



# *Your* Environment

## SITE INVESTIGATION REPORT - LAND BETWEEN COMMA OIL AND SOUTHERN WATER TREATMENT, DERING WAY, GRAVESEND, DA12 2QH

For Cowland Ltd

### *Your Environment*

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| <b>For and on behalf of YourEnvironment</b> |               |                             |  |              |

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Gravesham Borough Council

## 1.0 Introduction

YourEnvironment (YE) was instructed by Cowland Ltd (Quote No: Q884, Dated December 16<sup>th</sup> 2015) to conduct a Site Investigation (SI) at a site which is located at Dering Way, Gravesend, DA12 2QH.

As we understand current plans for the current redevelopment of the site include;

- A change of use of land to Use Class B8 Storage and Distribution.
- Formation of new access road and retention of discrete areas of soft landscaping.

The purpose of the report is to satisfy a specific planning condition, namely 4a, attached to the redevelopment by Gravesham Borough Council under reference 20110473

The proposed redevelopment plans for the site, at the time of issuing this report can be reviewed within **Appendix A**.

Our SI works comprised of five (5no.) windowless boreholes drilled to a maximum depth of 5.00 meters below ground level (mbgl) with laboratory testing comprising of soil contamination parameters. In addition, four of the window sampler boreholes were installed with standpipes to allow for future monitoring of groundwater levels and concentrations of ground gases to undertaken.

This SI was completed subsequent to a previously published Stage 1: Desktop Study & Walkover Report, which was issued by YE (Report Reference: YE2268, Revision 1, Issued: December 2015). The works as detailed within this report seeks to assess any possible potential pollutant linkages identified within this aforementioned report.

This report presents a full factual record of all site works carried out, the results of *insitu* testing and subsequent laboratory testing of selected samples obtained during these works. The report has been formulated in accordance with BS10175:2015 '*Investigation into Potentially Contaminated Sites - Code of Practice*' and CLR11 - '*Model Procedures for the Management of Land Contamination*' and from the National Planning Policy Framework.

YE take no responsibility for conditions which have not been revealed by the windowless sampler boreholes, or which occur between windowless sampler boreholes. Whilst every effort has been made to interpret the conditions between investigation locations, such information is only indicative and liability cannot be accepted for its accuracy.

The information contained in this report is intended for the use of the named client (or their approved contractors). Should any part of this report be relied on by a third party, that party does so wholly at its own risk and YE disclaims any liability to such parties. Should the purposes for which the report is used, or the proposed use of the site change, this report may no longer be valid and further use of reliance upon the report in those circumstances shall be at the client's sole and own risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic



conditions which could render the report inaccurate or unreliable. YE should in all such altered circumstances be commissioned to review and update this report accordingly.

## 2.0 Proposed Development

As we understand current plans for the current redevelopment of the site include;

- A change of use of land to Use Class B8 Storage and Distribution.
- Formation of new access road and retention of discrete areas of soft landscaping.

The purpose of the report is to satisfy a specific planning condition, namely 4a, attached to the redevelopment by Gravesham Borough Council under reference 20110473.

The proposed redevelopment plans for the site, at the time of issuing this report can be reviewed within **Appendix A**.

## 3.0 Physical Setting

### 3.1 Site Information

#### Access

The site is accessed from an access road that is constructed from crushed aggregate, concrete and brick.

#### Topography

Whilst the site is generally flat, there are two distinct areas that have been artificially raised. The northern 1/5<sup>th</sup> of the site has been raised by approximately 1m. There is a bund running east - west in the middle of the site that is approximately 1.5m high and runs about 20m in length and is 2m wide.

#### Vegetation

The site boundary on the northern and eastern side is made from mature hedgerows and trees. The remainder of the site is grassed which is kept short by grazing horses.

#### Buildings

There are no buildings on the site.

#### Surface Permeability

The site is 100% permeable.

#### Drainage Features

There is a ditch, which runs along the western boundary running north to south that has approximately 500mm of water in it. It also has a large quantity of tanks, drums, trolleys, tyres and other waste in it.

#### Other Services

There are no services on the site.

#### Surrounds

The site is completely surrounded by industrial uses. To the north is a railway line, the east is a sewage works and to the west is a lubricants plant with several large storage tanks present.

#### Potentially Contaminative Land Uses

On site sources:

- Raised ground at the north of the site is comprised of poorly compacted loose concrete, steel, plastic and wheels (Made Ground).

#### Off site sources:

- Railway line (north);
- Sewage works (east);
- Various tanks and associated infrastructure (west).

### 3.2 Geology

The relevant British Geological Survey (BGS) online mapping information indicates the site to be underlain by superficial deposits of Alluvium (Clay, Silt, Sand and Gravel), this overlies bedrock comprising of the Seaford Chalk Formation and the Newhaven Chalk Formation.

### 3.3 Hydrogeology

The Environment Agency designate aquifers in accordance with the Water Framework Directive. These designations reflect not only the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetlands ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

Within the superficial deposits, the aquifer is recorded as being a Secondary (undifferentiated) Aquifer. This designation assigned where it is not possible to attribute either category A or B to an aquifer type. In general, these layers have previously been designated as both Minor and Non-Aquifer in different locations due to the variable characteristics of the rock type.

The aquifer within the bedrock is recorded as being a Principal Aquifer. This is defined as geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally Principal Aquifers were previously Major Aquifers.

There are a three active groundwater abstraction licences within 2000m, the closest of which is located 74m southeast for the purposes of general/process washing. There is one active potable abstraction licence within 2000m, which is located 1607m southwest. The site is not within a Source Protection Zone (SPZ).

### 3.4 Hydrology

#### Surface Water Abstraction Licenses

There are a number of surface abstraction licences within 2000m, the closest active record is 838m east for the purposes of general use.

#### Detailed River Networks

There are a number of network entries within 500m, the closest of which is located 45m north for a primary river.



### Surface Water Features

The nearest surface water feature is listed as being on site, which we consider to be a drainage ditch.

## 4.0 Site History Summary & Risk

The earliest mapping (c. 1864) indicates that the site is undeveloped and is composed of fields within a low lying marsh area. The site has essentially remained undeveloped until the present day.

Observations made during the walkover survey indicate that the area is occupied by a grazing meadow.

In respect of off site historical and current risks, a number of uses have been identified:

- Railway line (immediately north of the site);
- Tank (200m east);
- Gas works (500m west);
- Sewage works and associated infrastructure (immediately east of the site);
- Electrical substation (over 100m west);
- Works (140m southwest, 180m east, 100m northwest);
- Laundry (160m southwest);
- Timber yard (60m northeast);
- Warehouse (80m north);
- Depot (over 100m northwest).

## 5.0 Preliminary Conceptual Site Model and Risk Assessment

This presented Conceptual Site Model has been developed from information presented in our initial Stage 1: Report to provide information regarding the possible sources of contamination on site, the pathway in which the contamination can migrate and a vulnerable receptor to the contamination, all of which need to be present for there to be a risk. Given the proposed end use of the site as being commercial the generic land use of 'commercial/industrial' has been applied. Consequently, the following potential Source - Pathway - Receptor relationships have been identified.

| Hazard / Pollutant  | Pathways   | Receptor                           | Potential Severity | Probability of Risk | Level of Risk | Justification  |
|---|--|------------------------------------|--------------------|---------------------|---------------|--|
| Hydrocarbons (TPH, PAH, BTEX, MTBE, SVOC's, Heavy VOC's). Heavy metals and asbestos in made ground on site and from off site. | Ingestion, dermal contact, inhalation                                      | Future end users and site visitors | Medium             | Likely              | Moderate      | A moderate risk is considered given the historic/current setting of the area adjoining the site and the Made Ground present on site. The chemical quality and composition of used material is unknown.   |
|   |  | Construction Workers               | Medium             | Likely              | Moderate      | A moderate risk is considered given the historic/current setting of the site and surrounding environs. Construction workers are likely to come into direct contact with soils and therefore the use of appropriate PPE should be adopted to mitigate against any potential risks |
| Ground Gases  | Leaching through soils and migration via groundwater or soil pore moisture | Controlled Waters                  | Medium             | Low Likelihood      | Low           | A low risk is considered given the presence of Secondary Undifferentiated Aquifer within the superficial deposits which are expected to be of significant thickness overlying the bedrock.   |
|   | Uptake   | Plant and Wildlife                 | Mild               | Low Likelihood      | Low           | A low risk is considered given limited amount of potential contamination identified from historical and current land use on site and in proximity to the study site.   |
|   | Gas generation, migration and build up within properties                   | Future end users, site workers.    | Mild               | Low Likelihood      | Low           | A low risk is considered given open storage and distribution nature of the proposed development and the Made Ground present on site. The chemical quality and composition of used material is unknown.   |

Table 1: Preliminary Conceptual Site Model and Risk Assessment

The risks posed to future end users and construction workers has been estimated as MODERATE, controlled waters and plant and wildlife as LOW and future end users from ground gases as LOW.



