285mm	End of Borehole at 4.00 m		4.00			

Remarks:
1.Borehole sides stable.
2.No water encountered.

Key:
D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
▽ = Water Strike (m)
▼ = Steady Water Level (m)

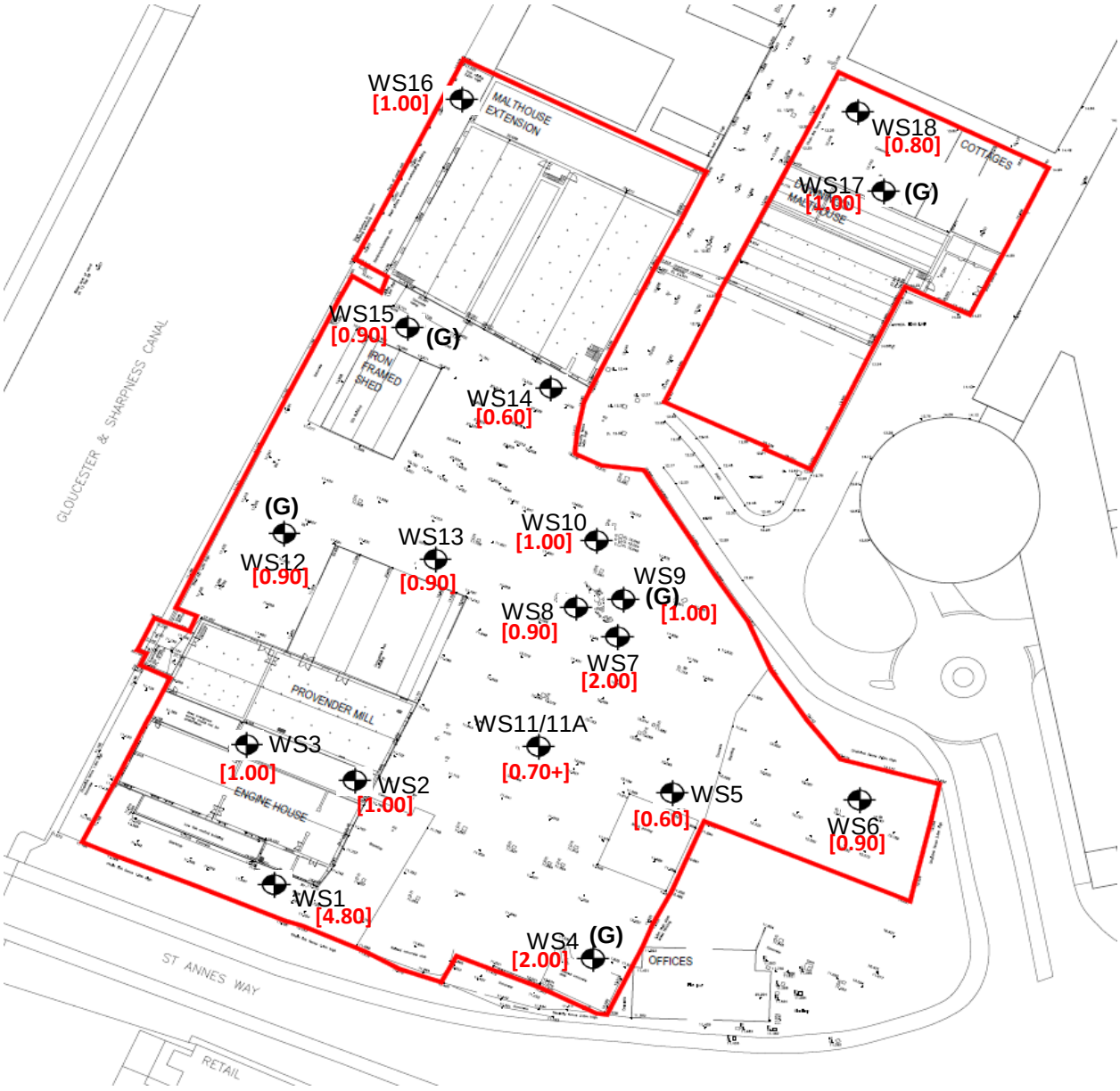
Project: Bakers Quay, Gloucester

Client: Rokeby Merchant (Gloucester) Ltd

Logged: GJS	Checked:	Field Book Ref: GJS15/01	Plant: Competitor Rig	Drawing Ref: WS18
Date: 15/04/2015	Approved:		Scale: 1:50	

APPENDIX V

Plan Indicating the Approximate Depth of the Made Ground



KEY

WS	WINDOW SAMPLE BOREHOLE
(G)	GAS MONITORING INSTALLATION
[1.00]	DEPTH OF MADE GROUND (m)

NB: All locations shown are approximate

Extract of *'Existing Site Layout Plan'* Ref. SK-EX-01 dated 04/12/14

Project No.	RDL00415	Drawn	GJS
Client	Rokeby Merchant (Gloucester) Ltd	Checked	
Project	Bakers Quay Gloucester	Approved	
		Scale	NTS
		Date Drawn	09/06/2015
Title	Plan Indicating the Approximate Depth of the Made Ground	Rev.	

Figure No.RDL00415/04

Jackson purdue lever

APPENDIX VI

Laboratory Test Results

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL15/2015

Client's Reference: Report Date: 06 May 2015

Client Name: GeoDyne
The Granary
Church Lane
Thrumpton
Notts
NG11 0AX

For the attention of: Gareth Smith

Contract Title: Bakers Quay

Date Received: 23/4/2015
Date Commenced: 23/4/2015
Date Completed: 6/5/2015

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
M Beastall (Laboratory Manager)

D Lambe (Senior Technician)
S Royle (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WS4			2.10-2.50	Brown slightly gravelly slightly sandy CLAY.
WS5			1.00-1.40	Brown slightly sandy CLAY.
WS12			1.30-1.70	Brown mottled grey slightly sandy CLAY.
WS14			0.70-1.00	Brown mottled grey slightly sandy CLAY.
WS18			2.50-2.80	Grey mottled brown slightly sandy CLAY.

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	06/05/15		06/05/15		06/05/15

BAKERS QUAY.

Contract No: PSL15/2015

Client Ref: 33011

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WS4			2.10-2.50	33				63	27	36	99	High plasticity CH.
WS5			1.00-1.40	35				61	26	35	100	High plasticity CH.
WS12			1.30-1.70	43				60	27	33	100	High plasticity CH.
WS14			0.70-1.00	24				60	26	34	100	High plasticity CH.
WS18			2.50-2.80	25				59	27	32	100	High plasticity CH.

