



Report prepared at
Bevin, Bevin & Co. Ltd
Brewery Hill,
Arundel
West Sussex
BN18 9DH

Report prepared for
Blackwall Reilly Limited

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Report Quality Management

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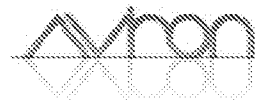
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1.0 PROJECT AND SITE INFORMATION

1.1 APPOINTMENT

Aviron Associates Limited (Aviron) was retained by Reilly Construction Limited (the “Client”) to undertake a Phase II Geo-Environmental Risk Assessment (GERA) of the following premises:

Bevin, Bevin & Co. Ltd, Brewery Hill, Arundel, West Sussex, BN18 9DH (hereafter referred to as the “site”).

The purpose of this Phase II GERA is to report on a ground investigation in order to address planning condition 15 of Arun District Council planning permission AB/104/13.

The ground investigation has been designed to evaluate risks identified within a previously issued Desk Study and Conceptual Site Model report (undertaken by others, see below) and Ground Investigation Report which was prepared by Aviron in December 2014 (see below).

This assessment shall include reference to previous reports and provide an updated conceptual site model, recommendations for any further investigation and as necessary remediation strategies.

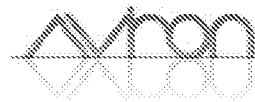
Aviron has relied upon information received from the Client and their agents as accurate, unless contradicted by written documentation or site observations.

1.2 THE SITE

Table 1.2 provides a summary of site details and surrounding area.

Table 1.2 - Site Details

Site Location	The site is located on Brewery Hill, between Tarrant Street, Arun Street and River Road, in the centre of Arundel, West Sussex approximately 20m to the north of the River Arun. The site is surrounded by premises fronting Tarrant Street to the north, Brewery Hill to the east, River Road to the south and Arun Street to the west.
National Grid Ref.	Centred at approximately 501713 106983.
Current Land Use	The site is currently given to the vacated buildings of Bevin, Bevin & Co. Ltd, formerly the Eagle Brewery. The existing buildings on site comprise the Grade II listed brewery, barrel stores and cart stores. External surfacing across the site is given mainly to concrete.
Surrounding Land Use	The site is located within an essentially residential area, with commercial premises to the north fronting Tarrant Street.

**Proposed Land Use**

It is proposed to refurbish and convert the existing buildings into seven new residential units and to part rebuild/demolish and construct six new one, two and three bedroom units with either garden areas or as mews.

Figure 1 is presented as the Proposed Development Plan.

1.3 PREVIOUS REPORTS AND INITIAL SITE CONCEPTUALISATION

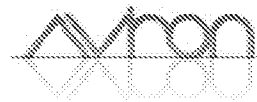
Prior to reviewing this report the following preceding and most relevant reports, which has been prepared by Land Science (provided by the client) and Aviron, should be reviewed;

- ✦ Land Science (Brighton) Limited, Desk Study and Conceptual Site Model (Phase I), for T Hollister (Chertsey) Ltd, project reference LS 0550, dated July 2012.
- ✦ Aviron Associates Limited, Ground Investigation Report (GIR), for Reilly Construction Limited, project reference 14-322.01, dated December 2014.

Based on the above 'Desk Study and Conceptual Site Model' (Phase I) the following provides a summary of the site's geo-environmental setting;

1.3.1 Contaminative (Land Science – Phase I)

- ✦ The site is currently given to a number of vacated and part derelict commercial premises formerly used as a brewery, workshops and stores of Bevin, Bevin & Co. Ltd, formerly the Eagle Brewery.
- ✦ Historical searches indicate that the site was developed as Eagle Brewery and terraced housing by the time of the earliest Ordnance Survey mapping of 1876; however the origins of the brewery possibly date back to 1785. The brewery is shown to have occupied the entire site by 1912 in the approximate current day layout.
- ✦ No significant historical development in the immediate surrounding area with exception of timber yard 10m to the east and a ship yard 30m to the south.
- ✦ A former above ground (diesel) storage tank (AST) was reputed to have been located in the centre of the site, adjacent an in-situ interceptor; and a dis-used underground (petrol) storage tank (UST) is located along the southern boundary.
- ✦ A series of wells reputed to have been filled and capped should be expected inside the eastern site boundary.



- ✦ The underlying superficial and solid geology of Raised Marine Deposits and Spetisbury Chalk Member are listed as a secondary (A) aquifer and a principal aquifer respectively.
- ✦ The site is not located within a source protection zone (SPZ).
- ✦ River Arun 20m to the south of the site.
- ✦ The site is not located in an area at risk of flooding.
- ✦ No landfills noted within 250m of the site. Radon protection not required. No significant sources of ground gas within influencing distance of on site. Potential for organic ground gas associated with the underlying Raised Marine Deposits.

The site's initial conceptual model is presented within the 'Phase I report' which considered an overall environmental risk rating of **MEDIUM-HIGH** as a result of potential risks from historical and existing sources. **MEDIUM** risks are considered in respect of controlled waters.

1.3.2 Geotechnical (Aviron – GIR)

- ✦ Findings of the GIR indicate that Made Ground (soft and firm clay, and very loose to loose chalk) extends beneath the site to depths of between 1.60m and 2.00m bgl. This is shown to overlie soft and very soft to soft becoming soft silty CLAY (Raised Marine Deposits) to a depth of 5.00m+ bgl.
- ✦ The Raised Marine Deposits may be suitable for soakaway drainage, however shallow ground expected at depths of between 1.0m and 2.0m bgl.
- ✦ Conventional trench fill foundations are not considered to be viable due to very low shear strength and hence bearing resistance.
- ✦ Piled foundations are likely to be required to support the proposed development buildings.

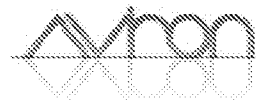
1.4 INVESTIGATION OBJECTIVE

The objective of this investigation and in accordance with Client instructions was to complete an;

- ✦ Evaluation of soil contamination, principally within overlying Made Ground and underlying natural strata.
- ✦ Evaluation of bulk hazardous ground (bio) gases and groundwater levels within borehole installations.



-
- ✦ Evaluation of 'deep' ground conditions and soil properties in respect of new foundations.



2.0 INVESTIGATION WORK

2.1 METHOD STATEMENT AND SITE INVESTIGATION APPROACH

A method statement detailing how the site investigation was to be conducted was produced in accordance with current statutory guidance, best practices and the Client's instructions.

A health and safety plan was completed before site work commenced. Site investigation staff were briefed on the potential contaminants likely to be encountered, and the appropriate personal protective equipment (PPE) to be adopted for this type of investigation.

The site investigation was conducted in accordance with British Standards; BS5930:1999 including amendment 2 'Code of Practice for site Investigation', and BS1377:1990 'Method of test for soils for Civil Engineering Purposes and BS10175:2011 'Investigation of Potentially Contaminated sites'.

The investigation focused on the following objectives as set out in Section 1.4 of this report.

2.2 SITE INVESTIGATION METHODS

Cable and percussion drilling and trial pitting were employed in order to assess the ground conditions at the site and to compliment the findings of the window sample drilling undertaken during the GIR.

An Exploratory Hole Location Plan is enclosed as **Figure 2**.

Cable and Percussion Drilling

One cable and percussion borehole (BH1) was completed on 16 January 2015 using a Pilcon Wayfarer cable and percussion drilling rig to a depth of 16.7m bgl. The borehole was located centrally within the site to provide coverage for the proposed development assuming piled foundations would be required.

Standard Penetration Tests (SPTs) were undertaken at 1.0m intervals within the borehole to 10m bgl and 2.0m intervals to 16.2m bgl in accordance with BS EN ISO 22476-3 "Standard Penetration Test 2005".

Geochemical testing was scheduled on selected samples as defined within section 3.0 of this report. Disturbed geotechnical soil samples were collected for geotechnical material property laboratory tests also as defined within section 3.0.



Trial Pitting

Four machine excavated trial pits (TP1-TP4) were completed using a Kubota tracked mini 360° excavator, supplied by the client on 22 January 2015 to depths of up to 2.00m bgl. The trial pits were excavated at various locations to enable soil samples to be collected and submitted for geochemical contamination laboratory tests. Trial pits were located spatially across the site and also targeted towards the AST/interceptor (TP3) and UST (TP4). Environmental samples were taken from the overlying Made Ground and natural strata (reworked) in each of the trial pits and submitted for geochemical contamination laboratory tests.

Geochemical testing was scheduled on selected samples as defined within section 3.0 of this report.

2.3 GROUND CONDITIONS

Exploratory Hole Logs are presented within **Appendix I**.

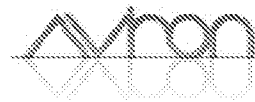
Figures 3 and 4 are presented as Trial Pit Photographs.

Detailed strata descriptions are shown on the respective borehole and trial pit logs though in general ground conditions are included below. The strata descriptions include data obtained during the window sampling in December 2014 (GIR 14-322.01);

- ☛ Concrete to between 0.10-0.20m bgl overlying MADE GROUND comprising soft and firm clay, sand and gravel, and chalk fill to depths of between 1.00m bgl (TP2, BH1) and 1.600m bgl (TP1).
- ☛ Soft and very soft to soft becoming soft silty CLAY (Raised Marine Deposits) to a maximum depth of 7.80m bgl encountered in Borehole BH1.
- ☛ Medium dense and dense GRAVEL to a depth of 12.10m bgl (BH1) (Raised Marine Deposits).
- ☛ CHALK of weathering Grade B (CIRIA C574, 2002) encountered to the termination depth of BH1 at 16.20m bgl.

2.3.1 Field Observations

- ☛ No unusual odours noted during ground investigation works. Localised organic odour noted in Raised Marine Deposits.
- ☛ No evidence of asbestos containing materials (cement fragments) was observed within the arisings.
- ☛ Localised roots and rootlets were observed within the overlying strata.



- ☼ Groundwater was struck within WS1 and WS2 at 2.00m and 1.00m bgl respectively with no rise noted after 20 minutes.
- ☼ Groundwater noted in TP1, TP2, TP3 and TP4 at 1.90m, 1.05m, 1.90m and 1.80m bgl respectively.
- ☼ Groundwater struck in BH1 at 7.80m bgl, rising to 6.50m bgl after 20 minutes.

2.4 MONITORING WELL INSTALLATIONS

As part of this investigation, location BH1 was converted to a monitoring well. Table 2.4 describes the construction of the well.

Table 2.4 Monitoring Well Construction

Location	Depth of plain pipe and bentonite seal (m)	Response zone; depth of slotted pipe with gravel screen (m)	Depth of install (m)
BH1	GL-1.0	1-12.0	12.0

* GL = Ground Level

2.5 SITE MONITORING AND FIELD MEASUREMENTS

2.5.1 Ground Gas Monitoring

In all instances and prior to completing groundwater monitoring and field measurements, bulk ground gases were monitored using a GA5000 Gas Analyser on the dates shown in table 2.5.2.

Results of this monitoring are discussed within Section 6.0 and provided within **Appendix II**.

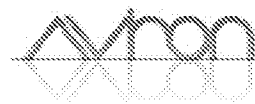
2.5.2 Groundwater Levels

Table 2.5.2 provides standing level groundwater 'dips'.

Table 2.5.2 Groundwater Depths

Location	Depth - m bgl 22.01.15	Depth - m bgl 05.02.15
BH1	1.20	1.08

Field monitoring sheets are enclosed in **Appendix II**.



3.0 LABORATORY ANALYSIS

3.1 SOIL GEOCHEMICAL TESTING

The following soil samples were collected on and submitted for geochemical analysis;

Table 3.1 Soil Geochemical Testing

Strata	No. Samples SUITE 1	No. Samples TPH CWG + BTEX + MTBE	No. Samples LC Suite	No. Samples WAC
Made Ground	6	6	0	1
Natural/reworked	2	1	3	0

Aviron's 'Suite 1' includes the following parameters; arsenic, barium, cadmium, total chromium, copper, nickel, zinc, lead, mercury, selenium, water soluble boron, total cyanide, total sulphate, water soluble sulphate (SO₄), total sulphur, speciated PAH, total phenols and pH.

The TPH CWG (Total Petrol Hydrocarbon Criteria Working Group) suite of analysis contains aromatic and aliphatic TPH speciation, Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) and Methyl Tert-Butyl Ether (MTBE).

Aviron's 'LC Suite' includes the following parameters; total sulphate, water soluble sulphate (SO₄), total sulphur, and pH. This is designed to determine buried concrete classification.

The Full WAC (Waste Acceptance Criteria) provides analysis for the two stage combined WAC test to enable waste soil classification.

The aforementioned analytical suites were chosen to provide a suitable screening in accordance with the potential contaminants identified within the Phase I report.