## 6.0 Fieldworks

### 6.1 Site Investigation

All SI works were completed on December 22<sup>nd</sup> 2015 under the supervision of a Geo-Environmental Engineer from YE. In summary the investigation included:

- A two man team ascertained the routes of any below ground services in close proximity to the proposed exploratory hole positions. They completed a utility search, using a CAT scan and lifting up of any man hole covers. Following the CAT scan, hand dug starter pits were completed to a depth of 1.2 metres below ground level (mbgl).
- Five (5no.) windowless sampler boreholes (WS1, WS3 to WS6) were completed, by means of a track mounted terrier rig, to a maximum depth of 5.00mbgl. The locations of exploratory holes were chosen to provide as broad a coverage of the site as possible.
- The windowless sampler boreholes were logged with any groundwater conditions noted and representative soil samples removed in accordance with current guidelines.
- Soil samples were removed from shallow sub surface locations, with further samples taken at depth at depths of 0.15mbgl, 0.30mbgl, 0.50mbgl, 0.7mbgl and 1.0mbgl, with the deepest sample to be obtained from the natural strata. Samples were subsequently placed in suitable containers including 1kg tubs and 250ml glass jars and placed in cool boxes with cool packs prior to storage within our *in-house* laboratory fridges and then subsequent forwarding to our designated laboratory for analysis.
- Four (4no.) windowless boreholes (WS1, WS3, WS5 and WS6) were installed with standpipes comprising of 50mm pipework to a maximum depth of 3m for the purposes of future gas and groundwater monitoring to be undertaken. These were completed with a lockable cover, flush with the ground, to protect the installation
- Upon completion, all exploratory holes not installed with standpipes, were back filled, compacted and made good to existing levels and finishes, with any surplus spoil bagged up and removed from site.

The positions of exploratory holes in relation to the existing site layout can be reviewed within [Appendix B](#). Photographs taken during the SI can be referred to in [Appendix C](#), with the drillers soil logs located in [Appendix D](#).

## 6.2 Ground Gas and Groundwater Monitoring

Three rounds of ground gas and groundwater monitoring were carried out on December 29<sup>th</sup> 2015, January 5<sup>th</sup> and 12<sup>th</sup> 2016 using the standpipe installations of all exploratory holes installed.

## 6.3 Ground Gas

Ground gas monitoring was carried out in accordance with the guidelines presented in CIRIA C665 'Assessing risk posed by hazard ground gases to buildings' using a Photo Ionisation Detector (PID) followed by a GA5000 and involved the following steps:

Flow was monitored for a period of two minutes where possible; maximum flow was recorded. Volatile Organic Compounds (VOC) concentrations were monitored for a period of two minutes where possible; maximum value was recorded. Ground gases, including concentrations of methane, carbon dioxide, hydrogen sulphide and carbon monoxide were monitored for up to five minutes. During monitoring, ground gas readings were logged every thirty seconds.

## 6.4 Groundwater

A groundwater sample was recovered, where possible, from each of the installations. Groundwater monitoring was completed in accordance with BS6068:2009 Water Quality Sampling: Guidance on Sampling of Groundwater.

A two phase dip meter was used to determine the presence of LNAPL (Light Non Aqueous Phase Liquids) and DNAPL (Dense Non Aqueous Phase Liquids). Each well was purged before a sample was taken and retained in a 1 litre coloured glass bottle (Winchester).

The samples were then placed in a cool box prior to transit to the laboratory.

The monitoring results are presented in [Appendix E](#).

## 7.0 Geology & Ground Conditions

The following ground conditions were encountered during the SI;

Topsoil - Encountered in all exploratory holes, with the exception of WS1 and WS3, to a maximum drilled depth of 0.25mbgl (in WS4) and generally comprised of a grass covered brown silty or clayey topsoil.

Made ground-Hardcore - Encountered in WS1 exploratory hole only to a depth of 0.1mbgl.

Gravelly Sand - Encountered in WS3 exploratory hole only to a depth of 0.5mbgl. Possibly fill material derived from natural sources.



Alluvium - Encountered within all exploratory holes to the maximum drilled depth of 5.0mbgl. The alluvium comprises very soft to firm, grey silty clay, and black very organic or peaty clay, or silty clay, generally containing a greater proportion of organic material below around 3 m bgl, including some more peaty bands. It is possible that the uppermost layer of silty clay soil in WS4, WS5 and WS6 is reworked natural material placed as fill.

Chalk bedrock was not encountered in any of the exploratory holes, however a BGS borehole record located 100m to the east of the Site indicates that the Chalk subcrops at around 29m bgl in the vicinity of the Site.

## 8.0 Groundwater Conditions

Groundwater was encountered in the exploratory holes at between 1.5 mbgl and 2.0 mbgl when drilled.

The groundwater levels observed during the monitoring rounds showed standing groundwater levels ranging from 0.91 m bgl in WS6 during the first monitoring round, to 0.08m bgl in WS1 during the third monitoring round. WS1, WS5 and WS6 are recorded as having been flooded (ie groundwater level at or above ground level) in the second monitoring round and WS5 remained flooded during the third monitoring round.

It should be noted that groundwater levels are dependent upon seasonal variations and can change after periods of prolonged rain fall or drought. Such seasonal variations could have an effect on site development, if high groundwater levels give rise to waterlogging.

## 9.0 Visual and Olfactory Observations

With the exception of general anthropogenic material identified, no visual and/or olfactory evidence of potential contamination was noted within any soils encountered as part of the investigative works undertaken.

Furthermore, in respect of groundwater monitoring completed no olfactory evidence was noted in any of the groundwaters retrieved. Furthermore, no presence of LNAPL/DNAPL was observed during SI works or monitoring undertaken.

## 10.0 Contamination

### 10.1 Soil Testing

A total of nine (9no.) samples have been analysed by Messrs QTS Environmental Ltd in their UKAS and MCERTS accredited laboratory-testing facility in accordance with laboratory protocol.

The testing completed comprised of a focused suite of heavy metals, pH, speciated Total Petroleum Hydrocarbons (Aromatic/ Aliphatic Split) and speciated Polycyclic Aromatic Hydrocarbons (PAH - including the more carcinogenic forms naphthalene and benzo(a)pyrene), pH and soil organic matter. This suite of testing also incorporated total cyanide, total phenols, benzene, toluene, ethylbenzene and xylenes (BTEX) and methyl



tert butyl ether (MTBE). Two samples of made ground from WS1 were also analysed for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs), and were submitted for an asbestos screen.

The results of this laboratory testing have been compared to the Soil Guideline Values (SGVs) as well as the CIEH 'LQM' guideline values for inorganic and organic contaminants in soils. The proposed development of the site is intended to comprise of commercial (B8 open storage and distribution) and therefore screening has been made against a land use of 'commercial'.

## 10.2 Selection of Screening Criteria

The on-site receptors for the study site are considered to be:

- Construction workers (during redevelopment of the site only);
- Future maintenance workers (following redevelopment);
- Staff and visitors (following redevelopment); and
- Trespassers (during redevelopment).

The off-site receptors for the site are considered to be:

- Staff and visitors to the commercial/industrial premises in the immediate vicinity of the site.

Risks to construction workers during the redevelopment process will be mitigated by adhering to appropriate health and safety legislation, and the wearing of appropriate personal protective equipment (PPE). During redevelopment, the site will be securely fenced to prevent trespassers from accessing the site, and good site management practices will be implemented to mitigate exposure to off-site receptors.

The potential pathways for contaminants within the soil to human health receptors following redevelopment are considered to be:

- Direct ingestion of soil and soil derived dust;
- Dermal contact with soil outside and soil derived dust inside
- Inhalation of soil derived dust inside and outside; and
- Inhalation of soil derived vapours inside and outside.

Additionally there may be pathways associated with accumulation of ground gases, followed by asphyxiation/explosion. A discussion of risks from accumulation of ground gases is presented within Section 10.6.

Potential risks via permeation of drinking pipes, and risks to concrete from attack by aggressive ground conditions should be considered at design stage.

The potential pathways for contaminants within the soil to off-site human health receptors following redevelopment are considered to be:

- Direct ingestion of soil and soil derived dust;
- Dermal contact with soil outside and soil derived dust inside
- Inhalation of soil derived dust inside and outside; and



- Inhalation of soil derived vapours inside and outside if contamination within soil is able to migrate across the site boundary within.

In the first instance, the results of this laboratory testing have been compared to generic assessment criteria (GAC) for the commercial land use scenario. These incorporate the following pathways:

- Direct ingestion of soil and soil derived dust;
- Dermal contact with soil outside and soil derived dust inside
- Inhalation of soil derived dust inside and outside; and
- Inhalation of soil derived vapours inside and outside.