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

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	06/05/15		06/05/15		06/05/15

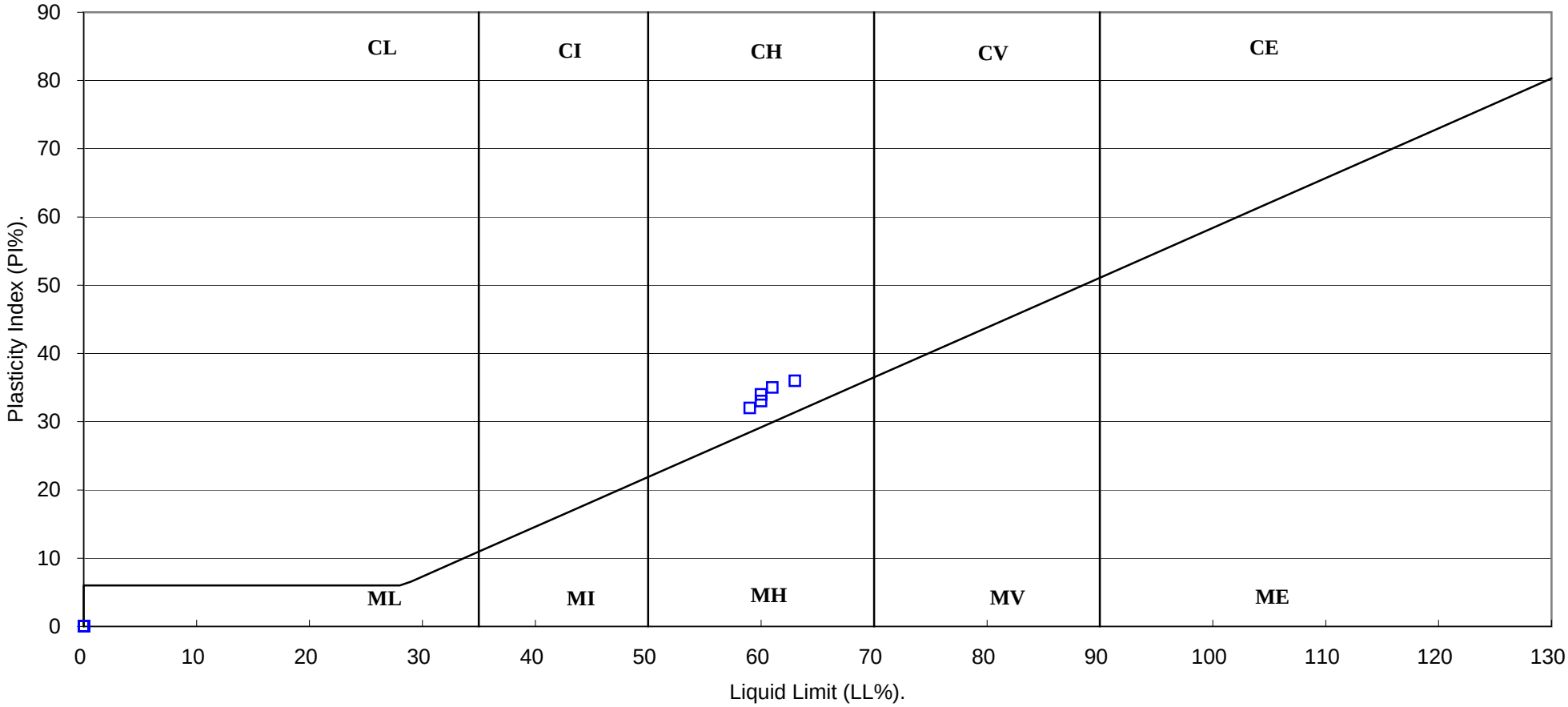
BAKERS QUAY.

Contract No: **PSL15/2015**

Client Ref: **33011**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



PSL Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		06/05/15		06/05/15		06/05/15
	BAKERS QUAY.				Contract No:	PSL15/2015
					Client Ref:	33011

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Report Number: 471383-2

Date of Report: 28-Apr-2015

Customer: Geodyne Ltd
The Granary
Church Lane
Thrumpton
Nottinghamshire
NG11 0AX

Customer Contact: Mr Gareth Smith

Customer Job Reference: 33011
Customer Purchase Order: 33011/GJS
Date Job Received at SAL: 17-Apr-2015
Date Analysis Started: 21-Apr-2015
Date Analysis Completed: 28-Apr-2015

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22

1549

Report checked and authorised by :
Chris Murphy
Project Manager

Issued by :
Chris Murphy
Project Manager

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
MCERTS Preparation

				SAL Reference	**471383 001**	**471383 002**	**471383 003**	**471383 004**	**471383 005**
				Customer Sample Reference	**WS2**	**WS4**	**WS6**	**WS8**	**WS12**
				Depth	**0.7**	**0.7**	**0.5**	**0.4**	**0.4**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
MCERTS Classification	T143	AR							
Moisture @ 105 C	T162	AR	0.1	%	**22**	**20**	**24**	**6.9**	**8.0**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
MCERTS Preparation

				SAL Reference	**471383 006**	**471383 007**	**471383 008**	**471383 009**	**471383 010**
				Customer Sample Reference	**WS15**	**WS16**	**WS17**	**WS3**	**WS5**
				Depth	**0.3**	**0.5**	**0.2**	**1.1**	**1.1**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
MCERTS Classification	T143	AR							
Moisture @ 105 C	T162	AR	0.1	%	**22**	**18**	**17**	**24**	**28**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
MCERTS Preparation

				SAL Reference	**471383 011**	**471383 012**	**471383 013**	**471383 014**	**471383 015**
				Customer Sample Reference	**WS14**	**WS18**	**WS1**	**WS2**	**WS3**
				Depth	**0.8**	**0.9**	**0.8**	**0.9**	**0.7**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
MCERTS Classification	T143	AR							
Moisture @ 105 C	T162	AR	0.1	%	**18**	**20**	**5.9**	**28**	**34**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
MCERTS Preparation

				SAL Reference	**471383 016**	**471383 017**	**471383 018**	**471383 019**	**471383 020**
				Customer Sample Reference	**WS7**	**WS7**	**WS7**	**WS8**	**WS9**
				Depth	**0.8**	**1.3**	**2.3**	**1.6**	**1.1**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
MCERTS Classification	T143	AR							
Moisture @ 105 C	T162	AR	0.1	%	**26**	**19**	**24**	**20**	**22**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
MCERTS Preparation

	SAL Reference	471383 021	471383 022	471383 023	471383 024
	Customer Sample Reference	WS9	WS10	WS17	WS17
	Depth	2.1	1.2	0.6	1.3
	Date Sampled	13-APR-2015	13-APR-2015	13-APR-2015	13-APR-2015
	Type	Clay	Clay	Clay	Clay

Determinand	Method	Test Sample	LOD	Units				
MCERTS Classification	T143	AR						
Moisture @ 105 C	T162	AR	0.1	%	**26**	**19**	**21**	**18**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
Miscellaneous

	SAL Reference	471383 001	471383 005	471383 007	471383 008	471383 013
	Customer Sample Reference	WS2	WS12	WS16	WS17	WS1
	Depth	0.7	0.4	0.5	0.2	0.8
	Date Sampled	13-APR-2015	13-APR-2015	13-APR-2015	13-APR-2015	13-APR-2015
	Type	Sandy Soil	Sandy Soil	Clay	Sandy Soil	Sandy Soil

Determinand	Method	Test Sample	LOD	Units					
Asbestos ID	T27	AR			N.D.	N.D.	-	N.D.	-
Chloride	T686	AR	1	mg/kg	**4**	-	**38**	-	**2**
Hg (Inorganic)	T605	AR	1	mg/kg	**12**	-	<1	-	**4**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
Miscellaneous

	SAL Reference	471383 023	471383 025	471383 026	471383 027	471383 028
	Customer Sample Reference	WS17	WS1	WS5	WS14	WS13
	Depth	0.6	0.2	0.4	0.4	0.3
	Date Sampled	13-APR-2015	13-APR-2015	13-APR-2015	13-APR-2015	13-APR-2015
	Type	Clay				