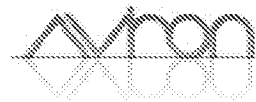
Soil samples for environmental quality analysis were sent to i2 Analytical Limited.

3.2 SOIL GEOTECHNICAL TESTING

The following soil samples were collected and submitted for geotechnical soil classification tests;

- Four samples were submitted for Atterberg limits and moisture content testing.

The purpose of this analysis is to determine plasticity and volume change potential.



- One sample was submitted for particle size distribution analysis.

The purpose of this analysis is to determine the grading of coarse grained soils.

- One sample as submitted for saturation moisture content of chalk

The purpose of this analysis is to determine chalk density.

Soil samples for geotechnical testing were sent to K4 Soils Laboratory.

Laboratory testing was undertaken in accordance with the relevant part and clause of BS1377: 1990.

3.3 SOIL LEACHATE TESTING

Upon fruition of the soil geochemical laboratory results the 'worst affected' samples were identified in terms of heavy metals, metalloids, PAH and hydrocarbon concentrations for the purpose of instructing soil leachate tests. The following analysis was subsequently completed;

- Two soil samples were analysed for Aviron's Suite 1 (leachate)
- One soil sample was analysed for TPH CWG (leachate)

The aforementioned analytical suites were chosen to target the worst effected soils (noting residetially acceptable soil concentrations) and provide a conservative assessment of ground conditions encountered.

3.4 SOIL SAMPLING PROTOCOL

All soil samples were collected from bored and excavated arisings using a trowel and following Aviron's standard protocols for soil sampling. To avoid cross contamination, the sampling equipment was cleaned using de-ionised water after each sample was retrieved. Clean latex gloves were used each time a soil sample was collected, and all samples were placed into clean sterilised jars for submission to the UKAS/MCERTS accredited laboratory.

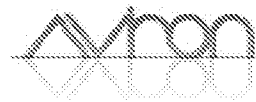
All sample containers were labelled on-site immediately prior to filling. These samples were identified by a label placed on the body of each container and the following information was recorded:

- Site name.
- Date collected.
- Unique sample number.
- Soil sample depth.

Samples for geochemical analysis were then placed into a cool box containing ice packs to maintain



refrigerated conditions following collection and transport to the laboratory. Ice packs were changed every twenty-four hours where necessary to maintain cool conditions and suppression of volatiles.



4.0 ENVIRONMENTAL INTERPRETATIVE GUIDANCE

4.1 GENERIC RISK ASSESSMENT

The purpose of a generic risk assessment is to determine the suitability of the site for the proposed development or is to be used as screening criteria to determine whether a site is contaminated, as defined under Part IIA of the EPA 1990. Parameter concentrations measured in the soil and groundwater through laboratory analysis have been compared with guidance values which are appropriate to the receptor under consideration.

4.2 GUIDANCE USED FOR ASSESSING SOIL CONTAMINATION

The 'Contaminated Land Exposure Assessment' (CLEA) Soil Guideline Values (SGVs) are used for generic assessment purposes for a limited number of chemical determinants. The SGVs have been derived using a combination of toxicological data and assumptions of the land-use (pathways), building stock and soils.

The CLEA Model (version 1.06) developed by the Environment Agency can be used to derive generic guidance values for a number of chemical determinants for which SGVs are still awaiting, using published TOX reports.

For chemical determinants where there are no available SGV, Aviron have applied "The LQM/CIEH S4ULs for Human Health Risk Assessment" published December 2014. The S4ULs (Suitable 4 Use Levels) replaced the previously and widely adopted Generic Assessment Criteria (GACs) that were developed by Land Quality Management (LQM)/CIEH (2nd edition, 2009).

Both guides used the CLEA Model (v1.06, adopted by LQM) together with published chemical physical-chemical data and toxicological information to derive acceptable contaminant concentrations to be used as a screening tool to determine the limit where there would be minimal impact to human health.

LQM acknowledgement for use of S4ULs. ***"Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3275. All rights reserved".***

4.3 GUIDANCE USED FOR THE ASSESSMENT RISK TO CONTROLLED WATERS

In accordance with CLR 11 Model Procedures for the Management of Land Contamination (Defra and EA 2004), environmental quality standards (EQS) and drinking water standards can be used a generic assessment values for controlled water receptors. These criteria are used by the Environment Agency and published within their Chemical Standards Database.

Specifically to this project the 'Driver' which shall be selected as appropriate for determine the most suitable



chemical standard shall be for the protection of aquatic life, specifically game fish. Generally these are the Environmental Quality Standards (EQS) and are 'hardness' related. Where the suitable EQS does not exist the UK Drinking Water Standard (UK DWS) shall be applied to make a conservative assessment.

Application of these standards shall provide a useful screening tool in the absence of other published guidance or site specific detailed risk assessment.

The assessment criteria used to assess the quality of groundwater beneath a given site should take into account the nature of the receptors which could be affected by the groundwater. The most sensitive receptors are regarded as abstractions, particularly for drinking water, followed by surface waters and sensitive ecosystems. Water abstractions shall not be considered for the subject site. Water supply services are also considered a receptor and should be considered where the services are likely to be in direct contact.

The most sensitive receptor at the site is the underlying secondary (A) aquifer (Raised Marine Deposit) and principal aquifer (Chalk) and the River Arun (20m)

Where there are exceedances, the contaminants of concern will be subject to further consideration in a tier 2 assessment using site-specific criteria and the EAs Remedial Target Methodology (RTM) model to further determine risk.

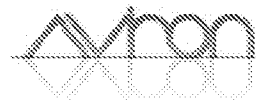
For some of the determinants there may not be a corresponding EQS value with which to assess the identified concentrations. Aviron will apply a hierarchy of guidance to assess the results using, in the first instance the UK DWS and then the Dutch Intervention Values and finally the US EPA Primary Drinking Water Quality Regulations.

4.4 GUIDANCE USED FOR THE ASSESSMENT OF HAZARDOUS GROUND GAS

The principal influence for causing the migration of landgas in the ground is changes to barometric pressure. The most onerous landgas emission conditions on a site are usually observed following days of low or rapidly falling barometric pressure below 1000 millibars (mb). Monitoring is usually performed over a period of several weeks or months in order to increase the chances of visiting the site on days when the conditions for monitoring worst-case results are correct.

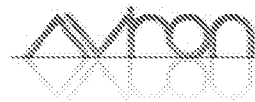
Gas monitoring results collected solely during high pressure conditions (>1000mb) may not provide a true value for worst case emission rates from the site.

Methane is produced by a number of processes, which can be biological or chemical in nature. The principal



process is from the biogenic decay of organic material and is commonly found associated with landfill and organic marsh deposits or river silts. Methane can also be found associated with coal workings. It is explosive at concentrations of between 5 and 15%, with 5% being termed the lower explosive limit (LEL).

In assessing the risks from hazardous ground gas, reference has been made to the guidance from BS 8485:2007 'Code of Practice for the characterization and remediation from ground gas in affected developments' and CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' 2007 which adopts a risk characterisation strategy based on the maximum flow (L/hour) and maximum steady stated concentration (%/v/v) of methane and carbon dioxide from a site to derive gas screening values (GSV) in litres/hour which are comparable with the Modified Wilson and Card classification (shown in Table 8.5 of C665) for any site which isn't intended to be developed as low-rise housing with vented underfloor void.



5.0 ASSESSMENT OF GEOCHEMICAL SOIL RESULTS

For the purpose of this assessment current CLEA SGVs and LQM S4ULs 1% SOM for residential with homegrown produce shall be applied. This is on the basis to allocation of private gardens is unclear.

Laboratory certificates of analysis for soil samples are presented in **Appendix III**.

5.1 HEAVY METALS AND METALLOIDS

During this assessment all concentrations of heavy metals and metalloids have recorded acceptable concentrations when compared to the relevant residential end use assessment.

No further consideration of metals and metalloids soil contamination is considered necessary.

5.2 POLY-CYCLIC AROMATIC HYDROCARBONS

During this assessment generally PAH species have been recorded at acceptable concentrations within the overlying Made Ground and underlying (re-worked Clay) when compared to the relevant residential end use assessment.

No further consideration of PAH soil contamination is considered necessary.

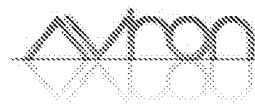
5.3 TOTAL PETROLEUM HYDROCARBONS

During this assessment all concentrations of aromatic and aliphatic TPH were recorded below the corresponding S4ULs with generally 'undetectable' to low concentrations being recorded. It is understood the site has not operated as in a 'vehicle re-fuelling capacity' for a number of years and as such residual fuel/hydrocarbon contamination may have naturally attenuated through microbial action (bio-degradation) within the underlying soils.

It may follow that TPH soil contamination exists directly adjacent to the underground tank/interceptor and directly beneath the above ground tank, which due to the limitation of ground investigation was not possible to detect.

In general terms no further considered of TPH soil contamination is considered necessary.

However, upon site clearance and demolition a discovery strategy should be prepared. This should involve the inspection and identification of fuel/hydrocarbon contamination, specifically in and around underground and above ground fuel tanks and interceptor chamber.



5.4 BTEX AND MTBE

During this assessment BTEX have been recorded at acceptable concentrations within the overlying Made Ground and underlying (re-worked) Clay where all concentrations have been recorded below the laboratory detection limits.

All concentrations of MTBE were recorded below the laboratory detection limited of 1µg/kg

Generally no further consideration of BTEX and MTBE soil contamination should be should be made, *however subsequent testing as part of the tanks and interceptor discovery strategy should include BTEX and MTBE.*

5.5 CYANIDE

Total cyanide was not detected above the laboratory detection limit of 1mg/kg with any of the samples submitted for analysis.

No further consideration of cyanide soil contamination shall be necessary.

5.6 PHENOLS

Total phenols were not detected at concentrations above the laboratory method detection limit of 1mg/kg within any of the samples submitted for analysis.

No further consideration of phenols soil contamination shall be necessary.

5.7 PH

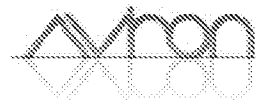
Soils are generally alkaline with pH values being recorded in the range of 8.1 to 9.6.

5.8 WASTE ACCEPTANCE CRITERIA (WAC)

One soil sample was collected from the underlying Made Ground for WAC analysis. Table 5.8 provides suggested waste classifications based on the WAC test results.

Table 5.8 – WAC Waste Classification

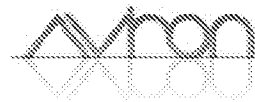
Location (Depth)	Strata Type	WAC Waste Classification
TP1 (0.4m)	Made Ground	Inert waste landfill. Subject to classification from receiving landfill.



The final waste classification should be determined by the receiving landfill and it is advised the soil chemical laboratory results are provided to a haulage contractor to enable formal waste classification and disposal rates.

Generally natural soils are exempt from WAC testing under European Waste Category (EWC) Code 17 05 04 and are automatically classified as inert waste. These must be disposed of at a suitably licensed inert waste landfill or a site that has a valid exemption from the Environmental Permitting (England and Wales) Regulations 2010 registered with the Environment Agency.

Waste classifications should be confirmed by the receiving landfill who will consider the laboratory datasets of soil chemical results and the EWC to complete their classification.



6.0 ASSESSMENT OF LEACHATE CHEMICAL RESULTS

Laboratory certificates of analysis for groundwater samples are presented in **Appendix III**.

A tier 1 assessment has been completed on the laboratory results by applying the UK Drinking Water Standard (UK DWS) followed by freshwater hardness related EQS ($>250\mu\text{g/l}$ CaCO_3 ; based on anticipated hard water typical of southern England). Where exceedances of determinants exists a qualitative risk assessment shall be undertaken which may lead to further detailed quantitative risk assessment.

6.1 HEAVY METALS AND METALLOIDS

During this assessment the majority of concentrations of heavy metals and metalloids are acceptable when compared to the available and adopted chemical standards.

No further elevations of heavy metals and metalloids were identified during comparison to the relevant DWS and EQS.

6.2 POLY-CYCLIC AROMATIC HYDROCARBONS

For the purpose of this assessment and to provide an initial screening in the absence of EQS values the following soil sample has recorded leachate total PAH concentrations in excess of the DWS of $0.2\mu\text{g/l}$;

Table 6.2 – Elevated PAH Concentrations

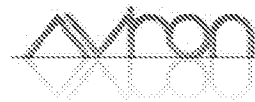
Location (Depth)	Strata Type	PAH Species	Concentration ($\mu\text{g/l}$)	DWS ($\mu\text{g/l}$)
TP2 (0.3m)	MADE GROUND	Total PAH	5.3	0.2

The leachable total PAH concentration recorded within sample TP1 at 1.7m (beneath the water table) was below the laboratory detection limit of $0.2\mu\text{g/l}$

Further consideration of the leachable PAH should be made.