Given that these incorporate a number of pathways that will not be relevant to the site following redevelopment, this is a highly conservative approach and exceedances will be discussed in this light.

Contaminants have been screened against revised LQM/CIEH S4UL criteria<sup>1</sup> where available. These GAC have been designed for use under planning, using Health Criteria Values based on minimal risk, and updated exposure parameters. The S4UL are intended to replace the previous LQM/CIEH GAC. The S4UL are based on the assumption of a sandy loam soil-the 2.5% soil organic matter (SOM) criteria have been used, where available and appropriate, in the first instance. All soil samples were analysed for %SOM, the range was from 1.2% - 7.3%, and so this conservative approach is considered appropriate for initial screening.

Where no S4UL are available, the EIC/ AGS/ CL:AIRE/ GAC<sup>2</sup> have been used. The toxicological criteria within these are also based on minimal risk. It is recognised that these criteria have not recently been updated, and in particular, do not incorporate the slightly higher inhalation rates that have been used within the S4UL. However, given that they incorporate additional pathways, they are considered suitable for an initial screen. The EIC/ AGS/ CL:AIRE/ GAC are also based on a sandy loam soil and the 1% SOM criteria have been used in the first instance.

There is neither an S4UL nor a EIC/ AGS/ CL:AIRE/ GAC available for lead. In the absence of a GAC based on minimal risk, the C4SL for lead has been used. It is recognised that this is based on a “low level of toxicological concern” rather than on a minimal risk level.

All the GAC are based on a sandy loam soil. This is considered appropriate for use for initial screening.

All of the GAC assume unsaturated soils. However, the use of the GAC are considered to be conservative, because they assume a certain air-filled porosity and water-filled porosity. The GAC also assume that no free phase product is present, and are not intended for use in this instance. No free product was observed within soils during the site investigation and no hydrocarbon sheen was noted during the round of groundwater monitoring undertaken.

### 10.3 Soil Testing Results & Screening

<sup>1</sup> Nathanail et al. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, 2015. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3495

<sup>2</sup> CL:AIRE (2010) The EIC/AGS/CL:AIRE Generic Assessment Criteria for Human Health Risk Assessment

All metals, PAHs, and TPH CWG analytes are presented in the following tables. Other potential contaminants of concern are only shown where there is at least one result exceeding the limit of detection. All of the soil contamination laboratory analytical results are presented within **Appendix F**.

### Metalloids

| Determinant           | Min  | Max | GAC               | Number of exceedances |
|-----------------------|------|-----|-------------------|-----------------------|
| Arsenic               | 8    | 32  | 640*              | 0                     |
| Cadmium               | <0.2 | 2.3 | 190*              | 0                     |
| Chromium (total)      | 13   | 50  | 8600              | 0                     |
| Chromium (hexavalent) | <2   | <2  | 33 <sup>a</sup>   | 0                     |
| Copper                | 8    | 24  | 68000*            | 0                     |
| Lead                  | 18   | 95  | 2300              | 0                     |
| Mercury               | <1   | 1.2 | 1100 <sup>b</sup> | 0                     |
| Nickel                | 9    | 32  | 980 <sup>c</sup>  | 0                     |
| Selenium              | <3   | <3  | 12000*            | 0                     |
| Zinc                  | 80   | 112 | 730000*           | 0                     |
| Total Phenols         | <2   | <2  | 3200*             | 0                     |

Table 2: Metalloids Soil Exceedances

\*LQM/CIEH GAC for Commercial land use scenario based on a sandy loam soil and 6% SOM.

+C4SL for Commercial land use scenario based on a sandy loam soil.

- Based on GAC for hexavalent chromium.
- Based on the inorganic mercury GAC as the conceptual site model does not suggest that other forms of mercury are likely to be present on site.
- LQM issued an update to the nickel S4ULs in August 2015 and this has been taken into account.

There are no exceedances in any of the samples analysed. Based on the foregoing we would conclude there is a minimal risk.

### Organics

| Determinant        | Min  | Max  | GAC    | Number of exceedances |
|--------------------|------|------|--------|-----------------------|
| Naphthalene        | <0.1 | <0.1 | 460*   | 0                     |
| Acenaphthylene     | <0.1 | <0.1 | 97000* | 0                     |
| Acenaphthene       | <0.1 | <0.1 | 97000* | 0                     |
| Fluorene           | <0.1 | <0.1 | 6800*  | 0                     |
| Phenanthrene       | <0.1 | 1.10 | 22000* | 0                     |
| Anthracene         | <0.1 | 0.32 | 54000* | 0                     |
| Fluoranthene       | <0.1 | 3.21 | 23000* | 0                     |
| Pyrene             | <0.1 | 2.83 | 54000* | 0                     |
| Benzo(a)anthracene | <0.1 | 1.74 | 170*   | 0                     |
| Chrysene           | <0.1 | 1.57 | 350*   | 0                     |



|                        |      |      |       |   |
|------------------------|------|------|-------|---|
| Benzo(b)fluoranthene   | <0.1 | 2.66 | 44*   | 0 |
| Benzo(k)fluoranthene   | <0.1 | 0.89 | 1200* | 0 |
| Benzo(a)pyrene         | <0.1 | 2.04 | 35*   | 0 |
| Indeno(1,2,3-cd)pyrene | <0.1 | 1.53 | 510*  | 0 |
| Dibenz(a,h)anthracene  | <0.1 | 0.24 | 3.6*  | 0 |
| Benzo(ghi)perylene     | <0.1 | 1.30 | 4000* | 0 |

Table 3: PAH Soil Exceedances

There are no exceedances noted.

| Determinant          | Min    | Max    | GAC      | Number of exceedances |
|----------------------|--------|--------|----------|-----------------------|
| Aliphatic >C5 - C6   | < 0.01 | < 0.01 | 5900*    | 0                     |
| Aliphatic >C6 - C8   | < 0.05 | < 0.05 | 17000*   | 0                     |
| Aliphatic >C8 - C10  | < 2    | < 2    | 4800*    | 0                     |
| Aliphatic >C10 - C12 | < 2    | < 2    | 23000*   | 0                     |
| Aliphatic >C12 - C16 | < 3    | < 3    | 82000*   | 0                     |
| Aliphatic >C16 - C21 | < 3    | < 3    | 1700000* | 0                     |
| Aliphatic >C21 - C34 | < 10   | 22     | 1700000* | 0                     |
| Aromatic >C5 - C7    | < 0.01 | < 0.01 | 46000*   | 0                     |
| Aromatic >C7 - C8    | < 0.05 | < 0.05 | 110000*  | 0                     |
| Aromatic >C8 - C10   | < 2    | < 2    | 8100*    | 0                     |
| Aromatic >C10 - C12  | < 2    | < 2    | 28000*   | 0                     |
| Aromatic >C12 - C16  | < 2    | < 2    | 37000*   | 0                     |
| Aromatic >C16 - C21  | < 3    | 23     | 28000*   | 0                     |
| Aromatic >C21 - C35  | < 10   | 142    | 28000*   | 0                     |

Table 4: TPH CWG Aliphatic/Aromatic Soil Exceedances

\* LQM/CIEH GAC for Commercial land use scenario based on a sandy loam soil and 2.5% SOM.

It is noted that the LQM/CIEH S4UL guidance recommends an additive approach for the TPH fraction, so that a hazard index approach is used. Based on a preliminary conservative comparison of maximum concentrations to S4ULs, no forward modelling is necessary to prove that this would still result in no exceedances at the site.

There are no exceedances noted.

#### Others

BTEX, MTBE, VOC and SVOC results were all below the laboratory Limits of Detection for all determinands and samples analysed.

The asbestos screening returned a negative result for the presence of fibrous material from all samples analysed.

Thus, based upon screening undertaken on contaminants which exceed their limit of detection, there are no relevant exceedances.

The soil contamination laboratory certificates can be reviewed within [Appendix F](#).

#### 10.4 Groundwater Testing

Samples were analysed by Messrs QTS Environmental Ltd in their UKAS and MCERTS accredited laboratory testing facility in accordance with laboratory protocol.

The testing completed comprised of a suite of testing similar to that undertaken for soils such as heavy metals, pH, speciated Total Petroleum Hydrocarbons (Aromatic/ Aliphatic Split) and speciated Polycyclic Aromatic Hydrocarbons (PAH - including the more carcinogenic forms naphthalene and benzo(a)pyrene), total cyanide, total phenols, BTEX, MTBE, and pH.

The results of this laboratory testing have been compared to the UK Drinking Water Standards (DWS) for inorganic and contaminants, where available.

#### 10.5 Groundwater Results

The results of the groundwater testing are shown in the following tables below where they are compared to the available Drinking Water Standards. All units are µg/l unless stated.