Determinand	Method	Test Sample	LOD	Units					
Asbestos ID	T27	AR			-	N.D.	-	-	-
Chloride	T686	AR	1	mg/kg	-	-	**2**	**5**	-
Hg (Inorganic)	T605	AR	1	mg/kg	<1	-	**120**	**2**	-
(Water Soluble) SO4 expressed as SO4	T242	AR	0.01	g/l	-	-	-	-	**0.04**
pH	T7	AR			-	-	-	-	**8.1**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
Miscellaneous

	SAL Reference	471383 031	471383 032
	Customer Sample Reference	WS12	WS15
	Depth	4.0	2.0
	Date Sampled	13-APR-2015	13-APR-2015
	Type		

Determinand	Method	Test Sample	LOD	Units		
(Water Soluble) SO4 expressed as SO4	T242	AR	0.01	g/l	**0.04**	**0.07**
pH	T7	AR			**7.5**	**8.1**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
Geodyne Suite 1

				SAL Reference	**471383 001**	**471383 002**	**471383 003**	**471383 004**	**471383 005**
				Customer Sample Reference	**WS2**	**WS4**	**WS6**	**WS8**	**WS12**
				Depth	**0.7**	**0.7**	**0.5**	**0.4**	**0.4**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	M40	2	mg/kg	**46**	**35**	**41**	**7**	**25**
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	**1**
Chromium	T6	M40	1	mg/kg	**13**	**14**	**30**	**5**	**21**
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Copper	T6	M40	1	mg/kg	**110**	**160**	**63**	**4**	**210**
Lead	T6	M40	1	mg/kg	**420**	**310**	**95**	**7**	**200**
Mercury	T6	M40	1	mg/kg	**12**	**69**	**2**	<1	**3**
Nickel	T6	M40	1	mg/kg	**47**	**43**	**33**	**5**	**40**
pH	T7	AR			**8.2**	**9.7**	**8.3**	**8.6**	**8.0**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Total Organic Carbon	T21	M40	0.1	%	**8.2**	**8.5**	**1.5**	**3.8**	**17**
Zinc	T6	M40	1	mg/kg	**380**	**140**	**99**	**13**	**270**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
Geodyne Suite 1

				SAL Reference	**471383 006**	**471383 007**	**471383 008**	**471383 009**	**471383 010**
				Customer Sample Reference	**WS15**	**WS16**	**WS17**	**WS3**	**WS5**
				Depth	**0.3**	**0.5**	**0.2**	**1.1**	**1.1**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	M40	2	mg/kg	**12**	**12**	**28**	**22**	**15**
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**23**	**29**	**21**	**49**	**34**
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1
Copper	T6	M40	1	mg/kg	**43**	**27**	**210**	**23**	**26**
Lead	T6	M40	1	mg/kg	**150**	**22**	**450**	**27**	**38**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	**72**
Nickel	T6	M40	1	mg/kg	**25**	**32**	**51**	**33**	**25**
pH	T7	AR			**8.3**	**7.8**	**8.0**	**7.5**	**7.9**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Total Organic Carbon	T21	M40	0.1	%	**3.9**	**1.2**	**20**	**1.1**	**0.7**
Zinc	T6	M40	1	mg/kg	**120**	**63**	**340**	**100**	**76**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
Geodyne Suite 1

SAL Reference	**471383 011**	**471383 012**
Customer Sample Reference	**WS14**	**WS18**
Depth	**0.8**	**0.9**
Date Sampled	**13-APR-2015**	**13-APR-2015**
Type	**Clay**	**Clay**

Determinand	Method	Test Sample	LOD	Units		
Arsenic	T6	M40	2	mg/kg	**7**	**6**
Cadmium	T6	M40	1	mg/kg	<1	<1
Chromium	T6	M40	1	mg/kg	**25**	**25**
Chromium VI	T6	AR	1	mg/kg	<1	<1
Copper	T6	M40	1	mg/kg	**26**	**19**
Lead	T6	M40	1	mg/kg	**18**	**12**
Mercury	T6	M40	1	mg/kg	**2**	<1
Nickel	T6	M40	1	mg/kg	**33**	**26**
pH	T7	AR			**8.0**	**8.1**
Selenium	T6	M40	3	mg/kg	<3	<3
Total Organic Carbon	T21	M40	0.1	%	**0.7**	**1.9**
Zinc	T6	M40	1	mg/kg	**58**	**46**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
GeoDyne USEPA16 PAHs

SAL Reference	**471383 001**	**471383 002**	**471383 003**	**471383 004**	**471383 005**
Customer Sample Reference	**WS2**	**WS4**	**WS6**	**WS8**	**WS12**
Depth	**0.7**	**0.7**	**0.5**	**0.4**	**0.4**
Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
Type	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**

Determinand	Method	Test Sample	LOD	Units					
Naphthalene	T207	M105	0.1	mg/kg	<0.1	**0.6**	<0.1	<0.1	**9.6**
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	**0.6**	<0.1	<0.1	**0.5**
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	**2.5**
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	**3.9**
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	**2.0**	<0.1	<0.1	**15**
Anthracene	T207	M105	0.1	mg/kg	<0.1	**0.9**	<0.1	<0.1	**5.2**
Fluoranthene	T207	M105	0.1	mg/kg	<0.1	**10**	**0.2**	**0.5**	**18**
Pyrene	T207	M105	0.1	mg/kg	<0.1	**11**	**0.2**	**0.5**	**15**
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1	**6.4**	<0.1	**0.2**	**5.8**
Chrysene	T207	M105	0.1	mg/kg	<0.1	**5.4**	<0.1	**0.2**	**5.0**
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1	**6.7**	<0.1	**0.3**	**4.5**
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1	**3.8**	<0.1	**0.2**	**2.6**
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1	**5.6**	<0.1	**0.2**	**3.6**
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	**2.5**	<0.1	**0.2**	**1.3**
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	**2.2**	<0.1	**0.2**	**1.4**
PAH(total)	T207	M105	0.1	mg/kg	<0.1	**59**	**0.4**	**2.5**	**94**
Dibenzo(ah)Anthracene	T99	AR	0.10	mg/kg	<0.10	**0.90**	<0.10	<0.10	**0.48**

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
GeoDyne USEPA16 PAHs

				SAL Reference	**471383 006**	**471383 007**	**471383 008**	**471383 009**	**471383 010**
				Customer Sample Reference	**WS15**	**WS16**	**WS17**	**WS3**	**WS5**
				Depth	**0.3**	**0.5**	**0.2**	**1.1**	**1.1**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**	**Sandy Soil**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	**0.4**	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	**0.2**	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	**0.6**	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	**0.9**	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	**0.1**	<0.1	**6.2**	**0.3**	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	**4.2**	**0.5**	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	**0.3**	**0.2**	**42**	**1.4**	<0.1
Pyrene	T207	M105	0.1	mg/kg	**0.3**	**0.1**	**36**	**1.0**	<0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	**13**	**0.4**	<0.1
Chrysene	T207	M105	0.1	mg/kg	<0.1	<0.1	**11**	**0.6**	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1	**13**	**0.4**	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1	**6.6**	**0.3**	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	**9.7**	**0.3**	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	**4.9**	**0.2**	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	<0.1	**6.5**	**0.2**	<0.1
PAH(total)	T207	M105	0.1	mg/kg	**0.7**	**0.3**	**160**	**5.6**	<0.1
Dibenzo(ah)Anthracene	T99	AR	0.10	mg/kg	<0.10	<0.10	**1.10**	<0.10	<0.10