It should be noted that the DWS was applied for this assessment in the absence of a more appropriate (less conservative) published value for the protection of aquatic life. The groundwater beneath the site is considered to be the secondary (a) aquifer (Raised Marine Deposits) and the site is not within a source protection zone.

Soil results have generally recorded PAH concentrations below laboratory detection limits and where detected soil concentrations are considered to be low.



6.3 TOTAL PETROLEUM HYDROCARBONS

For the purpose of this assessment the DWS of 10µg/l has been applied.

The sample tested for leachate has recorded concentrations below the laboratory detection limits of 10µg/l. It is noted TPH concentrations recorded within the soil analysis were not significantly elevated.

Soil results have generally recorded TPH concentrations below laboratory detection limits.

No further consideration of the leachable TPH should be made.

6.4 CYANIDE

During this assessment total cyanide was recorded below the laboratory detection limit of 10µg/l. The DWS for cyanide is 50µg/l.

Concentrations of total cyanide from the soil results were below laboratory detection limits.

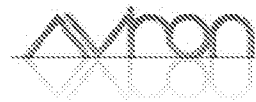
No further consideration of the leachable cyanide should be made.

6.5 PHENOLS

During this assessment all concentrations of total phenols were recorded below the laboratory detection limit of 10µg/l. The DWS for phenols is 0.05µg/l and the EQS is 30µg/l.

Concentrations of phenols from the soil results were below laboratory detection limits.

No further consideration of the leachable phenols should be made.



7.0 HAZARDOUS GROUND GAS MONITORING

Results for the ground gas monitoring are presented within **Appendix II**.

A part of our instruction one round of hazardous ground gas monitoring was be completed during routine post-investigation monitoring.

Monitoring for the presence of bulk hazardous gases has been completed on one occasion (5 February 2015) using a GA5000 Infra-Red Gas Analyser from Geotechnical Instruments Ltd. The flow rate and atmospheric pressure, in millibars (mb), was also measured during the monitoring process.

- ☒ **Methane** was not detected (0.0% v/v) during the single visit.
- ☒ **Carbon dioxide** was not detected (0.0% v/v) during the single visit.
- ☒ **Oxygen** condition was recorded at ambient concentrations with the lowest being 20.9% v/v.
- ☒ **Atmospheric pressure** was recorded at 1021mB during a period of rising pressure.
- ☒ **No flow rate** at 0.0 L/hour was recorded.

No concentrations of methane were recorded within the Lower and Upper Explosive Limit of 5% to 15% v/v as indicated in the NHBC document 'Guidance on Methane and Carbon Dioxide, 2007'. Concentrations of carbon dioxide were recorded above 5%.

Ambient oxygen concentrations were recorded.

Under normal use of the site (i.e. above ground), the risk presented by methane and carbon dioxide is dependent on both the concentrations and the rate of flow. In accordance with Wilson and Card methodology specified in the CIRIA C655 document, gas screening values were determined using the following:

$$GSV \text{ (litres/hour)} = \frac{\text{Maximum steady state concentration (\%)}}{100} \times \text{Flow Rate (litres/hour)}.$$

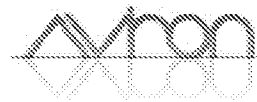
Based on the maximum concentrations and flows recorded, the GSV for methane was 0.0 L/hr and the GSV for carbon dioxide was 0.0 L/hr.

On the basis of the GSVs and their comparison with CIRIA C655, a Characteristic Situation 1 (CS1) was determined on the basis of the maximum carbon dioxide concentrations and flow rates. Characteristic



Situation 1 is interpreted as representing a very low risk, indicating “*natural soils with low organic content and ‘typical’ Made Ground*”, which concurs with the findings of the ground investigation.

It is noted no significant source of hazardous ground gas generation was identified within the desk study (Phase I) report.



8.0 ENVIRONMENTAL RISK SUMMARY

8.1 CONTAMINATION RISK FROM SOIL TO HUMAN HEALTH - END USERS

No visual or olfactory evidence of soil contamination was observed during the site investigation with the exception of an organic odour within the Raised Marine Deposits which is typical of this superficial strata.

The soil sampling and geochemical testing scheme of the in-situ Made Ground and natural soils was completed as part of this assessment which recorded concentrations of a wide variety of determinants below the relevant residential end use criteria.

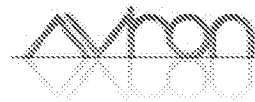
Ordinarily a LOW risk to human health is considered, however, a reputed above ground oil tank adjacent to a in-situ interceptor chamber and also a underground fuel storage tank is (was) located on site. This fuel infrastructure should be removed from site prior to development works and supervised by an environmental consultant. Accordingly a discovery strategy should be implement to manage any soil contamination identified during fuel infrastructure removal works. Upon completion of fuel infrastructure removal and local decontamination works a verification report should be produced to document to process.

As a result of this a **MEDIUM - HIGH** risk is considered to human health from potential, although as yet undiscovered soil contaminants.

8.2 CONTAMINATION RISK FROM SOIL TO HUMAN HEALTH - CONSTRUCTION WORKERS

Concentrations of soil determinants are unlikely to present a short term exposure risk to adult construction workers, specifically from the dermal contact, ingestion and inhalation pathways. Nonetheless construction workers should ensure suitable Personal Protective Equipment (PPE) is worn, in the event previously unidentified 'hotspots' of contamination may exist following site clearance. PPE should include;

-  Gloves to prevent dermal contact. It is advised that disposable latex gloves are worn beneath the outer 'work' gloves. This shall prevent skin contact with any contaminated soils which may come into contact with the 'work' gloves.
-  To prevent ingestion of contaminated soils construction workers should avoid putting hands or objects in their mouth whilst on-site.
-  To prevent ingestion of contaminated soils prior to eating or drinking construction workers should ensure their hands are properly washed, rinsed and dried. The use of latex gloves shall restrict any contaminated soils from coming into contact with the skin.



- ☼ To prevent inhalation of contaminated soils and any locally trapped pockets of vapour (not currently identified) construction workers should wear dust masks on dry and windy days and vapour masks if excavation works are completed within local pockets of ground where organic odours are identified. On damp or wet still days the risk of dust inhalation is low.

8.2.1 Provision for undiscovered contamination

Prior to starting groundworks a 'tool box' talk and site induction should be completed to induct construction workers on the soil quality and identification of potential contamination.

The 'tool box talk' should discuss a procedure for identifying any soils which may be uncovered during demolition/groundworks which have an unpleasant odour or visual appearance. In such an event the contractor should immediately inform the environmental consultant, who in turn should consult the local authority (Environmental Health Officer) to discuss an appropriate strategy to deal with the problem material.

8.3 DOMESTIC WATER SUPPLY

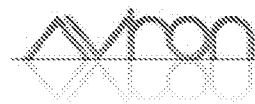
The geochemical laboratory results should be provided to the local water authority to ensure the correct materials are chosen for water supply pipes. Following the formal withdrawal of WRAS Guidance Note No. 9-04-03 (October 2002) The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land the UK Water Industry Research Ltd (UKWIR) report entitled "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Reference 10/WM/03/21; ISBN: 1 84057 5697) should be consulted.

8.4 CONTAMINATION RISK FROM SOILS TO CONTROLLED WATERS AND THIRD PARTIES

On the basis of the ground conditions encountered, the soil and soil leachate results it is not considered soil contamination presented a risk to controlled waters. Whilst the concentration of total PAH within sample TP2 (0.3m) is marginally above the DWS it is not considered a risk shall be presented to controlled waters. The site is not located within a source protection and therefore in the absence of alternative chemical standard the DWS is considered overlying conservative. The overlying soils are above the underlying secondary (a) aquifer, thus limited leaching potential and are also likely to be stripped from site in order to construct a piling mat (working platform circa 0.4m thick) for new foundation construction.

Locally undiscovered fuel contamination may exist around the fuel infrastructure, however, this shall be managed as part of a discovery strategy.

Generally it is not considered the site presents a risk to controlled waters and a **LOW** risk in this respect is



assigned. However, locally a MEIDUM - HIGH risk may be presented around the fuel infrastructure and accordingly a discovery strategy shall be implemented.

8.5 RISK FROM GROUND GAS

Ground gas monitoring was completed on one occasion, although due to weather conditions during the project period atmospheric pressures were above 1000mB.

The initial results have indicated acceptable gaseous concentrations and a gas characterisation situation of CS-1, being very low risk.

8.6 CONTAMINATION RISK FROM GROUNDWATER

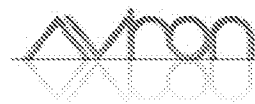
Based on the ground conditions encountered it is not considered that significantly contaminated ground water exists beneath the site. Accordingly a LOW risk is assigned.

8.7 CONCEPTUAL SITE MODEL

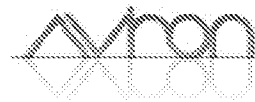
Following interpretation of the laboratory results, site dynamics and the aforementioned risk assessment a refined conceptual model has been prepared and is presented in table 8.7.

Table 8.7 Refined Conceptual Site Model (for pertinent pollutant linkage pathways)

Source	Pathway	Receptor	Risk	Justification
Undiscovered fuel contamination around fuel infrastructure	Direct contact Ingestion Inhalation of fugitive dust	Human health – construction workers	LOW	Short term risk to adult humans should fuel/hydrocarbon contamination be present during infrastructure removal considered to be LOW provided suitable Personal Protective Equipment (PPE) is worn.



	Direct contact	Human health – end	MEDIUM -	Should previously undiscovered fuel contamination be presented around fuel infrastructure and left in-situ an exposure risk to site end users is likely. Discovery strategy and subsequent contamination management necessary.
	Ingestion	users.	HIGH	
	Inhalation of fugitive dust			
	Direct contact	Flora and fauna	LOW	No elevated concentrations of determinants identified or evidence of contamination. Where proposed planting is required newly import suitable Topsoil should be applied.
	Direct	Infrastructure	LOW	Services should be placed in dedicated runs within the natural geology .
Undiscovered fuel contamination around fuel infrastructure	Leaching through underlying geology and hydrogeology	Controlled waters; surface waters, aquifer	MEDIUM	Should previously undiscovered fuel contamination be presented around fuel infrastructure and left in-situ a risk may exist to controlled waters. Discovery strategy and subsequent contamination management necessary.
Potential on-site groundwater contaminants	Leaching through underlying geology and hydrogeology	Controlled waters; surface waters, aquifer	LOW	Unlikely contaminated groundwater exists. Discovery strategy and subsequent contamination management shall address potential risks.
Hazardous Ground Gas	Migration through underlying geology and potential preferential pathways	Human health, principally site occupiers	LOW	No notable source of hazardous ground gas identified in desk based research. One round of monitoring indicate CS-1, NHBC 'Green'.
Off-site Sources	Migration through	Site	LOW	Distance from site is



	underlying geology and hydrogeology	considered to prevent any impact from industrial site.
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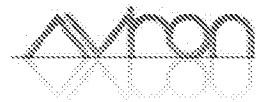
8.8 RISK RATING

The plausible pollutant linkages have been subject to risk classification, which is designed to consider environmental risk in the context of the current proposals for the site that may involve redevelopment or a change of use as discussed within Section 2.0.

Table 8.8 Risk Classification

Risk	Description
Low	Little risk of encountering contamination and causes of pollution and harm. Further assessment and site investigation is unlikely but may be required to confirm the absence of risk. Remediation very unlikely.
Medium	Reasonable risk of encountering contamination and causes of pollution and harm. Further assessment and site investigation may be required to further develop and refine the CSM. There is also low probably that site remediation shall be required.
High	Significant risk of encountering contamination and causes of pollution and harm. Further assessment and site investigation shall be required to further develop and refine the CSM. There is also the possibility that site remediation shall be required.

The overall environmental revised risk classification (following investigation works) for the proposed residential use is (overall) **MEDIUM** and management of fuel infrastructure and previously undiscovered contamination shall be necessary.



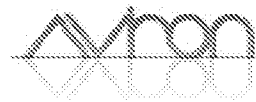
9.0 DISCOVERY STRATEGY

Figure 1 is presents the general locations of fuel infrastructure.