##### Metalloids

| Determinant | Max       | GAC      | Number of exceedances |
|-------------|-----------|----------|-----------------------|
| Arsenic     | 9         | 10       | 0                     |
| Barium      | 128       |          |                       |
| Beryllium   | <3        |          | 0                     |
| Boron       | 2590 µg/l | 1 mg/l   | 6                     |
| Cadmium     | <0.4      | 5.0      | 0                     |
| Chromium    | <5        | 50       | 0                     |
| Copper      | 6 µg/l    | 2.0 mg/l | 0                     |
| Lead        | <5        | 10       | 0                     |
| Mercury     | <0.05     | 10       | 0                     |
| Nickel      | 20        | 20       | 0                     |
| Selenium    | <5        | 10       | 0                     |
| Vanadium    | 11        |          | 0                     |
| Zinc        | 94        |          |                       |

Table 5: Metalloids Groundwater Exceedances

##### Organics

| Determinant     | Max | GAC | Number of exceedances |
|-----------------|-----|-----|-----------------------|
| Total >C6 - C40 | 449 | 10* | 1                     |

Table 6: TPH Groundwater Exceedances



| Determinant        | Max  | GAC        | Number of exceedances |
|--------------------|------|------------|-----------------------|
| Naphthalene        | 0.15 | 0.01 (LOD) | 5                     |
| Acenaphthylene     | 0.04 | 0.01 (LOD) | 1                     |
| Acenaphthene       | 0.03 | 0.01 (LOD) | 3                     |
| Fluorene           | 0.19 | 0.01 (LOD) | 4                     |
| Phenanthrene       | 0.74 | 0.01 (LOD) | 9                     |
| Anthracene         | 0.03 | 0.01 (LOD) | 1                     |
| Fluoranthene       | 0.04 | 0.01 (LOD) | 6                     |
| Pyrene             | 0.07 | 0.01 (LOD) | 6                     |
| Benzo(a)anthracene | 0.09 | 0.01 (LOD) | 1                     |
| Chrysene           | 0.08 | 0.01 (LOD) | 2                     |

Table 7: PAH Groundwater Exceedances (compounds where concentration < LOD not listed)

In summary, the groundwater monitoring results show:

- There are six exceedances of boron in comparison of the DWS from samples taken from WS1, WS3, WS5 and WS6, in all monitoring rounds. However, we consider this to be naturally occurring boron;
- No other elevated concentrations in respect of DWS for metals are noted;
- There are a number of PAH concentrations above the laboratory LOD for the compounds listed in Table 7 above, from samples taken from WS1, WS3, WS5 and WS6, in all monitoring rounds;
- There are a number of elevated concentrations of aliphatic and aromatic TPH fractions in the >C16-C21 and >C21-C34 ranges in WS1, WS3 and WS6 in the third monitoring round only, compared to the withdrawn drinking water standards for TPH of 10 µg/l.
- There are no exceedances of total cyanide, monohydric phenols, BTEX or MTBE above the laboratory LODs for these compounds.

The groundwater contamination laboratory certificates can be reviewed within [Appendix H](#).

### 10.6 Gas Monitoring Results

Gas monitoring was carried out on three occasions using a Gas monitor (Geotechnical Instruments GA5000). Readings were taken from the installed positions of WS1, WS3, WS5 and WS6. Due to high groundwater level and/or flooding of standpipes at WS1, WS5 and WS6 on the second monitoring round, and of WS5 on the third monitoring round, gas measurement was not possible at these locations at the time.

The standpipes were tested for the presence of methane, oxygen, carbon dioxide and hydrogen sulphide. The flow rates of the gas and barometric pressure were also recorded. No methane, hydrogen sulphide and carbon monoxide concentrations were recorded within any of the installed positions.

Oxygen concentrations ranged from a minimum of 17.9% (peak, WS1) and 18.8% (peak and steady, WS3) to 21.7% (peak/steady, WS1) in the installations, with the maximum recorded carbon dioxide concentration recorded within WS1 (peak) of 7.8%, WS6

(peak/steady) of 2.5% and maximum recorded methane concentration recorded within WS3 (peak) of 3.6%, WS6 (peak/steady) of 1.5%.

Positive and negative flow rates were recorded, to a maximum of 7.0/hr in WS6.

Barometric pressure was high on the first visit and low on the second and third visits, ranging between 985 to 1018mBars and noted to be steady/level.

The recorded concentrations of methane and carbon dioxide have been used to calculate a Gas Screening Value (GSV) for the gassing regime at this site. This value has been subsequently compared against CIRIA values supplied within CIRIA Document C665 *Assessing risks posed by hazardous ground gases to buildings* (2007) using Situation A for carbon dioxide and methane.

The values used represent the worst case steady state CO<sub>2</sub> and CH<sub>4</sub> concentrations across all installations. High peak concentrations, where not maintained in the steady state condition, have not been used.

The maximum flow rate of 7.0l/hr has been used in calculation of the GSV.

The GSV is calculated as:

(Worst case CO<sub>2</sub> and CH<sub>4</sub> concentration / 100) x worst case flow rate = GSV

| Peak Flow Rate (l/hr) | Worst Case CO <sub>2</sub> | CO <sub>2</sub> GSV       | Worst Case CH <sub>4</sub> | CH <sub>4</sub> GSV       |
|-----------------------|----------------------------|---------------------------|----------------------------|---------------------------|
| +7.0 l/hr             | 2.5%                       | 0.175l/hr CO <sub>2</sub> | 1.5                        | 0.125l/hr CH <sub>4</sub> |

Table 8: Calculated GSV

This GSV is a conservative estimate based on the maximum steady state concentrations and flow rate.

Based on the maximum calculated GSV of 0.175l/hr, the site was below the threshold of 0.7 l/hr given by CIRIA C665 for Characteristic Situation 2: Low Risk. Given the presence of peaty deposits in the alluvium this classification is to be expected and it is therefore assumed that the source of the gas is natural degradation in the peaty component of the alluvium. Based on this data, the indication is that there is a 'low' risk posed by ground gas.

The monitoring results are presented in **Appendix H**.



## 11.0 Updated Conceptual Site Model and Risk Assessment

The Conceptual Site Model has been re-formulated based upon the results from the SI in accordance with BS10175:2015. It aims to provide information regarding the sources of contamination and the pathways in which contamination can migrate to a vulnerable receptor, all of which need to be present for there to be a risk. This is in relation to the proposed end use being classified as 'commercial'. The following linkages have been identified.

| Hazard / Pollutant  | Pathways   | Receptor   | Potential Severity | Probability of Risk      | Level of Risk   | Justification   |
|---|--|--|--------------------|--------------------------|-----------------|---|
| Hydrocarbons (TPH, PAH, BTEX, MTBE, SVOC's, Heavy metals and asbestos in made ground on site and from off site. | Ingestion, dermal contact, inhalation                                      | Future end users and site visitors<br>Construction Workers | Low<br>Medium      | Low Likelihood<br>Likely | Low<br>Moderate | A low risk is considered given the lack of exceedances from chemical analysis compared with commercial GACs, in both the natural ground and the Made Ground present on site.<br>A moderate risk is considered on a precautionary basis given the presence of Made Ground on site. Construction workers are likely to come into direct contact with soils and therefore the use of appropriate PPE should be adopted to mitigate against any potential risks                               |
|   | Leaching through soils and migration via groundwater or soil pore moisture | Controlled Waters  | Medium             | Low Likelihood           | Low             | A low risk is considered given the lack of exceedances from the soils testing on the site and the clay/silty clay composition of the alluvial soils beneath the Site which are anticipated to be of low permeability, and their expected significant thickness overlying the bedrock chalk aquifer. However it is noted that the shallow groundwater is of poor quality, but this is likely to represent the impact of off site sources in the wider industrialised area around the site. |
|   | Uptake   | Plant and Wildlife   | Low                | Low Likelihood           | Low             | A low risk is considered given limited amount of potential contamination identified from historical and current land use on site and in proximity to the study site.  |
| Ground Gases  | Gas generation, migration and build up within properties                   | Future end users, site workers                             | Low                | Low Likelihood           | Low             | A low risk is considered given open storage and distribution nature of the proposed development and the Made Ground present on site and the lack of built development proposed.   |

Table 9: Updated Conceptual Site Model and Risk Assessment

The risks posed to future end users, controlled waters and plant and wildlife have been estimated as LOW, the risk to construction workers as MODERATE, and the risk to future end users from ground gases as LOW.



## 12.0 Site Investigation Findings

### 12.1 Risks to Human Health

No visual and/or olfactory evidence of potential contamination was noted within any soils encountered as part of the GI works undertaken.

No elevated concentrations of organic or inorganic determinands have been returned from laboratory testing undertaken from within both the Made Ground and the underlying natural soils identified during the SI. Therefore, we would conclude there is no risk to human health.