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
GeoDyne USEPA16 PAHs

				SAL Reference	**471383 011**	**471383 012**
				Customer Sample Reference	**WS14**	**WS18**
				Depth	**0.8**	**0.9**
				Date Sampled	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	<0.1
Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1
Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1
Chrysene	T207	M105	0.1	mg/kg	<0.1	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	<0.1
PAH(total)	T207	M105	0.1	mg/kg	<0.1	<0.1
Dibenzo(ah)Anthracene	T99	AR	0.10	mg/kg	<0.10	<0.10

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
TPH UKCWG

				SAL Reference	**471383 013**	**471383 014**	**471383 015**	**471383 016**	**471383 017**
				Customer Sample Reference	**WS1**	**WS2**	**WS3**	**WS7**	**WS7**
				Depth	**0.8**	**0.9**	**0.7**	**0.8**	**1.3**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Sandy Soil**	**Clay**	**Sandy Soil**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Benzene	T209	M105	10	µg/kg	(13,110) <20	(13) <10	(13) <10	(13) <10	(13) <10
Toluene	T209	M105	10	µg/kg	(110) <20	<10	<10	<10	<10
EthylBenzene	T209	M105	10	µg/kg	(110) <20	<10	<10	<10	<10
Methyl tert-Butyl Ether	T209	M105	10	µg/kg	(110) <20	<10	<10	<10	<10
O Xylene	T209	M105	10	µg/kg	(110) <20	<10	<10	<10	<10
M/P Xylene	T209	M105	10	µg/kg	(110) <20	<10	<10	<10	<10
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	(110) <0.200	<0.100	<0.100	<0.100	<0.100
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	(110) <0.20	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	(110) <0.20	<0.10	<0.10	<0.10	<0.10
TPH (C10-C12 aliphatic)	T206	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (C12-C16 aliphatic)	T206	M105	2	mg/kg	<2	<2	<2	<2	<2
TPH (C16-C21 aliphatic)	T206	M105	1	mg/kg	**5**	**2**	<1	<1	**3**
TPH (C21-C35 aliphatic)	T206	M105	4	mg/kg	<4	<4	<4	<4	<4
TPH (C35-C44 aliphatic)	T8	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (Aliphatic) total	T85	M105		mg/kg	**5.3**	<4.0	<4.0	<4.0	<4.0
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	(110) <0.20	<0.10	<0.10	<0.10	<0.10
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	(110) <0.20	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	(110) <0.20	<0.10	<0.10	<0.10	**0.32**
TPH (C10-C12 aromatic)	T206	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (C12-C16 aromatic)	T206	M105	1	mg/kg	**3**	<1	<1	<1	**2**
TPH (C16-C21 aromatic)	T206	M105	1	mg/kg	**42**	<1	**6**	<1	<1
TPH (C21-C35 aromatic)	T206	M105	1	mg/kg	**210**	**2**	**20**	<1	<1
TPH (C35-C44 aromatic)	T8	M105	1	mg/kg	**12**	<1	**1**	<1	<1
TPH (Aromatic) total	T85	M105		mg/kg	**260**	**2.0**	**27**	<1.0	**1.9**
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	**270**	<4.0	**27**	<4.0	<4.0

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
TPH UKCWG

				SAL Reference	**471383 018**	**471383 019**	**471383 020**	**471383 021**	**471383 022**
				Customer Sample Reference	**WS7**	**WS8**	**WS9**	**WS9**	**WS10**
				Depth	**2.3**	**1.6**	**1.1**	**2.1**	**1.2**
				Date Sampled	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**	**Clay**	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Benzene	T209	M105	10	µg/kg	**(13) 21**	(13) <10	(13) <10	(13) <10	(13) <10
Toluene	T209	M105	10	µg/kg	**24**	<10	<10	<10	<10
EthylBenzene	T209	M105	10	µg/kg	**86**	<10	<10	<10	<10
Methyl tert-Butyl Ether	T209	M105	10	µg/kg	<10	<10	<10	<10	<10
O Xylene	T209	M105	10	µg/kg	**280**	<10	<10	<10	<10
M/P Xylene	T209	M105	10	µg/kg	**120**	<10	<10	<10	<10
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	<0.100	<0.100	<0.100	<0.100	<0.100
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C10-C12 aliphatic)	T206	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (C12-C16 aliphatic)	T206	M105	2	mg/kg	<2	<2	<2	<2	<2
TPH (C16-C21 aliphatic)	T206	M105	1	mg/kg	**3**	<1	<1	<1	<1
TPH (C21-C35 aliphatic)	T206	M105	4	mg/kg	<4	<4	<4	<4	<4
TPH (C35-C44 aliphatic)	T8	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (Aliphatic) total	T85	M105		mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	**0.65**	<0.10	<0.10	<0.10	<0.10
TPH (C10-C12 aromatic)	T206	M105	1	mg/kg	**2**	<1	<1	<1	<1
TPH (C12-C16 aromatic)	T206	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (C16-C21 aromatic)	T206	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (C21-C35 aromatic)	T206	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (C35-C44 aromatic)	T8	M105	1	mg/kg	<1	<1	<1	<1	<1
TPH (Aromatic) total	T85	M105		mg/kg	**2.2**	<1.0	<1.0	<1.0	<1.0
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0

SAL Reference: 471383
Customer Reference: 33011

Soil Analysed as Soil
TPH UKCWG

				SAL Reference	**471383 023**	**471383 024**
				Customer Sample Reference	**WS17**	**WS17**
				Depth	**0.6**	**1.3**
				Date Sampled	**13-APR-2015**	**13-APR-2015**
				Type	**Clay**	**Clay**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Benzene	T209	M105	10	µg/kg	(13) <10	(13) <10
Toluene	T209	M105	10	µg/kg	<10	<10
EthylBenzene	T209	M105	10	µg/kg	<10	<10
Methyl tert-Butyl Ether	T209	M105	10	µg/kg	<10	<10
O Xylene	T209	M105	10	µg/kg	<10	<10
M/P Xylene	T209	M105	10	µg/kg	<10	<10
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	<0.100	<0.100
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C10-C12 aliphatic)	T206	M105	1	mg/kg	<1	<1
TPH (C12-C16 aliphatic)	T206	M105	2	mg/kg	<2	<2
TPH (C16-C21 aliphatic)	T206	M105	1	mg/kg	<1	<1
TPH (C21-C35 aliphatic)	T206	M105	4	mg/kg	<4	<4
TPH (C35-C44 aliphatic)	T8	M105	1	mg/kg	<1	<1
TPH (Aliphatic) total	T85	M105		mg/kg	<4.0	<4.0
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	<0.10	<0.10
TPH (C10-C12 aromatic)	T206	M105	1	mg/kg	<1	<1
TPH (C12-C16 aromatic)	T206	M105	1	mg/kg	<1	<1
TPH (C16-C21 aromatic)	T206	M105	1	mg/kg	<1	<1
TPH (C21-C35 aromatic)	T206	M105	1	mg/kg	<1	<1
TPH (C35-C44 aromatic)	T8	M105	1	mg/kg	<1	<1
TPH (Aromatic) total	T85	M105		mg/kg	<1.0	<1.0
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	<4.0	<4.0