9.1 ABOVE GROUND FUEL STORAGE TANK

Soil contamination may exist beneath the slab (bund) of the former AST. The following discovery strategy shall be adopted during site demolition and clearance;

1. Notify environmental consultant prior to demolition and site clearance. The environmental consultant should be in attendance during works for the purpose of advising, recording and to take suitable photographs.
2. Following removal of any surrounding fuel distribution pipes use a mechanical excavator pull the ground floor slab or tank plinth.
3. Environmental consultant to inspect soils beneath slab/plinth for residual fuel/oil contamination and any 'hidden' underground pipes of fuel distribution network. The basis of identification shall be visual (dark grey/black staining), olfactory (odour) and instrumental where a photon-ionisation detector (PID) shall be used to detect volatiles. A PID screening value of 10ppm shall be used as a screening for the identification of potential fuel/oil contamination.
4. Where visual, olfactory or PID contamination is suspected excavate and remove this contamination from the ground to a point where in-situ soils appear 'clean' and PID recordings are consistently below 10ppm.
5. Stockpile waste soils upon plastic sheeting to enable soil sampling for laboratory testing (Suite 1, TPH and WAC) to enable waste classification and disposal. Upon fruition of laboratory results dispose to licensed waste management facility.
6. Collect soil samples from faces of resultant void/surface from both areas of tank and fuel infrastructure (pump/pipes) and submit for speciated TPH laboratory testing to determine the absence of hydrocarbon based contamination.
7. Remediation targets shall be the LQM S4ULs (with homegrown produces) which are considered appropriate based on human health requirements.
8. Backfill the resultant void with suitably graded and compacted engineered fill to ensure stability of any adjacent infrastructure. Any imported fill should be 'clean' and meet current residential end



use chemical criteria.

9. Should laboratory results record TPH concentrations below the remediation targets the exercise can be considered successful. Should elevated concentrations remain, further excavation and PID monitoring as described in points 6 to 9, may be necessary.
10. Upon successful completion of works prepare a verification report.

9.2 UNDERGROUND FUEL STORAGE TANKS AND INTERCEPTOR

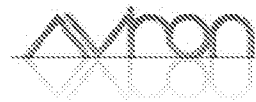
Soil contamination may exist beneath and around below ground tank and fuel interceptor. The following discovery strategy shall be adopted during site demolition and clearance;

1. Notify environmental consultant prior to demolition and site clearance. The environmental consultant should be in attendance during works for the purpose of advising, recording and to take suitable photographs.
2. Disconnect any fuel pumps and remove from site by licensed waste management contractor.
3. Carefully complete shallow excavation within the area to reveal the top edge of the tank/chambers.
4. Where encountered remove the service hatch/manhole covers and inspect for fuel. If fuel is present appoint specialist contractor to remove fuel, clean tank and dispose of waste fuel and cleaning detergents to licensed waste management facility.
5. Once tank/chamber is empty carefully excavate around the tank/chamber and remove from the ground. Once tank/chamber is removed remove fuel pumps and associated fuel distribution pipework/drainage. Only cold cutting of the tank should be engaged and the disposal should be to a licensed waste management facility.
6. Environmental consultant to inspect soils within resultant void for residual fuel contamination and any infrastructure which may remain potentially 'hidden' for former fuel supply. The basis of identification shall be visual (dark grey/black staining), olfactory (odour) and instrumental where a photon-ionisation detector (PID) shall be used to detect volatiles. A PID screening value of 10ppm shall be used as a screening for the identification of potential fuel/oil contamination.
7. Where visual, olfactory or PID contamination is suspected, excavate and remove this contamination from the void to a point where in-situ soils appear 'clean' and PID recordings are consistently below



10ppm.

8. Stockpile waste soils upon plastic sheeting to enable soil sampling for laboratory testing (Suite 1, TPH and WAC) to enable waste classification and disposal. Upon fruition of laboratory results dispose to licensed waste management facility.
9. Collect soil samples from faces of resultant voids from both tank and fuel infrastructure (pipes/pumps) and submit for speciated TPH laboratory testing to determine the absence of hydrocarbon based contamination.
10. Remediation targets shall be the LQM S4ULs (with homegrown produces) which are considered appropriate based on human health requirements.
11. Backfill the resultant void with suitably graded and compacted engineered fill to ensure stability of any adjacent infrastructure. Any imported fill should be 'clean' and meet current residential end use chemical criteria.
12. Should laboratory results record TPH concentrations below the remediation targets the exercise can be considered successful. Should elevated concentrations remain, further excavation and PID monitoring as described in points 6 to 9, may be necessary.
13. Upon successful completion of works prepare a verification report.



10.0 GEOTECHNICAL ASSESSMENT

This section provides a geotechnical assessment in connection with the proposed development as described within this report.

The locations of any underground services or engineering works and former foundations are unknown and therefore have not been fully taken into account in the following assessment. It has been assumed that any such works will not compromise foundations and ground stability.

The assessment of the stability of any slopes or retaining structures across or adjacent the site, the requirement for additional retaining structures, and the requirement for cut and fill that may be required to facilitate construction is outside the scope of this report.

Where applicable the following assessment includes allowable bearing pressures assuming conventional construction only and no allowances have been made for interaction between existing adjacent foundations and proposed foundations.

Please note that to be compliant with EN 1997 Eurocode 7: Geotechnical Design (and the UK National Annex to Eurocode 7), and to consider the GEO Limit State: failure or excessive deformation of the ground, additional information from the client's structural engineer will be required. Information regarding the permanent actions and variable actions (making up the 'characteristic action') applied to the foundations will be required along with confirmation of the foundation type and foundation dimensions.

10.1 GROUND CONDITIONS

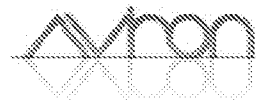
Exploratory hole logs are presented in **Appendix I** and ground conditions are formally appraised within section 2.3 of this report.

10.2 EXCAVATION CONDITIONS

Excavation of the materials encountered during the ground investigation should be achieved using conventional hydraulic excavation techniques.

From the ground investigation undertaken excavations in natural site are not expected to remain stable in the short term.

Free surface groundwater was encountered during the ground investigation works and monitoring period to a minimum depth 1.00-1.08m bgl (WS2, BH1) as such provision for de-watering in excavations locally across the site should be made.



Care should be taken to ensure that instability of excavations does not affect existing structures and services (e.g. foundations, roads, boundary walls or buildings) both on and off-site, and temporary support may be required in order to achieve this. Further advice should therefore be sought from the appointed structural engineer and specialist contractor regarding temporary works.

Care should also be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times.

10.3 EXISTING SERVICES/SUBSTRUCTURES

Due to the historical development of the site and site environs, existing services or sub-structures should be anticipated. Where foundations or obstructions are encountered during excavations for the proposed foundations, all new foundations should be extended downwards to fully penetrate all redundant former construction. Provision should be made for locating the former wells expected to be encountered along the eastern boundary of the site, and the wells filled and capped.

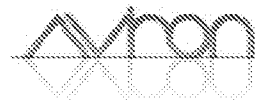
10.4 BEARING STRATA

Observations, in-situ testing and laboratory test results indicate that the overlying natural soft and very soft CLAY strata (Raised Marine Deposits) encountered across the site are not suitable for the construction of conventional shallow load bearing applications such as strip and pad foundations. Similarly due to excessive anticipated settlement beneath structures constructed on raft foundations, consideration should be given to supporting the proposed development buildings on piled foundations.

Atterberg Limits Tests and Material Properties (Design Parameters)

Atterberg limits tests conducted on the fine grained Made Ground at depths of 0.40m and 0.90m bgl indicate that the strata comprise inorganic clays of intermediate plasticity (CI). The modified plasticity index of the Made Ground is shown to be 12% and 15% indicating strata of low volume change potential.

Atterberg limits tests undertaken on the natural clay strata, representing Raised Marine Deposits between 1.00m and 4.00m bgl, indicate that the strata comprise inorganic clays of low to intermediate and high plasticity (CL/CI/CH). The modified plasticity index of these deposits is shown to be 17-31% which are therefore of medium volume change potential. The moisture content is shown to approach the liquid limit in a number of the samples confirming the low shear strength noted in the boreholes and trial pits.



For the purposes of this assessment and in accordance with NHBC Standards Chapter 4.2, Building Near Trees, the Made Ground and natural clay strata are classified as being of low and medium volume change potential respectively.

In the absence of reliable laboratory triaxial and shear box test data an estimated critical state angle of shearing resistance (ϕ'_{crit}) of 30° and 25° has been assumed for the overlying fine grained Made Ground and natural clay strata respectively using Table 2 of BS8002:1994 September 2001. It is assumed that the drained shear strength c' is zero.

The results of particle size distribution analysis indicate that the underlying coarse grained strata of the Raised Bead Deposits comprise silty sandy predominantly fine and medium GRAVEL of negligible volume change potential. An estimated critical state angle of shearing resistance (ϕ'_{crit}) of 34° has been assumed for the gravel strata using Table 3 of BS8002:1994 September 2001. It is assumed that the strata are sub-angular and moderately graded.

The CHALK strata encountered at a depth of 14.20m bgl is shown to be of medium density in accordance with CIRIA C574, Engineering in Chalk, 2002.

Please note that when using this data for design purposes, the effects of eccentric loading are taken into account, and that the bearing pressure is limited to account for maximum tolerable settlement beneath the structure and adjacent properties.

10.5 TREE INFLUENCE ON FOUNDATIONS

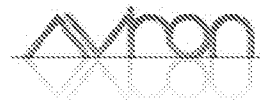
When considering the influence of trees on foundations, the material properties of the strata beneath the site and the distance and species of the trees to the foundations are the determining factors. For the purposes of this assessment the Made Ground and natural clay strata are classified as being of low and medium volume change potential respectively.

However provided the proposed buildings are constructed on piled foundations, an adjustment to foundation depths in accordance with NHBC Chapter 4.2 Building Near Trees is unlikely to be required.

10.6 FOUNDATION TYPE, DEPTH AND BEARING CAPACITY

Strip and Pad Foundations

Due to the low shear strength noted within the overlying Made Ground and natural CLAY strata beneath the site, strip and pad foundations are not considered suitable to support the proposed development buildings.



Raft Foundations

To avoid shear failure the safe bearing pressure beneath reinforced rigid raft foundations should be restricted to 17.5kN/m^2 . However it should be noted that settlement beneath a raft of dimensions $8\text{m} \times 18\text{m}$ (Plots 8-10) supporting 17.5kN/m^2 is likely to be up to 75mm and therefore beyond serviceability limits. Consideration should therefore be given to supporting the proposed development buildings on piled foundations.

Piled Foundations and Temporary Works

Should the safe bearing pressure provided above be insufficient to provide the necessary support to the proposed redevelopment works, or settlement deemed to be beyond tolerable limits, consideration should be given to a piled foundation solution.

The advice of a piling specialist should therefore be sought to determine the likely requirements when considering the ground and groundwater conditions encountered and the health and safety requirements and constraints of working within the confines of the site and adjacent neighbouring properties.

It should be noted that the above recommendations have been made using data obtained from WS1 and WS2, TP1-TP4 and the cable percussion borehole BH1 to a maximum drilled depth of 16.20m bgl.

Provision should be made for dewatering of groundwater locally in excavations.

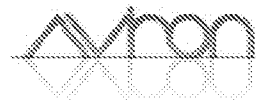
10.7 FLOOR SLABS

It is assumed that the floor slabs of the proposed development buildings will be suspended.

10.8 CONCRETE CLASSIFICATION

In accordance with Building Research Establishment (BRE) Special Digest 1: 2005 - Concrete in Aggressive Ground, the following laboratory test data has been used to derive classifications for buried concrete (Table C2, brown field locations) beneath the site:

☼ Soluble Sulphate (2:1 extract)	– 0.01g/l to 0.40g/l
☼ Total Sulphate	– 0.0079% to 0.26%
☼ Total Sulphur	– 0.0085% to 0.28%
☼ Total Potential Sulphate	– 0.0255% to 0.84%



 Oxidisable Sulphate	– 0.0% to 0.74%
 pH	– 7.8 to 9.6

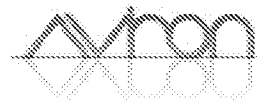
“BRE guidance suggests that ‘if significant number of determination of oxidisable sulphates is above 0.3%, then use the results of total potential sulphate to determine the concrete class”.

Oxidisable sulphate has been calculated above 0.3% SO₄ and therefore exceeds the threshold where the concrete classification is based on oxidisable sulphate and total potential sulphate.

The Design Sulphate Class for concrete beneath the site is DS-3. Assuming static groundwater (raft foundations above the groundwater level of 1.00m) the Aggressive Chemical Environment for Concrete (ACEC) Class is AC-2s. For piled foundations below the groundwater level, the ACEC Class is AC-3.

It should be noted that additional considerations for the determination of concrete class and appropriate aggregate use are set out in BRE Special Digest 1. These are considerations specific to the soil type, the proposed development and the type of concrete foundations to be used at the site.

Laboratory results for the pH and sulphate testing are included within **Appendix III**.



11.0 CONCLUSIONS AND RECOMMENDATIONS

This Phase II Geo-Environmental Risk Assessment has provided an assessment of the site's geo-environmental setting, previous assessments and an evaluation of ground conditions.