### 12.2 Risks to Controlled Waters

Slightly elevated concentrations of some TPH fractions and PAH compounds were identified from laboratory analyses completed on groundwater samples taken during the three monitoring rounds, though TPH exceedances were only apparent in the third monitoring round.

Elevated concentrations in respect of boron are considered to represent naturally occurring boron.

No elevated determinands were noted based on the screening undertaken from soil testing completed on both the Made Ground and underlying natural strata, and no evidence of historic contaminative use on the site itself that could have given rise to contamination of groundwater. It is noted that there is a high degree of industrial development in the surrounding area and is likely that the analytical results represent the general groundwater quality in the area.

Therefore, it would be feasible to conclude that there has been minimal impact, if any, to the groundwater regime underlying the site from the overlying soils. In addition, as a result of the ground conditions identified, lateral migration to off-site receptors including surface water features would also be limited.

### 12.3 Risks to Proposed Development

#### 12.3.1 Gas Measures

The results of gas monitoring conducted at the site over a three week period and the subsequent calculated GSV has been identified as being below guidance levels given by CIRIA for Characteristic Situation 2 (<0.7L/hr).

Therefore, the site has been characterised as Characteristic Situation 2 with a risk classification of 'low risk'. The requirement for built commercial development would be a well constructed reinforced concrete ground slab with at least 1200g/m<sup>2</sup> DPM, or a beam and block or pre-cast concrete slab and minimum 2000 g/m<sup>2</sup> DPM or a reinforced gas



membrane. However as there is no built development currently proposed this is not relevant to the current proposals.

#### 12.3.2 Services

Given that new services may be installed as part of the redevelopment of the site, we would recommend the local water board be contacted to determine their specification for the type of pipework which should be used on this site.

All services and in particular potable water supply pipework should comprise of material that is resistant to attack and degradation to chemical attack, particularly given the presence of Made Ground identified.

Further information can be found within the published guidance for the '*Selection of Water Supply Pipes to be used in Brownfield Sites*', issued in January 2011 by the UK Water Industry Research (UKWIR), this supersedes the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note - '*Laying Pipes in Contaminated Land*' which has been withdrawn.

#### 12.4 Risks to Plants and Wildlife

A negligible risk has attributed given the absence of elevated concentrations returned, as the concentrations of phytotoxic contaminants were not significant.

#### 12.5 Risks to Site Workers

Precautions should be taken to minimise exposure of site workers during ground works through the implementation of site safety procedures and the use of suitable personal protective equipment (PPE). Such precautions should include, but not be limited to:

- Personal hygiene, washing and changing procedures;
- Availability of site welfare;
- Provision of PPE appropriate to the task; and
- Daily safety briefings and tool box talks.

All site works will be undertaken in accordance with the guidelines prepared by the Health and Safety Executive (1991) and all work will be carried out in accordance with the Principal Contractor's Health and Safety Plan.

### 13.0 Recommendations

The following recommendations are based on the results of chemical laboratory testing to date.

The following recommendations made do not constitute a formal remediation strategy and/or validation report. Given the absence of contaminant exceedances it is not

considered that a remediation strategy or validation report should be required. This should be confirmed with the local planning authority.

### 13.1 Watching Brief and Discovery Strategy

A watching brief should be maintained by the Main Contractor at all times during groundworks. Should any unforeseen contamination, such as oils or soils/groundwater with an unusual colour or odour, be encountered during groundworks then the following procedure should be implemented:

- Work to cease in that area to prevent exposure to ground workers and potential contaminants being spread around;
- Notify a Geoenvironmental Consultant, to attend site and sample material;
- Notify the Environmental Health Department / Contaminated Land Officer(s) of the City of Lincoln Council;

If the nature and extent of the contamination is unmanageable under the procedure set out above, then a suitable management, mitigation or remediation procedure will be agreed with the CLO. However, this is considered unlikely at this particular site.

### 13.2 Installed Boreholes

The boreholes which have been installed may be required to be decommissioned in accordance with the EA guidance document '*Decommissioning Redundant Boreholes and Wells*'.

This should be undertaken once appropriate consultation has been concluded within the relevant consultees.

### 13.3 Imported Material

Any material imported to make up levels to the proposed development level should be of an appropriately specified chemical quality so as to be, as a minimum, suitable for the proposed commercial/industrial development, and so as not to increase the risk to environmental receptors. Material imported as surplus from other development sites is likely to be regarded by the Environment Agency as waste and an appropriate environmental exemption, standard rules or bespoke environmental permit would be required to allow its use on the Site. Alternatively, the Cl:Aire Definition of Waste Development Industry Code of Practice (DOWCOP) may be applicable, allowing non contaminated material to be imported under certain conditions without its being classified as waste.



### 13.4 Verification Reporting

It is recommended that you confirm with the relevant environmental consultees whether they require a validation and/or closure report providing documentation/audit trail for the completion of any ground works completed on site.

If a verification Report is required it should include, but not be limited to, the following:

- Site visit records and photographic records from the watching brief;
- Site visit records and photos from visits completed by a Geoenvironmental Consultant;
- Duty of care records for disposal of waste material including the landfill site(s) or disposal facility where the material has been disposed and a copy of the Contractor's current waste carrier's licence (to be provided by Contractor).
- Records and test certificates relating to the management and disposal of unforeseen contaminants and/or ACMs (if any);
- Details of source and chemical test results for imported materials; and
- Confirmation of water supply pipe materials installed.

### 14.0 Limitations

This report has been prepared by YE with all reasonable skill, care and diligence. The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources.

The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned.

Information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data with respect to site conditions. Should additional information become available which may influence the opinion expressed in this report, YE reserves the right to review such information and, if warranted, to alter the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed.

The recommendations contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted industry practices at this time and as such is not a guarantee that the study site is free of hazardous conditions.

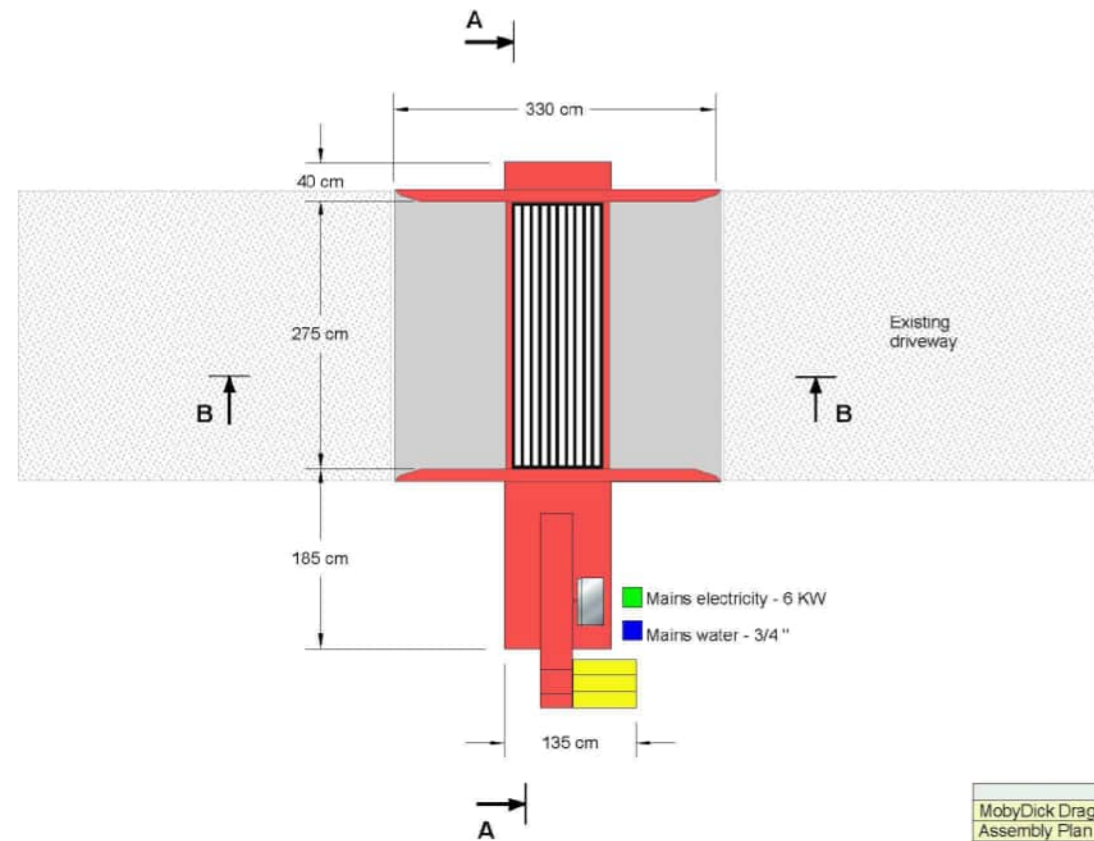
This report has been prepared solely for the use of the named client, and may not be relied upon by other parties without written consent from YE. YE disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