Index to symbols used in 471383-2

Value	Description
AR	As Received
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
N.D.	Not Detected
110	LOD raised due to low internal standard recovery.
13	Results have been blank corrected.
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos

Method Index

Value	Description
T85	Calc
T162	Grav (1 Dec) (105 C)
T206	GC/FID (MCERTS)
T209	GC/MS(Head Space)(MCERTS)
T27	PLM

T143	Process
T99	GC/MS (LV)
T6	ICP/OES
T8	GC/FID
T207	GC/MS (MCERTS)
T242	2:1 Extraction/ICP/OES (TRL 447 T1)
T21	OX/IR
T7	Probe
T605	ICP/OES (Inorganic Mercury)
T686	Discrete Analyser

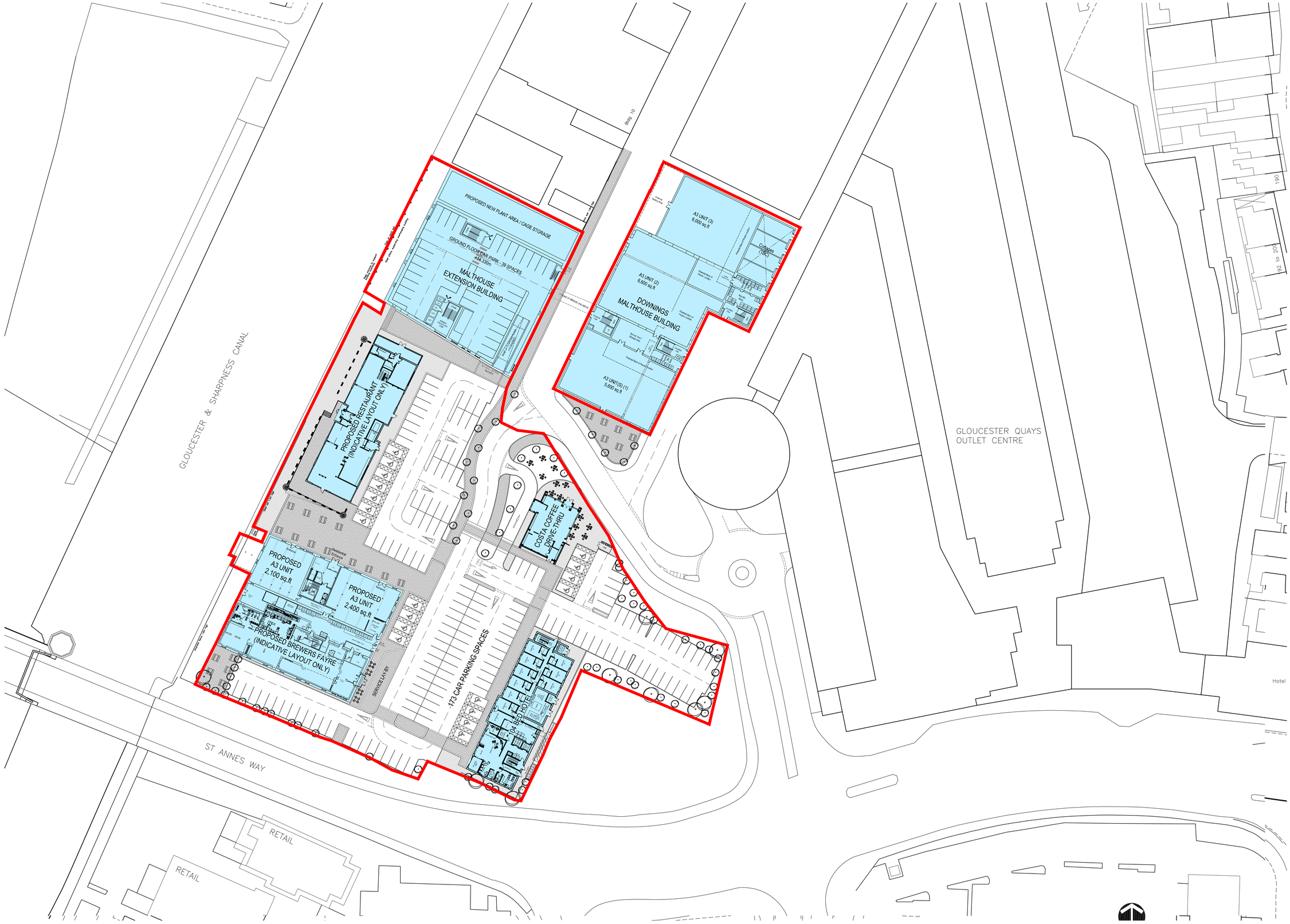
Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos ID	T27	AR			SU	001,005,008,025
Chloride	T686	AR	1	mg/kg	N	001,007,013,026-027
Hg (Inorganic)	T605	AR	1	mg/kg	N	001,007,013,023,026-027
(Water Soluble) SO4 expressed as SO4	T242	AR	0.01	g/l	N	028,031-032
pH	T7	AR			U	028,031-032
Arsenic	T6	M40	2	mg/kg	M	001-012
Cadmium	T6	M40	1	mg/kg	M	001-012
Chromium	T6	M40	1	mg/kg	M	001-012
Chromium VI	T6	AR	1	mg/kg	N	001-012
Copper	T6	M40	1	mg/kg	M	001-012
Lead	T6	M40	1	mg/kg	M	001-012
Mercury	T6	M40	1	mg/kg	M	001-012
Nickel	T6	M40	1	mg/kg	M	001-012
pH	T7	AR			M	001-012
Selenium	T6	M40	3	mg/kg	M	001-012
Total Organic Carbon	T21	M40	0.1	%	N	001-012
Zinc	T6	M40	1	mg/kg	M	001-012
Naphthalene	T207	M105	0.1	mg/kg	M	001-012
Acenaphthylene	T207	M105	0.1	mg/kg	U	001-012
Acenaphthene	T207	M105	0.1	mg/kg	M	001-012
Fluorene	T207	M105	0.1	mg/kg	M	001-012
Phenanthrene	T207	M105	0.1	mg/kg	M	001-012
Anthracene	T207	M105	0.1	mg/kg	U	001-012
Fluoranthene	T207	M105	0.1	mg/kg	M	001-012
Pyrene	T207	M105	0.1	mg/kg	M	001-012
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	001-012
Chrysene	T207	M105	0.1	mg/kg	M	001-012
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	M	001-012
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	M	001-012
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	001-012
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	001-012
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	001-012
PAH(total)	T207	M105	0.1	mg/kg	U	001-012
Dibenzo(ah)Anthracene	T99	AR	0.10	mg/kg	M	001-012
MCERTS Classification	T143	AR			M	001-024
Moisture @ 105 C	T162	AR	0.1	%	N	001-024
Benzene	T209	M105	10	µg/kg	M	013-024
Toluene	T209	M105	10	µg/kg	M	013-024
EthylBenzene	T209	M105	10	µg/kg	M	013-024
Methyl tert-Butyl Ether	T209	M105	10	µg/kg	M	013-024
O Xylene	T209	M105	10	µg/kg	M	013-024
M/P Xylene	T209	M105	10	µg/kg	M	013-024
TPH (C5-C6 aliphatic)	T209	M105	0.100	mg/kg	N	013-024
TPH (C6-C8 aliphatic)	T209	M105	0.10	mg/kg	N	013-024
TPH (C8-C10 aliphatic)	T209	M105	0.10	mg/kg	N	013-024
TPH (C10-C12 aliphatic)	T206	M105	1	mg/kg	M	013-024
TPH (C12-C16 aliphatic)	T206	M105	2	mg/kg	M	013-024
TPH (C16-C21 aliphatic)	T206	M105	1	mg/kg	M	013-024
TPH (C21-C35 aliphatic)	T206	M105	4	mg/kg	M	013-024
TPH (C35-C44 aliphatic)	T8	M105	1	mg/kg	N	013-024
TPH (Aliphatic) total	T85	M105		mg/kg	N	013-024
TPH (C6-C7 aromatic)	T209	M105	0.10	mg/kg	N	013-024
TPH (C7-C8 aromatic)	T209	M105	0.10	mg/kg	N	013-024
TPH (C8-C10 aromatic)	T209	M105	0.10	mg/kg	N	013-024
TPH (C10-C12 aromatic)	T206	M105	1	mg/kg	N	013-024
TPH (C12-C16 aromatic)	T206	M105	1	mg/kg	M	013-024