The site investigation comprised the completion of one cable percussion borehole to a depth of 16.20m bgl and four machine dug trial pits to depths of up to 2.00m bgl.

11.1 ENVIRONMENTAL

- ☛ The site investigation undertaken has revealed a mantle of Made Ground overlying natural strata of Clay (Raised Marine Deposits) and Chalk
- ☛ The assessment has provided a geochemical appraisal of ground conditions. The Made Ground and natural Clay samples submitted for geochemical tests did not record any elevated concentrations of determinants. Generally it is not considered in-situ soils present a risk to human health, however, locally fuel infrastructure shall need to be managed.
- ☛ Leachate tests completed on soil samples have also recorded acceptable concentrations. Generally it is not considered in-situ soils present a risk to controlled waters, however, locally fuel infrastructure shall need to be managed.
- ☛ It is also not considered the site present a significant risk from hazardous ground gas ingress on the basis of gas monitoring results.
- ☛ **The discovery strategy presented in section 9.0 shall need to be implemented to manage fuel infrastructure (tanks, fuel lines, interceptor) and upon removal of such a verification report should be prepared to document the absence of associated soil contamination.**

Generally Aviron assigned an overall **MEDIUM** environmental risk and further action highlighted in bold type shall be necessary.

11.2 GEOTECHNICAL

The following geotechnical issues have been considered as part of this assessment and are summarised below;

- ☛ Dewatering should be expected in excavations below circa 1.00m bgl (WS2 and BH1).
- ☛ Provision should be made for filling and capping wells reputed to be located along eastern site



boundary.



12.0 PROJECT INSTRUCTION AND LIMITATIONS

12.1 SCOPE OF WORKS

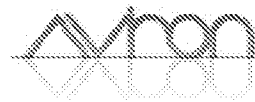
The following scope of work was undertaken to an agreed brief set out in Aviron's proposal of 13 January 2015 and involves the following;

- ✦ Cable percussion drilling to include one borehole to a depth of 16m bgl taking Standard Penetration Tests (SPTs) at 1.0m and 2.0m intervals to assess ground conditions at depth.
- ✦ Install the borehole with a HDPE standpipe to enable one round of post-investigation ground gas and groundwater monitoring.
- ✦ Undertake machine pitting to evaluate overlying ground conditions and to facilitate soil sampling.
- ✦ Log the strata within each exploratory hole noting any water strikes.
- ✦ Collect disturbed soil samples from exploratory holes and submit for geochemical soil laboratory tests to determine the presence or absence of soil contaminants, and geotechnical material property tests to enable foundation recommendations.
- ✦ All soil samples shall be collected in accordance with the instruction and ground conditions and submitted to UKAS/MCERTS accredited laboratories for testing.
- ✦ Prepare an interpretative Phase II GERA report to interpret ground conditions with respect to potential environmental risks and suitable remediation and provide recommendations for foundation design and engineering parameters.

Aviron has relied upon information received from the Client and their agents as accurate, unless contradicted by written documentation or site observations.

12.2 PUBLISHED GUIDANCE

This report follows the technical approach presented in Contaminated Land Report 11 (CLR11) "Model Procedures for the Management of Land Contamination" prepared by the Environment Agency in 2004. CLR11 provides guidance on the application of management processes when assessing potentially contaminated land.



This project and report have been designed to fulfil the information requirements set out in the Environment Agency Guidance on Requirements for Land Contamination Reports prepared by the Environment Agency in 2005.

Notwithstanding the above this report is additionally prepared in accordance with current guidance notes, standards and practices as set out by the Environment Agency and statutory organisations in order to establish potential and significant pollutant linkages as defined in Part IIA of the Environmental Protection Act 1990.

12.3 LIMITATIONS

Aviron's scope of work has been designed to meet the timeframe and budgets. As such it may follow that further work would be prudent upon evaluation of the ground conditions. The scope of work provided shall provide a view of site conditions and understanding of potential geo-environmental risks and possible mitigation procedures.

The information used in this report has been derived from the site investigation, which in turn were based on known current and historical land uses identified at the site and surrounding area, available to Aviron at the time of the investigation.

Intrusive points chosen relate to the data collected and the risk assessment will rely on these points only. It therefore follows that some areas of the site will not be examined. It is always possible that some areas not investigated may contain conditions which would be impossible to determine due to lack of evidence or time and budget restrictions.

This report provides recommendations for foundation design based upon the ground conditions encountered and where possible makes predictions for possible variations in ground conditions. However, it is always possible that not all variations in ground conditions can be accounted for and shall also be dependent upon design loadings and foundation construction techniques used. Our recommendations should therefore not supersede the project's Consulting Structural and Civil Engineers design.

Should changes in legislation, statutory requirements or industry practices occurred following issue of this report, this report should be viewed in light of these changes.

Should a notable time period elapse between the date issue of this report and the date of application of this report changes to site dynamics may occur and in particular the site inspection notes may no longer be applicable should any change of use occur to the site in the interim.



13.0 REFERENCES AND OTHER SOURCES OF INFORMATION

Land Science (Brighton) Limited, Desk Study and Conceptual Site Model (Phase I), for T Hollister (Chertsey) Ltd, project reference LS 0550, dated July 2012.

Aviron Associates Limited, Ground Investigation Report (GIR), for Reilly Construction Limited, project reference 14-322.01, dated December 2014.

DEFRA and Environment Agency, 2004. Model Procedures for the Management of Land Contamination, Contaminated Land Report 11.

NHBC (2010). National House Building Council Standards. Chapter 4.

British Geological Survey Website. www.bgs.ac.uk

Environment Agency Website: www.environment-agency.gov.uk

BS EN ISO 22475-1 Geotechnical investigation and testing - sampling methods and groundwater measurements

BS10175. British Standards Institute. 2011, Investigation of Potentially Contaminated Land - Code of Practice.

LQM/CIEH: Paul Nathanail, Caroline McCaffrey, Andy Gillett, Richard Ogden and Judith Nathanail. 2014. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. ISBN 978-0-9931084-0-2. "Copyright Land Quality Management Limited reproduced with permission; Publication number S4UL3275. All rights reserved"

BRE Special Digest 1:2005. Concrete in Aggressive Ground.

SR2: Human health toxicological assessment of contaminants in soil, Science Report SC050021/SR2, Environment Agency, August 2008.

SR7: Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values, Science Report SC050021/SR7, Environment Agency, November 2008.

BS 8485:2007 Code of Practice for the characterization and remediation from ground gas in affected developments.

CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' 2007.



NHBC Guidance on Methane and Carbon Dioxide 2007 (Boyle and Witherington, 2007).

Somerville, S. H., Control of groundwater for temporary works, CIRIA Report 113 (1986).

Figures

- 1 Proposed Development Plan
- 2 Exploratory Hole Location Plan
- 3 - 4 Trial Pit Photographs



Legend

-  Window Sample and Cable Percussion Borehole Locations
-  Trial Pit Locations
-  Underground (UST) and former above ground (AST) storage tanks

Notes

Plan provided to Aviron by Client

AST removed from site.

Figure 1

Drawing Title

Proposed Development Layout and Exploratory Hole Location Plan

Project Number 14-322.02

Project Title

Bevin, Bevin & Co. Ltd, Brewery Hill, Arundel, West Sussex, BN18 9DH

Drawn by OB

Checked by JB

Scale NTS

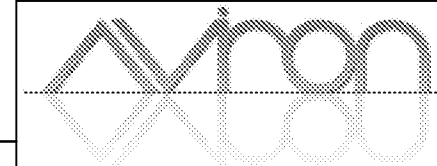




Photo 1
TP1



Photo 2
TP1 arisings



Photo 3
TP2



Photo 4
TP2 arisings

Legend

Notes

Plan provided to Aviron by Client

Figure 3

Drawing Title

Trial Pit Photographs

Project Number 14-322.02

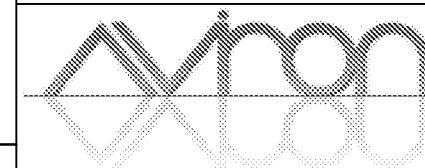
Project Title

Bevin, Bevin & Co. Ltd, Brewery Hill,
Arundel, West Sussex, BN18 9DH

Drawn by OB

Checked by JB

Scale NTS



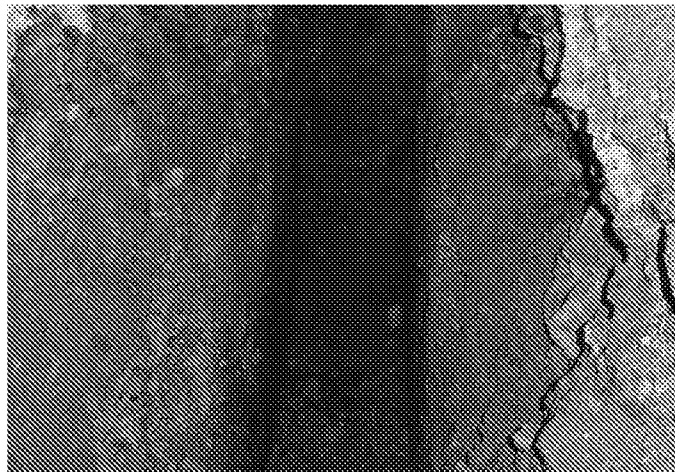


Photo 5
TP3

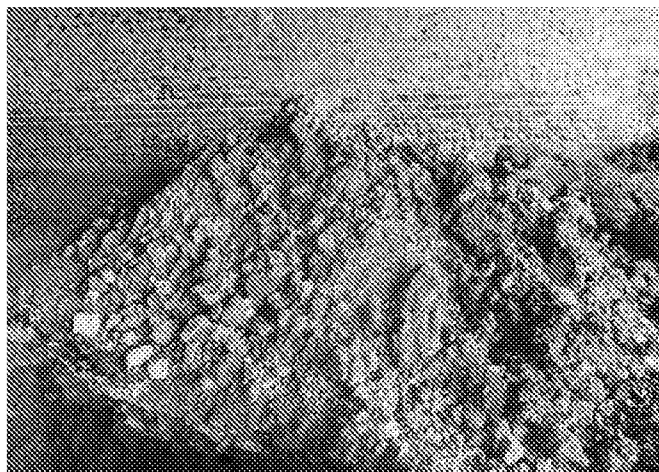


Photo 6
TP3 arisings

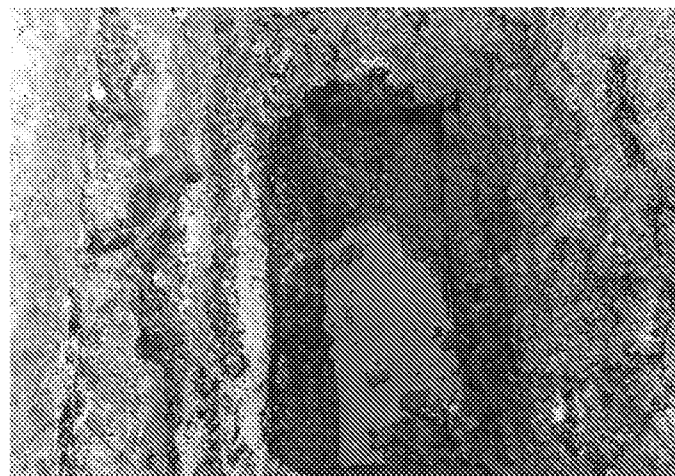


Photo 7
TP4



Photo 8
TP4 arisings

Legend

Notes

Plan provided to Aviron by Client

Figure 4

Drawing Title

Trial Pit Photographs

Project Number 14-322.02

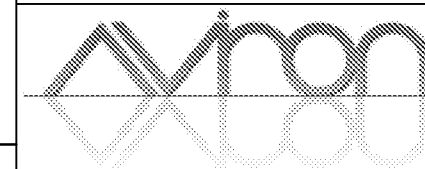
Project Title

Bevin, Bevin & Co. Ltd, Brewery Hill,
Arundel, West Sussex, BN18 9DH

Drawn by OB

Checked by JB

Scale NTS

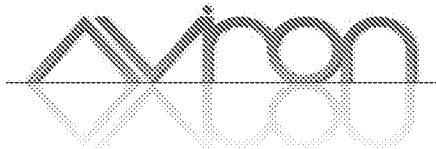


Appendices

- I Exploratory Hole Logs
- II Field Monitoring Data Sheets
- III Soil Contamination Laboratory Results
- IV Soil Geotechnical Laboratory Results

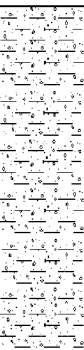
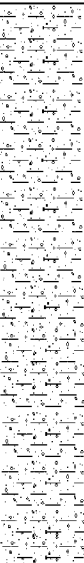
Appendix

I Exploratory Hole Logs

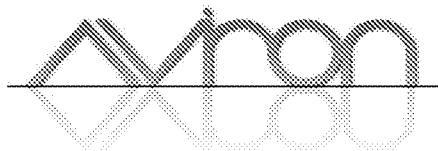


BOREHOLE LOG

Project: Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH				Project No. 14-322.02	Borehole: BH1
Client: Blackwall Reilly Limited			Start: 16.01.2015	End: 16.01.2015	Sheet: 1 of 4
Method/Plant Used: CP Pilcon		Co-ordinates: NT		Ground Level:	

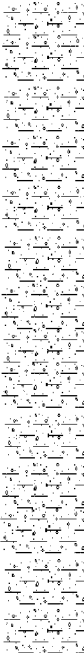
Description of Strata	Legend	Depth (m bgl) Thickness	Well Const.	Samples/Tests			SPT Results						R Value	Laboratory Test Details
				Depth	No	Type	75mm	75mm	75mm	75mm	75mm	75mm		
MADE GROUND; Concrete.		(0.20) 0.20		1.2-1.7	1	SPT	1	0	1	0	1	0	2	Atterberg
MADE GROUND; Matrix of brown and dark brown sandy gravelly clay and fine to coarse, angular to sub-angular sand and gravel and occasional cobbles of flint, chalk, brick and concrete.		(0.80) 1.00												
Very soft to soft brown and grey green slightly sandy slightly gravelly CLAY. Gravel is fine to medium and coarse, angular to sub-rounded flint, quartz and shells. Organic odour.		(1.50) 2.50												
Soft locally very soft brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium and coarse, angular to sub-rounded flint and occasional shells.		(5.30)												
Continued....														