## APPENDIX A: Redevelopment plans



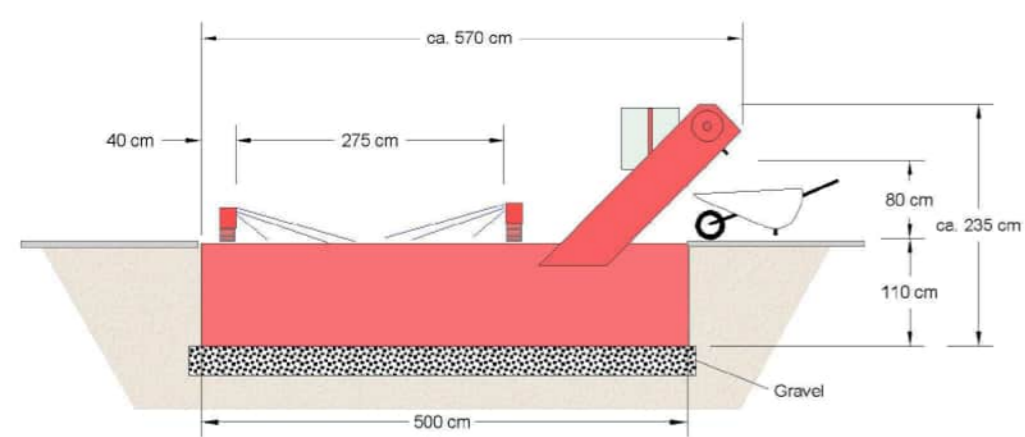


1 x MobyDick Dragon (E) Wheel Washing System On each Plot  
<http://uk.mobydick.com/wheel-washing-systems/?L=9>

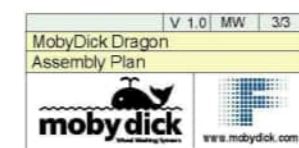
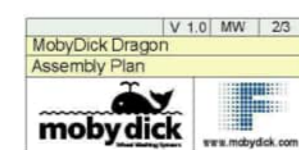
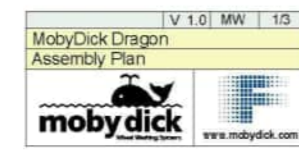
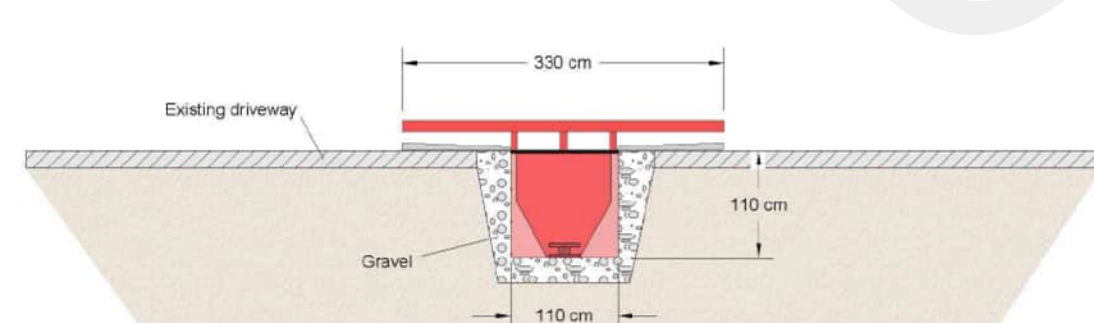


PLAN VIEW

SECTION A-A



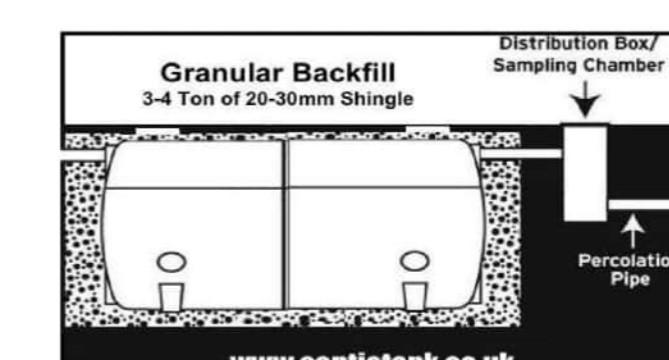
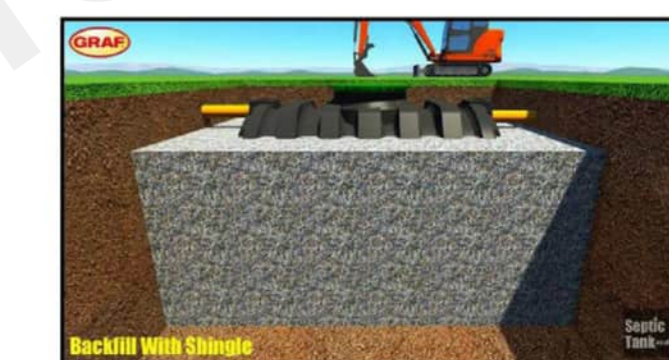
SECTION B-B



Site Location Plan

1:500

1 x GRAF Carat Septic Tank 6 Person  
 On each Plot  
<http://shop.septic-tank.co.uk/septic-tanks/graf-carat-septic-tank-6-person>



1 X EXTRA LARGE WHEELED BIN (1100 LITRE) WITH 4 WHEELS AND ROLL TOP LID ON EACH PLOT  
<http://www.plastor.co.uk/content/extra-large-wheeled-bin-1100-litre-4-wheels-and-roll-top-lid>



| Technical data | Content | External dimensions (mm) | Internal dimensions (mm) | Weight (kg) | Material | Associated colors |   |  |
|----------------|---------|--------------------------|--------------------------|-------------|----------|-------------------|---|--|
| Model 1100     | 1100    | 1285                     | 1135                     | 862         | 1670     | 440               | HDPE / HDPE / UV resistant / cadmium-free | Grey / (RAL) green / (RAL) yellow (RAL 1023) |

Notes & Comments

Surface Rain Water Dispersal:  
 All Hard Standing surfaces including roadways will incorporate permeable TARMACADAM or Other ASPHALT Surfacing to allow RW to Dispers naturally.

There will be no requirement for surface rain water distribution through conventional piped drainage systems.

Recommended site capping to include the following.

<http://www.tarmac.com/solutions/aggregates-asphalt/ultiflow/>

Planting Legend :

1- Shrubs



1- Tree (A)



1- Tree (B)



1- Tree (C)



**LANGLEYS CHARTERED SURVEYORS**  
 249 BROADWAY  
 BEXLEYHEATH  
 KENT DA6 8DB  
 t: 0208 298 1707  
 f: 0208 298 0699  
 e: janine@langleyscs.co.uk  
 nader@langleyscs.co.uk

Site: Land at Dering Way, Gravesend, Gravesham, Kent DA12 2QX

Proposal Description: Condition 3, 5 and 9 Illustrative Layout Showing location of requirements On Site

Drawing: Site Location Plan

Client/Applicant: PC Properties International  
 Scale: @ A1 All measurements taken onsite  
 See Individual Drawings

Drawing Reference: DRAW-DW-1015-SIP-CONDITIONS 3, 5 & 9  
 Drawn By: Langley's Design & Development Team