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
TPH (C16-C21 aromatic)	T206	M105	1	mg/kg	M	013-024
TPH (C21-C35 aromatic)	T206	M105	1	mg/kg	M	013-024
TPH (C35-C44 aromatic)	T8	M105	1	mg/kg	N	013-024
TPH (Aromatic) total	T85	M105		mg/kg	N	013-024
TPH (Aliphatic+Aromatic) (sum)	T85	M105		mg/kg	N	013-024

APPENDIX VII

Development Masterplan



1 Proposed Site Layout Plan
1:500 @ A1

XREF'S IN THIS DRAWING

Notes:

- Please note that the proposals are based on indicative historic survey information. Proposals are therefore indicative, subject to the issue of more detailed survey information.
- The survey information for the Malthouse Building is incomplete and as such the details shown have been based partly on OS data and should not be relied upon. The missing information is to be confirmed in due course.
- The extent of the demolition shall be reviewed on advice of specialist designers and relevant bodies.
- Existing window locations have been retained in plan however they may need to be realigned in height and/or width to suit floor levels, etc. The extent of windows should also be reviewed and considered in line with minimum lux levels for residential use. The introduction of new windows may also be required within the existing facade.
- Whilst the initial proposals show an intention to retain the main building envelope, English Heritage and relevant bodies may object or recommend further changes.
- Collective operator requirements will have to be reviewed and amended accordingly. Operator requirements will be implemented where possible.
- The extent of the existing structure and roof removals required as part of this scheme are to be agreed and confirmed in due course. Further discussion with the structural engineer is required.
- Further survey information is required to ascertain detailed external levels and existing floor levels. Levels shown currently are indicative only.
- The external surface finishes and landscaping will need to be subject to further detailed design which will need to be agreed with the local authority and English Heritage.
- The legal requirements for the overlap of the proposed site and the adjacent canal trust in relation to access and surface finishes, etc. needs to be identified and agreed with the canal trust.

Car Parking Schedule:

External car parking:

Disabled spaces	-	19
Standard spaces	-	154
Total external	-	173

(Of which 70 spaces are reserved for the proposed hotel patrons).

Malthouse extension car parking:

Basement level	-	38
Ground floor level	-	36
Total m.e. spaces	-	74

Total development spaces:

Disabled spaces	-	19
Standard spaces	-	228
Total spaces	-	247

No.	Date	Description	Drwn/Chkd By
B	27/02/15	LAYOUT UPDATED TO REFLECT THE LATEST BUILDING PROPOSALS	PA/AJD
A	17/02/15	MASTERPLAN UPDATED TO INCLUDE LATEST BUILDING LAYOUTS.	DB/PA

CLIENT
Rokeby Developments

PROJECT
Bakers Quay
Gloucester

TITLE
Proposed Masterplan

DRAWING STATUS
Sketch

DRAWN	PA	CHECKED	AJD
SCALE	1:500 @ A1		
DATE	12/12/14		

wcec architects
Chesterfield 01246 260261 | London 020 7404 6569 | Leeds 0113 3366018 | Livingston 08700 555915
email@wcec.co.uk www.wcec.co.uk

JOB NO.	DRAWING NO.	REV
10-305	SK-MP-01	B

APPENDIX VIII

Gas Monitoring Results

Project No.	RDL00415
Client	Rokeby Merchant (Gloucester) Ltd
Site Location	Bakers Quay, Gloucester
Date	29/04/2015
Weather	Clear and warm
Atmospheric Pressure Range (mb)	1010
Equipment	GEO09 & Dipmeter
Operator	RM

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.		**Methane (% v/v)**	**Carbon Dioxide (% v/v)**	**Oxygen (% v/v)**	**Gas Flow (l/hr)**	**Depth to Groundwater (m begl)**	**Time to steady reading (secs)**	**Other Issues i.e. odour, condition of installation, etc**
WS4	**Peak**	0.0	0.6	20.1	0.0	2.75	10	Monitored for 120 Seconds
	Steady	0.0	0.6	20.1	0.0			
WS9	**Peak**	0.0	0.3	19.5	0.0	0.85	31	Monitored for 120 Seconds
	Steady	0.0	0.2	19.5	0.0			
WS12	**Peak**	3.7	1.9	13.8	0.0	0.72	35	Monitored for 120 Seconds
	Steady	3.7	1.9	13.8	0.0			
WS15	**Peak**	0.0	0.2	19.5	0.0	0.88	15	Monitored for 120 Seconds
	Steady	0.0	0.2	19.5	0.0			
WS17	**Peak**	0.0	1.2	19.2	0.0	NGW	20	Monitored for 120 Seconds
	Steady	0.0	1.1	19.2	0.0			
Ambient		0.0	0.0	20.7	0.0			

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)
NA - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No Groundwater Encountered

Project No.	RDL00415
Client	Rokeby Merchant (Gloucester) Ltd
Site Location	Bakers Quay, Gloucester
Date	08/05/2015
Weather	Overcast
Atmospheric Pressure Range (mb)	1010
Equipment	GEO09 & Dipmeter
Operator	RM

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.		**Methane (% v/v)**	**Carbon Dioxide (% v/v)**	**Oxygen (% v/v)**	**Gas Flow (l/hr)**	**Depth to Groundwater (m begl)**	**Time to steady reading (secs)**	**Other Issues i.e. odour, condition of installation, etc**
WS4	**Peak**	0.0	0.7	19.8	0.0	2.70	5	Monitored for 120 Seconds
	Steady	0.0	0.7	19.8	0.0			
WS9	**Peak**	0.0	0.3	19.0	0.0	0.73	25	Monitored for 120 Seconds
	Steady	0.0	0.3	19.0	0.0			
WS12	**Peak**	0.2	2.6	8.1	0.0	0.52	65	Monitored for 120 Seconds
	Steady	0.2	2.6	8.1	0.0			
WS15	**Peak**	0.0	0.0	20.4	0.0	0.35	0	Monitored for 120 Seconds
	Steady	0.0	0.0	20.4	0.0			
WS17	**Peak**	0.0	0.0	20.4	0.0	0.67	0	Monitored for 120 Seconds
	Steady	0.0	0.0	20.4	0.0			
Ambient		0.0	0.0	20.4	0.0			

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)
NA - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No Groundwater Encountered