Casing record			Chiselling records			Water level observations (depths in metres below gl)					
Date	Diameter (mm)	Depth (m)	Time	From (m)	To (m)	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
16.01.15	150	14.20				16.01.15 22.01.15 05.02.15	7.80	6.50	-	6.50 1.20 1.08	
Remarks Gas and groundwater monitoring installation to 12.0m.									By	Date	
									Logged	JB	22.01.2015
									Checked	OB	12.02.2015
									Scale 01:25		

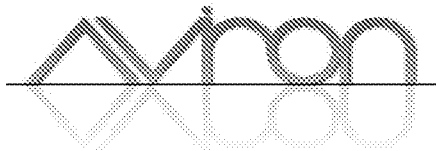


BOREHOLE LOG

Project:				Project No.		Borehole:		
Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH				14-322.02		BH1		
Client:			Start:		End:		Sheet:	
Blackwall Reilly Limited			16.01.2015		16.01.2015		2 of 4	
Method/Plant Used:		Co-ordinates:		Ground Level:				
CP Pilcon		NT						

Description of Strata	Legend	Depth (m bgl) (thickness)	Well Cost	Samples/Tests			SPT Results						N Value	Laboratory Test Details
				Depth	No	Type	75mm	75mm	75mm	75mm	75mm	75mm		
... continued Soft brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium and coarse, angular to sub-rounded flint and occasional shells.		7.80 (4.30)		5.2-5.7	5	SPT	1	1	1	2	2	2	7	
				6.2-6.7	6	SPT	1	1	1	1	1	2	5	
				7.2-7.7	7	SPT	1	2	2	2	2	2	8	
Medium dense becoming dense brown, silty sandy fine to coarse angular to sub-rounded GRAVEL of flint.				8.2-8.7	8	SPT	6	6	6	7	7	8	28	PSD
Continued....				9.2-9.7	9	SPT	8	10	10	11	11	13	45	

Casing record			Chiselling records			Water level observations (depths in metres below gl)					
Date	Diameter (mm)	Depth (m)	Time	From (m)	To (m)	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
16.01.15	150	14.20				16.01.15	7.80	6.50	-	6.50	
						22.01.15				1.20	
						05.02.15				1.08	
Remarks									By	Date	
									Logged	JB	22.01.2015
									Checked	OB	12.02.2015
									Scale 01:25		

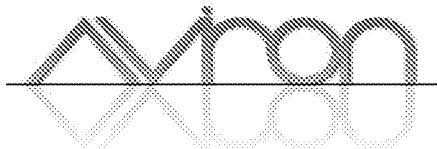


BOREHOLE LOG

Project:				Project No.		Borehole:	
Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH				14-322.02		BH1	
Client:				Start:		End:	
Blackwall Reilly Limited				16.01.2015		16.01.2015	
Method/Plant Used:		Co-ordinates:		Ground Level:			
CP Pilcon		NT					

Description of strata	Flagged	Depth (m) (true hole)	Well Code	Samples/Tests			SPT Results						N Value	Laboratory Test Details
				Depth	No	Type	75mm	75mm	75mm	75mm	75mm	75mm		
... continued Dense brown, silty sandy fine to coarse angular to sub-rounded GRAVEL of flint.				10.2-10.7	10	SPT	6	6	7	10	10	12	39	
White slightly weathered CHALK, weak, medium density. Fractures closely spaced often clean and tight, occasionally infilled up to 3mm with comminuted chalk. Occasional flint cobbles. (Grade B)		12.10 (4.60)		12.2-12.7	11	SPT	4	4	6	6	6	7	25	
Continued...				14.2-14.7	12	SPT	5	6	6	7	7	8	28	SMC

Casing record			Chiselling records			Water level observations (depths in metres below g)					
Date	Diameter (mm)	Depth (m)	Time	From (m)	To (m)	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
16.01.15	150	14.20				16.01.15	7.80	6.50	-	6.50	
						22.01.15				1.20	
						05.02.15				1.08	
Remarks									By	Date	
									Logged	JB	22.01.2015
									Checked	OB	12.02.2015
											Scale 01:25

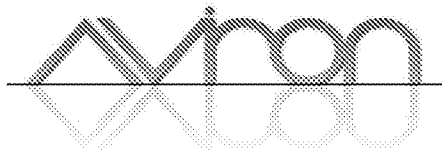


BOREHOLE LOG

Project: Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH		Project No. 14-322.02	Borehole: BH1
Client: Blackwall Reilly Limited		Start: 16.01.2015	End: 16.01.2015
Method/Plant Used: CP Pilcon		Co-ordinates: NT	
		Ground Level:	

Description of strata	Lithology	Depth (m bgl) (thickness)	Well Code	Samples/Tests			SPT Results						Laboratory Test Details
				Depth	No	Type	75mm	75mm	75mm	75mm	75mm	75mm	
... continued White slightly weathered CHALK, weak, medium density. Fractures closely spaced often clean and tight, occasionally infilled up to 3mm with comminuted chalk. Occasional flint cobbles. (Grade B)				16.2-16.7	13	SPT	6	5	6	6	7	9	28
Borehole Complete at 16.70m bgl		16.70											

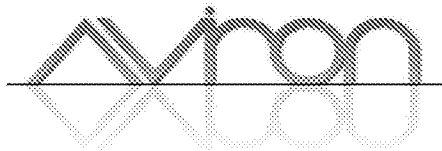
Casing record			Chiselling records			Water level observations (depths in metres below gl)					
Date	Diameter (mm)	Depth (m)	Time	From (m)	To (m)	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
16.01.15	150	14.20				16.01.15 22.01.15 05.02.15	7.80	6.50	-	6.50 1.20 1.08	
Remarks									By	Date	
									Logged	JB	22.01.2015
									Checked	OB	12.02.2015
											Scale 01:25



TRIAL PIT LOG

Project: Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH						Project No. 14-322.02		Trial Pit: TP1					
Client: Blackwall Reilly Limited					Start: 22.01.15		End: 22.01.15		Sheet: 1 of 1				
Method/Plant Used: Kubota mini-tracked 360			Co-ordinates: NT				Ground Level: NT						
Description of Strata	Legend	Depth (m bgl) (Thickness)	Well Casing	Samples/Tests								Laboratory Test Details	
				Depth	No	Type							
MADE GROUND: Concrete.		(0.15) 0.15		0.20	1	ES							Suite 1
MADE GROUND: Matrix of brown and grey brown sandy gravelly clay and silty angular to rounded fine to coarse sand and gravel of flint, chalk, brick, tile, concrete and metal fragments. Occasional cobbles.		(0.70) 0.85		0.40	2	ES							WAC
MADE GROUND: Grey brown clayey silty gravelly angular to rounded fine to coarse sand. Gravel is angular to rounded fine to coarse brick, tile and flint. Occasional chalk fragments.		(0.75) 1.60		0.90	3	ES							Suite 1
Soft brown, grey green and dark grey slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to medium flint, shell and occasional decayed organic matter. Organic odour. (Possibly reworked)		(0.40) 2.00		1.70	4	ES							Suite 1
Trial pit completed at 2.00m.													

Dimensions (m)			Water level observations (depths in metres below gl)					
Length	Width	Depth	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
			22.01.2015	-	-	-	1.90	
Remarks Water seepage at 1.90m bgl, no rise after 20 minutes. Organic odour noted in underlying strata. Brick wall encountered in southern limb of trial pit to 0.80m bgl.						By	Date	
						Logged	OB	22.01.15
						Checked	JB	22.01.15
								Scale 01:25



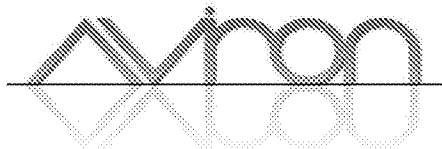
TRIAL PIT LOG

Project:				Project No.		Trial Pit:	
Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH				14-322.02		TP2	
Client:				Start:		End:	
Blackwall Reilly Limited				22.01.15		22.01.15	
Method/Plant Used:				Co-ordinates:		Ground Level:	
Kubota mini-tracked 360				NT		NT	

Description of Strata	Legend	Depth (m bgl) (Thickness)	Well Casing	Samples/Tests							Laboratory Test Details		
				Depth	No	Type							
MADE GROUND: Concrete.		(0.15) 0.15		0.20	1	ES							Suite 1
MADE GROUND: Matrix of brown and grey brown sandy gravelly clay and silty angular to rounded fine to coarse sand and gravel of flint, chalk, brick, tile, concrete and metal fragments. Occasional cobbles. ...0.55-0.60 dark grey black silty ashy clinker		(0.85) 1.00											
Soft grey green and dark grey slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to medium flint, shell and occasional decayed organic matter. Organic odour. (Possibly reworked)				(0.80) 1.80	1.10	2	ES						
Trial pit completed at 1.80m.													

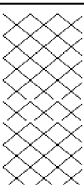
Dimensions (m)			Water level observations (depths in metres below gl)					
Length	Width	Depth	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
			22.01.2015	-	-	-	1.05	

Remarks Water seepage at 1.05m bgl from backed-up drain. Organic odour noted in underlying strata.						By	Date	
						Logged	OB	22.01.15
						Checked	JB	22.01.15
								Scale 01:25



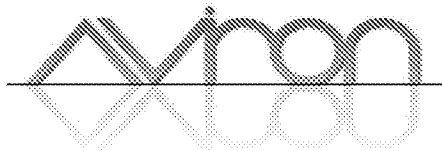
TRIAL PIT LOG

Project:				Project No.		Trial Pit:	
Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH				14-322.02		TP3	
Client:				Start:		End:	
Blackwall Reilly Limited				22.01.15		22.01.15	
Method/Plant Used:				Co-ordinates:		Ground Level:	
Kubota mini-tracked 360				NT		NT	

Description of Strata	Legend	Depth (m bgl) (Thickness)	Well Casing	Samples/Tests								Laboratory Test Details	
				Depth	No	Type							
MADE GROUND: Greb rown becoming white sandy gravel and cobbles of chalk.		(0.10) 0.10		0.25	1	ES							Suite 1
MADE GROUND: Matrix of grey brown and white sandy gravel and cobbles of chalk, flint and brick, and silty angular to rounded fine to coarse sand and gravel of chalk, brick and concrete.		(0.55) 0.65											
MADE GROUND: Grey brown silty angular to sub-rounded fine to coarse sand and gravel and occasional cobbles of chalk, flint and occasional brick. Pockets of sandy gravelly clay locally.		(0.75) 1.40		0.80	2	ES							
Soft grey green sandy slightly gravelly CLAY. Gravel is angular to rounded fine to medium flint, shell and occasional decayed organic matter. Organic odour. (Possibly reworked)		(0.60) 2.00											
Trial pit completed at 2.00m.													