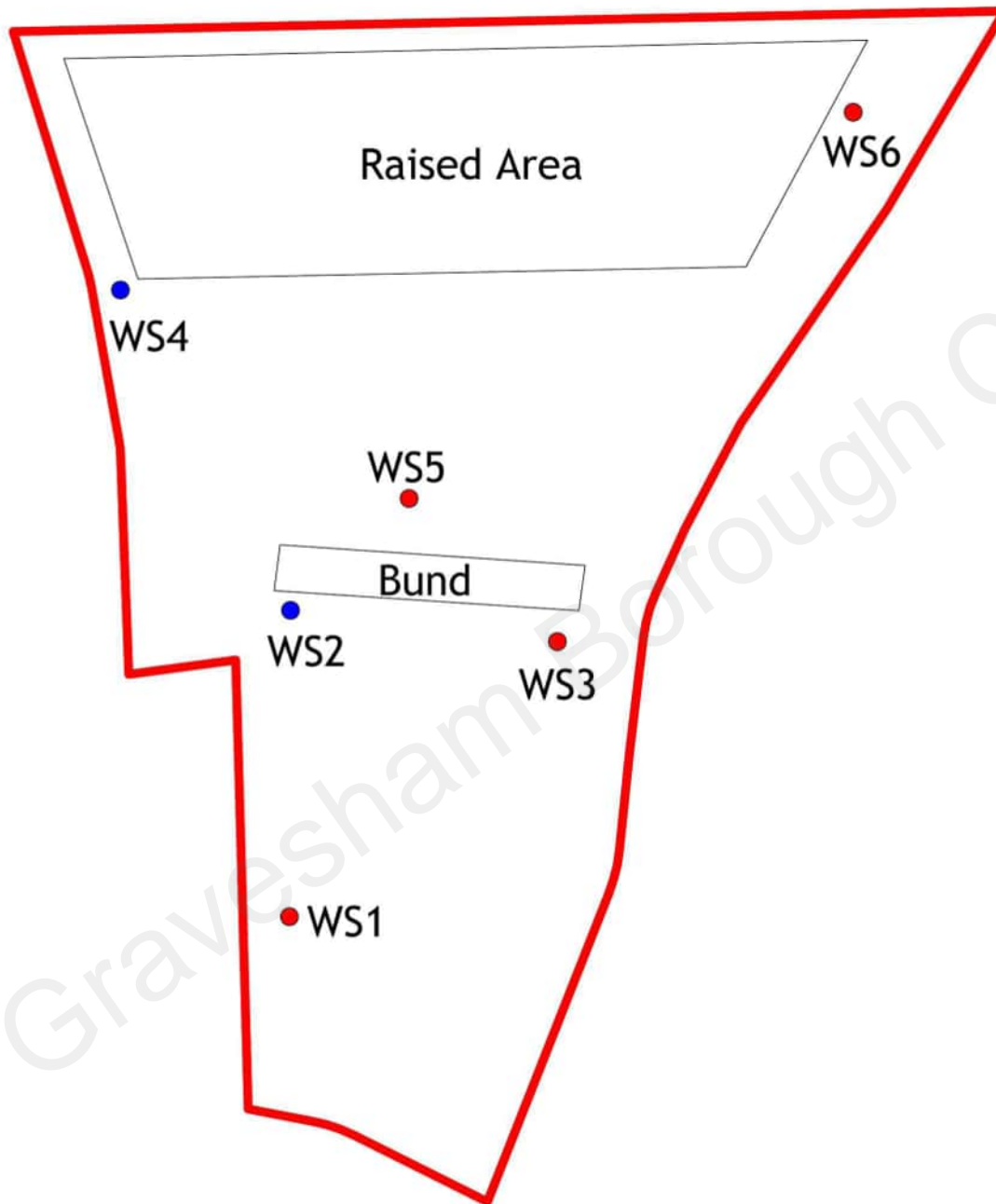
| Date       | Rev. Number | Page # | LPA |
|------------|-------------|--------|-----|
| 30/09/2015 | Rev. Date   |        |     |



## APPENDIX B: SI Plan







- Window Sample
- Window Sample (Installed)

|                |                          |
|----------------|--------------------------|
| Title          | SI Plan                  |
| Project        | Dering Way,<br>Gravesend |
| Project Number | YE2272                   |
| Drawing Number | YE2272.001               |
| Scale          | NTS                      |
| Date           | January 2016             |
| Drawn by       | CSH                      |
| Checked by     | KJB                      |



## APPENDIX C: Photos





Site: Dering Way, Gravesend  
Client: Cowland Ltd  
Job Reference: YE2272, Dated: December 2015

A.



B.



C.



D.



- A. WS6 location looking north.
- B. WS5 location looking west.
- C. WS4 location looking northwest.
- D. WS3 location looking west.



E.



F.



G.



H.



- E. WS1 location looking northwest.
- F. Access issues close to WS6, drill rig kept slipping on clayey surface.
- G. Looking west along the small slope where the rig had access issues.
- H. Raised bund topography.





I.



J.



*Your Environment*

I. Raised bund level.

J. Raised bund level.



## APPENDIX D: Logs







# Probe Log

Borehole No.

**DP3**

Sheet 1 of 2

Project Name: Derring Way - Gravesend

Project No.  
YE2272

Co-ords: -

Hole Type  
DCP

Location: Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH.

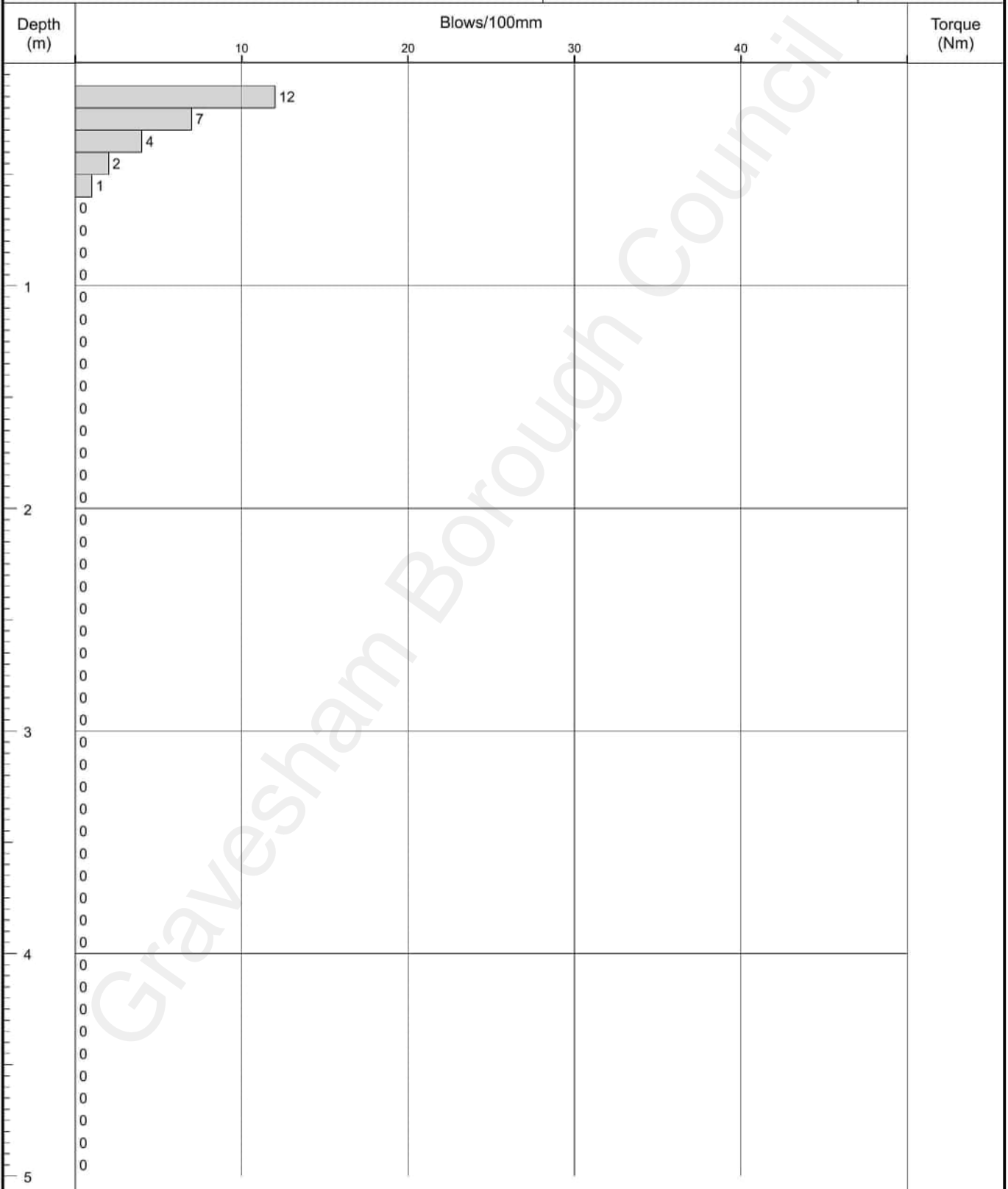
Level:

Scale  
1:25

Client: Cowland Ltd

Dates: 22/12/2015 -

Logged By



|         |             |        |                    |      |
|---------|-------------|--------|--------------------|------|
| Remarks | Fall Height | 750    | Cone Base Diameter |      |
|         | Hammer Wt   | 64     | Final Depth        | 5.00 |
|         | Probe Type  | DPSH-B | Log Scale          | 1:25 |



# Probe Log

Borehole No.

**DP3**

Sheet 2 of 2

Project Name: Derring Way - Gravesend

Project No.  
YE2272

Co-ords: -

Hole Type  
DCP

Location: Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH.

Level:

Scale  
1:25

Client: Cowland Ltd

Dates: 22/12/2015 -

Logged By

| Depth (m) | Blows/100mm |    |    |    | Torque (Nm) |
|-----------|-------------|----|----|----|-------------|
|           | 0           | 10 | 20 | 30 |             |
| 0         |             |    |    |    |             |
| 6         |             |    |    |    |             |
| 7         |             |    |    |    |             |
| 8         |             |    |    |    |             |
| 9         |             |    |    |    |             |
| 10        |             |    |    |    |             |

Remarks

Fall Height 750

Cone Base Diameter

Hammer Wt 64

Final Depth 5.00

Probe Type DPSH-B

Log Scale 1:25





# Probe Log

Borehole No.