Project No.	RDL00415
Client	Rokeby Merchant (Gloucester) Ltd
Site Location	Bakers Quay, Gloucester
Date	14/05/2015
Weather	Heavy Rain
Atmospheric Pressure Range (mb)	1008
Equipment	GEO09 & Dipmeter
Operator	RM

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.		**Methane (% v/v)**	**Carbon Dioxide (% v/v)**	**Oxygen (% v/v)**	**Gas Flow (l/hr)**	**Depth to Groundwater (m begl)**	**Time to steady reading (secs)**	**Other Issues i.e. odour, condition of installation, etc**
WS4	**Peak**	0.0	0.5	20.1	0.0	2.54	10	Monitored for 120 Seconds
	Steady	0.0	0.5	20.1	0.0			
WS9	**Peak**	0.0	0.9	18.7	0.0	0.75	26	Monitored for 120 Seconds
	Steady	0.0	0.9	18.7	0.0			
WS12	**Peak**	0.1	0.5	19.1	0.0	0.54	15	Monitored for 120 Seconds
	Steady	0.1	0.5	19.1	0.0			
WS15	**Peak**	0.0	0.0	20.5	0.0	0.83	0	Monitored for 120 Seconds
	Steady	0.0	0.0	20.5	0.0			
WS17	**Peak**	0.0	0.0	20.5	0.0	0.67	0	Monitored for 120 Seconds
	Steady	0.0	0.0	20.5	0.0			
Ambient		0.0	0.0	20.5	0.0			

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)
NA - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No Groundwater Encountered

Project No.	RDL00415
Client	Rokeby Merchant (Gloucester) Ltd
Site Location	Bakers Quay, Gloucester
Date	22/05/2015
Weather	Clear, warm
Atmospheric Pressure Range (mb)	1023
Equipment	GEO09 & Dipmeter
Operator	RM

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.		**Methane (% v/v)**	**Carbon Dioxide (% v/v)**	**Oxygen (% v/v)**	**Gas Flow (l/hr)**	**Depth to Groundwater (m begl)**	**Time to steady reading (secs)**	**Other Issues i.e. odour, condition of installation, etc**
WS4	**Peak**	0.0	0.5	19.5	0.0	2.73	10	Monitored for 120 Seconds
	Steady	0.0	0.5	19.5	0.0			
WS9	**Peak**	0.0	0.7	18.2	0.0	0.77	25	Monitored for 120 Seconds
	Steady	0.0	0.4	18.8	0.0			
WS12	**Peak**	0.3	1.4	16.4	0.0	0.65	24	Monitored for 120 Seconds
	Steady	0.3	1.4	16.4	0.0			
WS15	**Peak**	0.0	0.0	19.2	0.0	0.83	0	Monitored for 120 Seconds
	Steady	0.0	0.0	19.2	0.0			
WS17	**Peak**	0.0	0.0	20.3	0.0	0.69	0	Monitored for 120 Seconds
	Steady	0.0	0.0	20.3	0.0			
Ambient		0.0	0.0	20.3	0.0			

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)
NA - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No Groundwater Encountered

Project No.	RDL00415
Client	Rokeby Merchant (Gloucester) Ltd
Site Location	Bakers Quay, Gloucester
Date	27/05/2015
Weather	Sunny
Atmospheric Pressure Range (mb)	1018
Equipment	GEO09 & Dipmeter
Operator	GJS

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.		**Methane (% v/v)**	**Carbon Dioxide (% v/v)**	**Oxygen (% v/v)**	**Gas Flow (l/hr)**	**Depth to Groundwater (m begl)**	**Time to steady reading (secs)**	**Other Issues i.e. odour, condition of installation, etc**
WS4	**Peak**	0.0	0.4	19.4	0.0	2.73	25	Monitored for 120 Seconds
	Steady	0.0	0.4	19.4	0.0			
WS9	**Peak**	0.0	0.6	18.0	0.0	0.79	25	Monitored for 120 Seconds
	Steady	0.0	0.6	18.9	0.0			
WS12	**Peak**	0.1	0.2	19.4	0.0	0.69	20	Monitored for 120 Seconds
	Steady	0.1	0.2	19.4	0.0			
WS15	**Peak**	0.0	0.0	19.9	0.0	0.88	10	Monitored for 120 Seconds
	Steady	0.0	0.0	19.9	0.0			
WS17	**Peak**	0.0	0.0	20.6	0.0	0.69	10	Monitored for 120 Seconds
	Steady	0.0	0.0	20.6	0.0			
Ambient		0.0	0.0	20.3	0.0			

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)
NA - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No Groundwater Encountered

Project No.	RDL00415
Client	Rokeby Merchant (Gloucester) Ltd
Site Location	Bakers Quay, Gloucester
Date	03/06/2015
Weather	Clear, warm
Atmospheric Pressure Range (mb)	1022
Equipment	GEO09 & Dipmeter
Operator	RM

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.		**Methane (% v/v)**	**Carbon Dioxide (% v/v)**	**Oxygen (% v/v)**	**Gas Flow (l/hr)**	**Depth to Groundwater (m begl)**	**Time to steady reading (secs)**	**Other Issues i.e. odour, condition of installation, etc**
WS4	**Peak**	0.0	0.4	20.0	0.0	2.77	10	Monitored for 120 Seconds
	Steady	0.0	0.4	20.0	0.0			
WS9	**Peak**	0.0	0.5	19.3	0.0	0.74	15	Monitored for 120 Seconds
	Steady	0.0	0.5	19.3	0.0			
WS12	**Peak**	0.2	0.3	18.7	0.0	0.62	35	Monitored for 120 Seconds
	Steady	0.2	0.3	18.7	0.0			
WS15	**Peak**	0.0	0.0	19.8	0.0	0.67	0	Monitored for 120 Seconds
	Steady	0.0	0.0	19.8	0.0			
WS17	**Peak**	0.0	0.0	20.2	0.0	0.84	0	Monitored for 120 Seconds
	Steady	0.0	0.0	20.2	0.0			
Ambient		0.0	0.0	20.3	0.0			

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)
NA - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No Groundwater Encountered

APPENDIX IX

Plates

Project No.	RDL00415	Drawn	GJS	Plate No. 1
Client	Rokeby Merchant (Gloucester) Ltd	Checked		
		Approved		
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.
		Date Drawn	09/06/2015	
Title	Views of Window Samples WS1 & WS2	Jackson purdue lever		

Project No.	RDL00415	Drawn	GJS	Plate No. 2
Client	Rokeby Merchant (Gloucester) Ltd	Checked		
		Approved		
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.
		Date Drawn	09/06/2015	
Title	Views of Window Samples WS4 & WS5	Jackson purdue lever		

Project No.	RDL00415	Drawn	GJS	Plate No. 3
Client	Rokeby Merchant (Gloucester) Ltd	Checked		
		Approved		
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.
		Date Drawn	09/06/2015	
Title	Views of Window Samples WS7 & WS9	Jackson purdue lever		

WS9 - Wood remains in the Natural Strata at 2.50m begl

WS9 - Wood remains in the Natural Strata at 2.50m begl

Project No.	RDL00415	Drawn	GJS	Plate No. 4	
Client	Rokeby Merchant (Gloucester) Ltd	Checked			
		Approved			
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.	
		Date Drawn	09/06/2015		
Title	Views of Window Sample WS9 Arisings	Jackson purdue lever			