Dimensions (m)			Water level observations (depths in metres below gl)					
Length	Width	Depth	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
			22.01.2015	-	-	-	1.90	

Remarks Water seepage at 1.90m bgl, no rise after 20 minutes. Organic odour noted in underlying strata.						By	Date	
						Logged	OB	22.01.15
						Checked	JB	22.01.15
								Scale 01:25



TRIAL PIT LOG

Project: Bevan, Bevan & Co. Ltd, Brewery Hill, Arundel, BN18 9DH						Project No. 14-322.02		Trial Pit: TP4	
Client: Blackwall Reilly Limited						Start: 22.01.15		End: 22.01.15	
Method/Plant Used: Kubota mini-tracked 360			Co-ordinates: NT			Ground Level: NT			

Description of Strata	Legend	Depth (m bgl) (Thickness)	Well Casing	Samples/Tests									Laboratory Test Details
				Depth	No	Type							
MADE GROUND: Concrete.		(0.15) 0.15		0.20	1	ES							Suite 1
MADE GROUND: Matrix of brown and grey brown sandy gravelly clay and silty angular to rounded fine to coarse sand and gravel of flint, chalk, brick, tile, concrete and metal fragments. Occasional cobbles. Roots and rootlets.		(0.55) 0.70		0.60-0.70	2	ES							Suite 1
...0.60-0.70 dark grey black silty ashy clinker		(0.70) 1.40		0.85	3	ES							Suite 1
MADE GROUND: Matrix of grey brown and white sandy gravelly clay and silty angular to rounded fine to coarse sand and gravel of chalk and flint. Occasional cobbles.		(0.60) 2.00		1.80	4	ES							Suite 1
Soft dark grey green slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to medium flint, shell and occasional decayed organic matter. Organic odour. (Possibly reworked)													
Trial pit completed at 2.00m.													

Dimensions (m)			Water level observations (depths in metres below gl)					
Length	Width	Depth	Date	Water strike	Water level (after 20mins)	Flow	Standing level	Remarks
			22.01.2015	-	-	-	1.80	

Remarks		By	Date
Water seepage at 1.80m bgl, no rise after 20 minutes. Organic odour noted in underlying strata.		Logged	OB 22.01.15
		Checked	JB 22.01.15
		Scale 01:25	

Appendix

II Field Monitoring Data Sheets

MONITORING DATA SHEET

SITE Brewery Hill, Arundel
PROJECT 14-322.02



Visit number	1	Equipment	Dip metre
Date	22/01/2015	Weather	Over-cast/sunny and rain
Taken by	OB	Barometric Trend*	NT

Record of Stable Concentrations								
Location	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Pres. (mB)	Flow (l/h)	Water (m bgl)	Base Well (m bgl)	PID (ppm)
BH1	-	-	-	-	-	1.20	12.00	NT

Max Stable Concs (% v/v)	
CH4	
CO2	

Max Stable Flow	
	l/h

Gas Screening Values (l/h)	
CH4	0
CO2	0

Visit number	2	Equipment	Dip metre & GA5000
Date	05/02/2015	Weather	Over-cast, cold, snowing
Taken by	OB	Barometric Trend*	Rising

Record of Stable Concentrations								
Location	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Baro. Pres. (mB)	Flow (l/h)	Water (m bgl)	Base Well (m bgl)	PID (ppm)
BH1	0.0	0.0	20.9	1021	0.0	1.08	12.00	NT

Max Stable Concs (% v/v)	
CH4	0.0
CO2	0.0

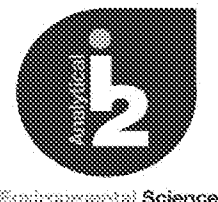
Max Stable Flow	
0.0	l/h

Gas Screening Values (l/h)	
CH4	0
CO2	0

*Source, Met Office

Appendix

III Soil Contamination Laboratory Results



James Burkitt

Aviron Associates Ltd
Badgemore House
Henley
Oxfordshire
RG9 4NR

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

Analytical Report Number : 15-65926

Project / Site name:	Brewery Hill, Arundel	Samples received on:	23/01/2015
Your job number:	14-322.02	Samples instructed on:	23/01/2015
Your order number:		Analysis completed by:	02/02/2015
Report Issue Number:	1	Report issued on:	02/02/2015
Samples Analysed:	11 soil samples		

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

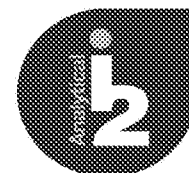
Standard sample disposal times, unless otherwise agreed with the laboratory, are :

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

Excel copies of reports are only valid when accompanied by this PDF certificate.



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Environmental Science

Analytical Report Number: 15-65926

Project / Site name: Brewery Hill, Arundel

Lab Sample Number				409886	409887	409888	409968	409969
Sample Reference				BH1	BH1	BH1	TP1	TP1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.20	4.20	8.20	0.20	0.90
Date Sampled				22/01/2015	22/01/2015	22/01/2015	22/01/2015	22/01/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	20	20	14	15	18
Total mass of sample received	kg	0.001	NONE	0.43	0.45	0.46	1.1	1.1

General Inorganics

pH	pH Units	N/A	MCERTS	8.9	9.0	8.9	9.6	9.6
Total Cyanide	mg/kg	1	MCERTS	-	-	-	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	ISO 17025	260	79	230	810	930
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.16	0.079	0.047	0.18	0.28
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	160	79	47	180	280
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.079	0.040	0.023	0.091	0.14
Total Sulphur	mg/kg	50	NONE	150	150	85	440	450

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	-	-	-	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	-	-	-	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	-	-	-	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	< 0.05	< 0.05

Total PAH

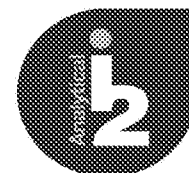
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	-	-	-	< 1.60	< 1.60
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	8.2	10
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	120	110
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	-	0.4	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	-	0.4	0.5
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	15	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	51	46
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	240	180
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	21	19
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	69	73



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Environmental Science

Analytical Report Number: 15-65926

Project / Site name: Brewery Hill, Arundel

Lab Sample Number				409886	409887	409888	409968	409969
Sample Reference				BH1	BH1	BH1	TP1	TP1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.20	4.20	8.20	0.20	0.90
Date Sampled				22/01/2015	22/01/2015	22/01/2015	22/01/2015	22/01/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

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

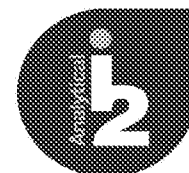
Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	< 10	< 10

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	< 10	< 10



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Environmental Science

Analytical Report Number: 15-65926

Project / Site name: Brewery Hill, Arundel

Lab Sample Number				409970	409971	409972	409973	409974
Sample Reference				TP1	TP2	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.70	0.30	0.25	0.20	0.60-0.70
Date Sampled				22/01/2015	22/01/2015	22/01/2015	22/01/2015	22/01/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	23	24	17	21	33
Total mass of sample received	kg	0.001	NONE	1.1	1.0	1.1	1.1	1.1

General Inorganics

pH	pH Units	N/A	MCERTS	9.1	8.6	8.4	8.3	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO ₄	mg/kg	50	ISO 17025	260	300	2600	1100	2000
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.25	0.042	0.80	0.43	0.17
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	250	42	800	430	170
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.12	0.021	0.40	0.21	0.085
Total Sulphur	mg/kg	50	NONE	1000	200	780	890	1300

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.28	0.38	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.37	0.76	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.33	0.66	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.15	0.33	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.23	0.54	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.22	0.54	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	0.19	0.28	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.44	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

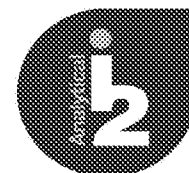
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	1.77	3.93	< 1.60
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.2	9.4	2.7	7.3	12
Barium (aqua regia extractable)	mg/kg	1	MCERTS	96	87	34	62	610
Boron (water soluble)	mg/kg	0.2	MCERTS	1.1	0.8	1.7	1.6	1.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	0.4	< 0.2	0.4	0.3
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19	16	4.4	7.5	3.0
Copper (aqua regia extractable)	mg/kg	1	MCERTS	29	35	12	49	110
Lead (aqua regia extractable)	mg/kg	1	MCERTS	76	64	96	96	190
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	19	4.7	13	50
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	76	110	24	60	80



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Environmental Science

Analytical Report Number: 15-65926

Project / Site name: Brewery Hill, Arundel

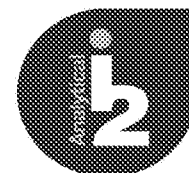
Lab Sample Number				409970	409971	409972	409973	409974
Sample Reference				TP1	TP2	TP3	TP4	TP4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.70	0.30	0.25	0.20	0.60-0.70
Date Sampled				22/01/2015	22/01/2015	22/01/2015	22/01/2015	22/01/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	< 10	12	10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	< 10	25	22	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	< 10	37	33	< 10



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Environmental Science

Analytical Report Number: 15-65926

Project / Site name: Brewery Hill, Arundel

Lab Sample Number				409975				
Sample Reference				TP4				
Sample Number				None Supplied				
Depth (m)				1.80				
Date Sampled				22/01/2015				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	25				
Total mass of sample received	kg	0.001	NONE	1.2				

General Inorganics

pH	pH Units	N/A	MCERTS	8.1				
Total Cyanide	mg/kg	1	MCERTS	< 1				
Total Sulphate as SO ₄	mg/kg	50	ISO 17025	1000				
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.58				
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	580				
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.29				
Total Sulphur	mg/kg	50	NONE	2800				

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10				
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10				
Fluorene	mg/kg	0.1	MCERTS	< 0.10				
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10				
Anthracene	mg/kg	0.1	MCERTS	< 0.10				
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10				
Pyrene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10				
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10				
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				

Total PAH

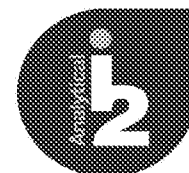
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60				
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.9				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	45				
Boron (water soluble)	mg/kg	0.2	MCERTS	3.1				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	75				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	60				



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Environmental Science

Analytical Report Number: 15-65926

Project / Site name: Brewery Hill, Arundel

Lab Sample Number				409975				
Sample Reference				TP4				
Sample Number				None Supplied				
Depth (m)				1.80				
Date Sampled				22/01/2015				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Monaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-xylene	µg/kg	1	MCERTS	< 1.0				
o-xylene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10				

Analytical Report Number : 15-65926

Project / Site name: Brewery Hill, Arundel

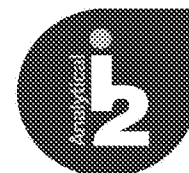
* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
409886	BH1	None Supplied	2.20	Light brown clay and sand with gravel.
409887	BH1	None Supplied	4.20	Light brown clay and sand with gravel.
409888	BH1	None Supplied	8.20	Light brown clay and sand with gravel.
409968	TP1	None Supplied	0.20	Brown clay and sand with gravel.
409969	TP1	None Supplied	0.90	Brown clay and sand with gravel.
409970	TP1	None Supplied	1.70	Grey clay and gravel with gravel.
409971	TP2	None Supplied	0.30	Brown clay and gravel with gravel.
409972	TP3	None Supplied	0.25	Light grey topsoil and sand with brick and chalk.
409973	TP4	None Supplied	0.20	Grey clay and sand with chalk.
409974	TP4	None Supplied	0.60-0.70	Black topsoil and clay with rubble.
409975	TP4	None Supplied	1.80	Grey clay and sand.