Project No.	RDL00415	Drawn	GJS	Plate No. 5	
Client	Rokeby Merchant (Gloucester) Ltd	Checked			
		Approved			
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.	
		Date Drawn	09/06/2015		
Title	Views of Window Samples WS17 & WS18	Jackson purdue lever			

View of the concrete silo looking northeast

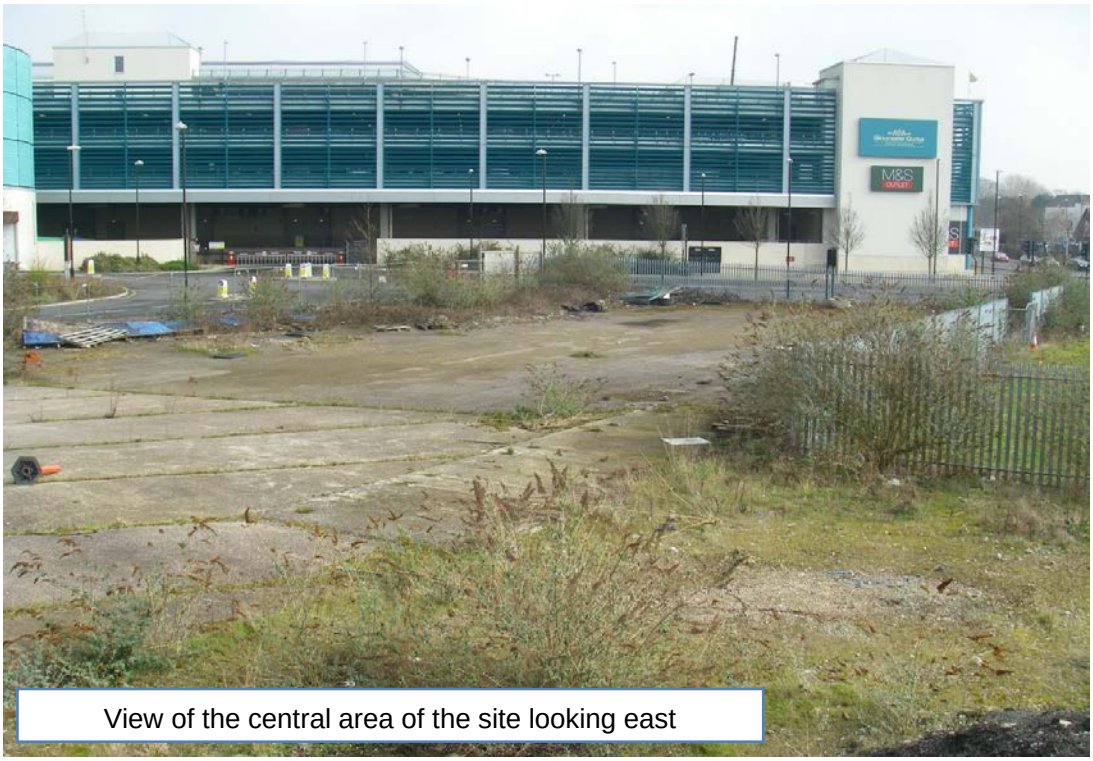
View of the central area of the site looking west

Project No.	RDL00415	Drawn	GJS	Plate No. 6	
Client	Rokeby Merchant (Gloucester) Ltd	Checked			
		Approved			
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.	
		Date Drawn	09/06/2015		
Title	Site Views	Jackson purdue lever			

View of the underground fuel storage tank covers and pump island

View of the central area of the site looking northwest

Project No.	RDL00415	Drawn	GJS	Plate No. 7	
Client	Rokeby Merchant (Gloucester) Ltd	Checked			
		Approved			
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.	
		Date Drawn	09/06/2015		
Title	Site Views	Jackson purdue lever			



View of the central area of the site looking east

View of the central area of the site looking southwest

Project No.	RDL00415	Drawn	GJS	Plate No. 8	
Client	Rokeby Merchant (Gloucester) Ltd	Checked			
		Approved			
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.	
		Date Drawn	09/06/2015		
Title	Site Views	Jackson purdue lever			

View of the yard in the northern parcel of the site

View of the northern parcel of the site looking southwest

Project No.	RDL00415	Drawn	GJS	Plate No. 9	
Client	Rokeby Merchant (Gloucester) Ltd	Checked			
		Approved			
Project	Bakers Quay, Gloucester	Scale	NTS	Rev.	
		Date Drawn	09/06/2015		
Title	Site Views	Jackson purdue lever			

APPENDIX X

Conditions & Limitations

Conditions & Limitations

Phase I Desk Studies

1. Works undertaken to provide the basis of the Phase I Desk Study report comprise a review of information available from a number of sources/parties (potentially also including the Client) together with a walk over of the site (where applicable and included within the quotation). The opinions given in the Phase I Desk Study are based on the information available from third parties/sources that has been obtained within the available timeframe. Jackson Purdue Lever assumes all third party information to be true and correct and therefore cannot accept liability for the accuracy of such information supplied.

2. Should additional information become available that may affect the comments and opinions made within the Phase I Desk Study, Jackson Purdue Lever reserves the right to review such information and make modifications to comments/opinions as appropriate.

3. It should be borne in mind that a Phase I Desk Study collates available information to generate a conceptual model of the site. The actual geotechnical and environmental considerations can only be fully quantified by intrusive investigation works to confirm the accuracy of the conceptual site model.

Phase II Intrusive Investigations

1. Our quotation assumes that access to the site will be arranged by others at no cost to ourselves.

2. We have assumed that free access is available throughout to the entire site and that works can be undertaken during a single mobilisation. Where restricted access is encountered, or where additional unscheduled mobilisations are required, additional costs may be incurred to the client.

3. We have assumed that all available information relating to buried services will be supplied by the Client at no cost to ourselves. No responsibility will be accepted for damage to underground services that have not been brought to our prior attention by the Client.

4. All excavations/boreholes will be backfilled with compacted arisings upon completion, with any excess arisings left proud of ground levels. Excess arisings will not be removed from the site unless specifically requested by the Client. Where we are requested to remove excess arisings, all associated costs will be passed to the Client.

5. We will attempt to leave the site in a clean and tidy state, however, it must be understood that some disturbance of the site is unavoidable during intrusive works.

6. Exploratory holes are positioned approximately on site by Jackson Purdue Lever. Should the client require precise locations of all exploratory points, additional fees will be incurred. It must be borne in mind that backfilled trial pits can create 'soft spots', therefore, should the Client wish to designate 'no dig' zones, for example under the footprint of proposed structures, these must be brought to our attention prior to commencement of works.

7. Groundwater observations relate to conditions encountered at the time of investigation. It must be understood that groundwater levels may vary as a result of recent climatic conditions or seasonal variation.

8. Trial pits and boreholes examine only a small proportion of the total site area. No liability can be accepted for conditions not revealed in exploratory holes, particularly between positions. All extrapolations of available data are given in good faith.

Payment

1. Payment terms are strictly 28 days from the invoice date.

2. Prior to commencement of works, we require receipt of formal written instruction from the party accepting full financial responsibility for the work. In the absence of such an instruction, we would expect the instructing Consulting Engineers/Architects to accept full financial responsibility for the works.

3. Receipt of instruction to commence work shall be taken as acceptance and compliance of the foregoing conditions.

Liability

1. No individual liability shall be implied to, or accepted by, any employee for works undertaken for and on the behalf of Jackson Purdue Lever.