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Environmental Science

Analytical Report Number : 15-65926**Project / Site name: Brewery Hill, Arundel****Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Stones not passing through a 10 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample results are not corrected for the stone content of the sample.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by extraction with water followed by ICP-OES. Results reported corrected for extraction ratio (soil equivalent) as g/l and mg/kg; and upon the 2:1 leachate (g/l).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	NONE
TPHCWG (Soil)	Determination of pentane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.****Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



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WD18 8YS

Analytical Report Number : 15-65939

Project / Site name:	Brewery Hill, Arundel	Samples received on:	23/01/2015
Your job number:	14-322.02	Samples instructed on:	23/01/2015
Your order number:		Analysis completed by:	02/02/2015
Report Issue Number:	1	Report issued on:	02/02/2015
Samples Analysed:	1 wac multi sample		

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

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

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

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i2 Analytical

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Watford, WD18 8YS



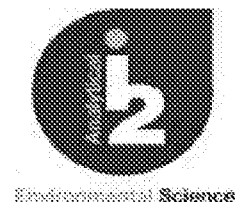
Waste Acceptance Criteria Analytical Results							
Report No:	15-65939						
					Client: AVIRONAL		
Location	Brewery Hill, Arundel						
Lab Reference (Sample Number)	409986				Landfill Waste Acceptance Criteria		
					Limits		
Sampling Date	22/01/2015				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP1						
Depth (m)	0.40						
Solid Waste Analysis							
TOC (%)**	0.6				3%	5%	6%
Loss on Ignition (%) **	3.8				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.30				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 1.6				100	--	--
pH (units)**	8.9				--	>6	--
Acid Neutralisation Capacity (mol / kg)	7.0				--	To be evaluated	To be evaluated
Eluate Analysis					Limit values for compliance leaching test		
(BS EN 12457 - 3 preparation utilising end over end leaching procedure)	2:1	8:1		Cumulative 10:1	using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
	mg/l	mg/l		mg/kg			
Arsenic *	0.013	0.012		0.12	0.5	2	25
Barium *	0.040	0.023		0.25	20	100	300
Cadmium *	< 0.0005	< 0.0005		< 0.0020	0.04	1	5
Chromium *	0.0049	0.0022		0.025	0.5	10	70
Copper *	0.011	0.0051		0.058	2	50	100
Mercury *	< 0.0015	< 0.0015		< 0.010	0.01	0.2	2
Molybdenum *	0.012	0.0032		0.043	0.5	10	30
Nickel *	0.0033	0.0012		0.014	0.4	10	40
Lead *	0.023	0.015		0.16	0.5	10	50
Antimony *	< 0.0050	< 0.0050		0.023	0.06	0.7	5
Selenium *	< 0.010	< 0.010		< 0.040	0.1	0.5	7
Zinc *	0.0078	0.0049		0.053	4	50	200
Chloride *	< 4.0	< 4.0		< 15	800	4000	25000
Fluoride	0.072	0.057		0.59	10	150	500
Sulphate *	26	4.8		74	1000	20000	50000
TDS	80	50		540	4000	60000	100000
Phenol Index (Monhydric Phenols) *	< 0.13	< 0.13		< 0.50	1	-	-
DOC	3.6	1.8		21	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.6						
Dry Matter (%)	83						
Moisture (%)	17						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.21						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and I2 cannot be held responsible for any discrepancies with current legislation

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

* = UKAS accredited (liquid eluate analysis only)

** = MCERTS accredited



Analytical Report Number : 15-65939

Project / Site name: Brewery Hill, Arundel

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
409986	TP1	None Supplied	0.40	Brown clay and sand with gravel.

Analytical Report Number : 15-65939

Project / Site name: Brewery Hill, Arundel

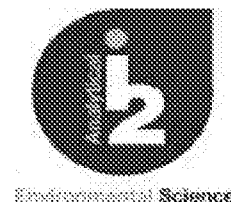
Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046-PL	W	NONE
BTEX (Sum of BTEX compounds) in soil	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Chloride in WAC leachate (BS EN 12457-3 Prep)	Determination of chloride in leachate by Gallery discrete analyser.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L082-PL	W	ISO 17025
DOC in WAC leachate (BS EN 12457-3 Prep)	Determination of dissolved organic carbon in leachate by the measurement on a non-dispersive infrared analyser of carbon dioxide released by acidification.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L037-PL	W	NONE
Fluoride in WAC leachate (BS EN 12457-3 Prep)	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L033-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in WAC leachate (BS EN 12457-3 Prep)	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
Mineral Oil in Soil	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PCB's by GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	NONE
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Phenol Index in WAC leachate (BS EN 12457-3 Prep)	Determination of monohydric phenols in leachate by continuous flow analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Sociated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Stones not passing through a 10 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in WAC leachate (BS EN 12457-3 Prep)	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L039-PL	W	ISO 17025
TDS in WAC leachate (BS EN 12457-3 Prep)	Determination of total dissolved solids in leachate by electrometric measurement.	In-house method based on Standard Methods for the Examination of Water and Waste Water, 21st Ed.	L004-PL	W	NONE
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS

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



Analytical Report Number : 15-65939

Project / Site name: Brewery Hill, Arundel

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

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

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



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Environmental Science

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Analytical Report Number : 15-66981

Project / Site name:	Brewery Hill, Arundel	Samples received on:	23/01/2015
Your job number:	14-322.02	Samples instructed on:	13/02/2015
Your order number:		Analysis completed by:	19/02/2015
Report Issue Number:	1	Report issued on:	19/02/2015
Samples Analysed:	2 leachate samples		

Signed:


Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:


Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

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

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

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Analytical Report Number: 15-66981
Project / Site name: Brewery Hill, Arundel

Lab Sample Number				416694	416695			
Sample Reference				TP2	TP1			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.30	1.70			
Date Sampled				22/01/2015	22/01/2015			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	6.7	8.0			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO ₄	µg/l	100	ISO 17025	44800	21100			
Total Sulphur	µg/l	1	NONE	15000	7000			

Total Phenols

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
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Speciated PAHs

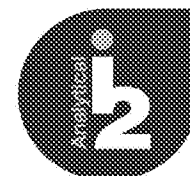
Naphthalene	µg/l	0.01	NONE	1.6	< 0.01			
Acenaphthylene	µg/l	0.01	NONE	2.1	< 0.01			
Acenaphthene	µg/l	0.01	NONE	0.23	< 0.01			
Fluorene	µg/l	0.01	NONE	0.46	< 0.01			
Phenanthrene	µg/l	0.01	NONE	0.69	< 0.01			
Anthracene	µg/l	0.01	NONE	0.18	< 0.01			
Fluoranthene	µg/l	0.01	NONE	0.11	< 0.01			
Pyrene	µg/l	0.01	NONE	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01			
Chrysene	µg/l	0.01	NONE	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01			

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	5.3	< 0.2			
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1.1	ISO 17025	8.5	5.2			
Barium (dissolved)	µg/l	0.05	ISO 17025	49	49			
Boron (dissolved)	µg/l	10	ISO 17025	49	21			
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08			
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4			
Copper (dissolved)	µg/l	0.7	ISO 17025	12	10			
Lead (dissolved)	µg/l	1	ISO 17025	2.4	< 1.0			
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.2	2.2			
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0			
Zinc (dissolved)	µg/l	0.4	ISO 17025	2.1	3.8			



Environmental Science

Analytical Report Number: 15-66981
Project / Site name: Brewery Hill, Arundel

Lab Sample Number				416694	416695			
Sample Reference				TP2	TP1			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.30	1.70			
Date Sampled				22/01/2015	22/01/2015			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status					

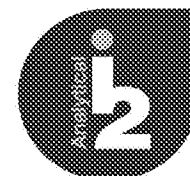
Monaromatics

Benzene	µg/l	1	NONE	< 1.0	-			
Toluene	µg/l	1	NONE	< 1.0	-			
Ethylbenzene	µg/l	1	NONE	< 1.0	-			
p & m-xylene	µg/l	1	NONE	< 1.0	-			
o-xylene	µg/l	1	NONE	< 1.0	-			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	-			

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	10	NONE	< 10	-			
TPH-CWG - Aliphatic >C6 - C8	µg/l	10	NONE	< 10	-			
TPH-CWG - Aliphatic >C8 - C10	µg/l	10	NONE	< 10	-			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	-			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	-			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	-			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	-			

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



Environmental Science

Analytical Report Number : 15-66981

Project / Site name: Brewery Hill, Arundel

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron in leachate	Determination of boron by acidification followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in leachates	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073W-PL	W	NONE
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Monohydric phenols in leachate	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L070-PL	W	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Sulphur in leachates	Determination of total sulphur in leachates by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-UK	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE

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

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

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

Appendix

IV Soil Geotechnical Laboratory Results

Project Name: Brewery Hill, Arundel					Samples Received: 29/01/2015		K4 SOILS 	
					Project Started: 30/01/2015			
Client: Airon Associates Limited					Testing Started: 09/02/2015			
Project No: 14-322.01			Our job/report no: 18254		Date Reported: 10/02/2015			

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
BH1	SB	1.20 - 1.70	Brown and grey mottled slightly gravelly silty CLAY with occasional fm chalk fragments (gravel is fmc and sub-angular to rounded flint gravel and fm chalk gravel)	35	60	22	38	60	
BH1	SB	2.20 - 2.70	Brown slightly gravelly slightly sandy silty CLAY with traces of fine rootlets and occasional fine chalk fragments (gravel is fm and sub-angular to angular)	30	47	20	27	70	
BH1	SB	3.20 - 3.70	Brown slightly gravelly slightly sandy silty CLAY (gravel is fm and sub-angular flint and fine chalk gravel)	31	46	18	28	90	
BH1	SB	4.20 - 4.70	Brown slightly gravelly slightly sandy silty CLAY (gravel is fmc and sub-angular to rounded)	33	39	18	21	90	



Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.

BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.

BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

Checked and Approved

Initials: K.P

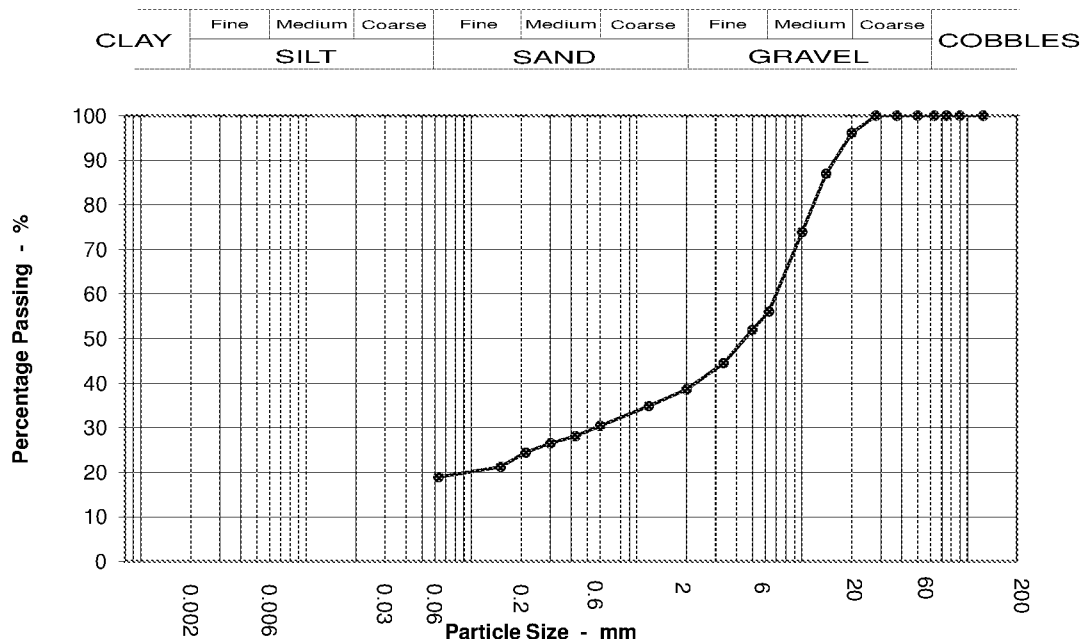
Date: 10/02/2015

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

All samples connected with this report, incl any on 'hold' will be stored and disposed off according to Company policy. A copy of this policy is available on request.

K4 SOILS 	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	18254
		Project No:	14-322.01
Location	Brewery Hill, Arundel	Borehole / Trial Pit No:	BH1
		Depth	8.20 m
Visual Soil Description	Brown clayey sandy GRAVEL (gravel is fmc and angular to rounded)	Sample Type/No	SB -



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	87		
10	74		
6.3	56		
5	52		
3.35	44		
2	39		
1.18	35		
0.6	30		
0.425	28		
0.3	26		
0.212	24		
0.15	21		
0.063	19		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.2
Sedimentation	N/A
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	61.4
Sand	19.7
Silt & Clay	18.9

Grading Analysis	
D100	125.0
D60	7.1
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY

Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories:

K.Phaure(Tech.Mgr)

J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved

Initials: kp

Date: 10/02/2015



Project Name: Brewery Hill, Arundel					Samples Rec: 29/01/2015		K4 SOILS 	
					Project Started: 30/01/2015			
Client: Aviron Associates Limited					Testing Started: 08/02/2015			
Project No: 14-322.01			Our Job/report no: 18254		Date reported: 10/02/2015			
BH / TP No :	Sample no / ref:	Sample depth (m)	Sample Description	Bulk density (Mg/m3)	Dry density (Mg/m3)	Moisture content (%)	Saturation Moisture content (%)	Remarks / Sample Size Complies With BS 1377 Part 2
BH1	SB	14.20	Off white cobble CHALK fragments	2.07	1.68	24	23	No
 Summary of Test results BS 1377 : Part 2 : Clause 3.3 : 1990 Determination of Saturation Moisture Content of Chalk Checked and Approved Initials: kp Date: 10/02/2015								
Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) All samples connected with this report ,incl any on 'hold' will be stored and disposed off according to Company policy.Acopy of this policy is available on request.								

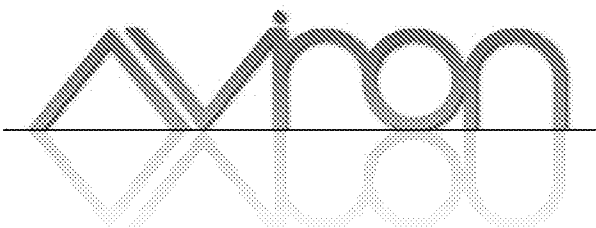
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