**DP4**

Sheet 2 of 2

|   |                    |                     |               |
|---|--------------------|---------------------|---------------|
| Project Name: Derring Way - Gravesend   | Project No. YE2272 | Co-ords: -          | Hole Type DCP |
| Location: Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. |                    | Level:              | Scale 1:25    |
| Client: Cowland Ltd   |                    | Dates: 22/12/2015 - | Logged By     |

| Depth (m) | Blows/100mm |    |    |    | Torque (Nm) |
|-----------|-------------|----|----|----|-------------|
|           | 0           | 10 | 20 | 30 |             |
| 0         |             |    |    |    |             |
| 6         |             |    |    |    |             |
| 7         |             |    |    |    |             |
| 8         |             |    |    |    |             |
| 9         |             |    |    |    |             |
| 10        |             |    |    |    |             |

Gravesham Borough Council

|         |             |        |                    |      |
|---------|-------------|--------|--------------------|------|
| Remarks | Fall Height | 750    | Cone Base Diameter |      |
|         | Hammer Wt   | 64     | Final Depth        | 5.00 |
|         | Probe Type  | DPSH-B | Log Scale          | 1:25 |





# Probe Log

Borehole No.

**DP5**

Sheet 2 of 2

|   |                    |                     |               |
|---|--------------------|---------------------|---------------|
| Project Name: Derring Way - Gravesend   | Project No. YE2272 | Co-ords: -          | Hole Type DCP |
| Location: Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. |                    | Level:              | Scale 1:25    |
| Client: Cowland Ltd   |                    | Dates: 22/12/2015 - | Logged By     |

| Depth (m) | Blows/100mm |    |    |    | Torque (Nm) |
|-----------|-------------|----|----|----|-------------|
|           | 0           | 10 | 20 | 30 |             |
| 0         |             |    |    |    |             |
| 6         |             |    |    |    |             |
| 7         |             |    |    |    |             |
| 8         |             |    |    |    |             |
| 9         |             |    |    |    |             |
| 10        |             |    |    |    |             |

Gravesham Borough Council

|         |             |        |                    |      |
|---------|-------------|--------|--------------------|------|
| Remarks | Fall Height | 750    | Cone Base Diameter |      |
|         | Hammer Wt   | 64     | Final Depth        | 5.00 |
|         | Probe Type  | DPSH-B | Log Scale          | 1:25 |





# Probe Log

Borehole No.

**DP6**

Sheet 2 of 2

|   |                     |            |               |
|---|---------------------|------------|---------------|
| Project Name: Derring Way - Gravesend   | Project No. YE2272  | Co-ords: - | Hole Type DCP |
| Location: Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. | Level:              |            | Scale 1:25    |
| Client: Cowland Ltd   | Dates: 22/12/2015 - |            | Logged By     |

| Depth (m) | Blows/100mm |    |    |    | Torque (Nm) |
|-----------|-------------|----|----|----|-------------|
|           | 0           | 10 | 20 | 30 |             |
| 0         |             |    |    |    |             |
| 6         |             |    |    |    |             |
| 7         |             |    |    |    |             |
| 8         |             |    |    |    |             |
| 9         |             |    |    |    |             |
| 10        |             |    |    |    |             |

Gravesham Borough Council

|         |             |        |                    |      |
|---------|-------------|--------|--------------------|------|
| Remarks | Fall Height | 750    | Cone Base Diameter |      |
|         | Hammer Wt   | 64     | Final Depth        | 5.00 |
|         | Probe Type  | DPSH-B | Log Scale          | 1:25 |

# Borehole Log

Borehole No.

**WS1**

Sheet 1 of 1

|               |   |             |        |          |            |           |      |
|---------------|---|-------------|--------|----------|------------|-----------|------|
| Project Name: | Derring Way - Gravesend   | Project No. | YE2272 | Co-ords: |            | Hole Type | WLS  |
| Location:     | Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. |             |        | Level:   |            | Scale     | 1:50 |
| Client:       | Cowland Ltd   |             |        | Dates:   | 22/12/2015 | Logged By |      |

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m)    | Level (m)                | Legend   | Stratum Description |  |
|------|---------------|----------------------------|------|---------|--------------|--------------------------|--|---------------------|--|
|      |               | Depth (m)                  | Type | Results |              |                          |  |                     |  |
|      |               |                            |      |         | 0.10         |                          | Brick and concrete cobbles <b>HARDCORE</b> .   |                     |  |
|      |               | 0.25                       | ES   |         |              |                          | Soft dark brown slightly sandy slightly gravelly <b>SILT &amp; CLAY</b> with occasional brick and concrete cobbles. Gravel is angular to rounded fine to coarse flint. |                     |  |
|      |               | 0.50                       | ES   |         | 0.65         |                          | Soft grey brown silty <b>CLAY</b> .  |                     |  |
|      |               | 1.00                       | ES   |         |              |                          |  | 1                   |  |
|      |               | 1.50                       | ES   |         |              |                          |  |                     |  |
|      |               | 2.00                       | ES   |         | 1.90         |                          | Very soft grey silty peaty <b>CLAY</b> .   |                     |  |
|      |               | 2.50                       | ES   |         |              |                          |  | 2                   |  |
|      |               | 3.00                       | ES   |         |              |                          |  | 3                   |  |
|      |               | 4.00                       | ES   |         |              |                          |  | 4                   |  |
|      |               | 5.00                       | ES   |         | 4.85<br>5.00 |                          | Soft brown clayey <b>PEAT</b> .  |                     |  |
|      |               |                            |      |         |              | End of Borehole at 5.00m |  | 5                   |  |
|      |               |                            |      |         |              |                          |  | 6                   |  |
|      |               |                            |      |         |              |                          |  | 7                   |  |
|      |               |                            |      |         |              |                          |  | 8                   |  |
|      |               |                            |      |         |              |                          |  | 9                   |  |
|      |               |                            |      |         |              |                          |  | 10                  |  |

Remarks  
No olfactory evidence of contamination.



# Borehole Log

Borehole No.

**WS3**

Sheet 1 of 1

|               |   |             |        |          |            |           |      |
|---------------|---|-------------|--------|----------|------------|-----------|------|
| Project Name: | Derring Way - Gravesend   | Project No. | YE2272 | Co-ords: |            | Hole Type | WLS  |
| Location:     | Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. |             |        | Level:   |            | Scale     | 1:50 |
| Client:       | Cowland Ltd   |             |        | Dates:   | 22/12/2015 | Logged By |      |

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m) | Level (m)                                    | Legend  | Stratum Description |  |
|------|---------------|----------------------------|------|---------|-----------|--|---|---------------------|--|
|      |               | Depth (m)                  | Type | Results |           |  |   |                     |  |
|      |               | 0.50                       | ES   |         | 0.50      |  | Loose dark brown silty gravelly SAND. Gravel is subangular to rounded fine to medium flint. |                     |  |
|      |               | 1.00                       | ES   |         |           |  | Firm brown grey slightly silty CLAY.  | 1                   |  |
|      |               | 1.50                       | ES   |         |           |  |   |                     |  |
|      |               | 2.00                       | ES   |         |           | 1.90   | Dark grey black very organic rich CLAY.   | 2                   |  |
|      |               | 2.50                       | ES   |         |           |  |   |                     |  |
|      |               | 3.00                       | ES   |         |           | 2.85   | Very soft grey silty CLAY   | 3                   |  |
|      |               | 3.45                       |      |         |           |  |   |                     |  |
| 4.00 | ES            |                            |      |         |           | Very soft dark grey organic rich silty CLAY. | 4   |                     |  |
| 5.00 | ES            |                            |      | 5.00    |           | End of Borehole at 5.00m                     | 5   |                     |  |
|      |               |                            |      |         |           |  |   | 6                   |  |
|      |               |                            |      |         |           |  |   | 7                   |  |
|      |               |                            |      |         |           |  |   | 8                   |  |
|      |               |                            |      |         |           |  |   | 9                   |  |
|      |               |                            |      |         |           |  |   | 10                  |  |

Remarks  
No olfactory evidence of contamination.

# Borehole Log

Borehole No.

**WS4**

Sheet 1 of 1

|               |   |             |        |          |            |           |      |
|---------------|---|-------------|--------|----------|------------|-----------|------|
| Project Name: | Derring Way - Gravesend   | Project No. | YE2272 | Co-ords: |            | Hole Type | WLS  |
| Location:     | Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. |             |        | Level:   |            | Scale     | 1:50 |
| Client:       | Cowland Ltd   |             |        | Dates:   | 22/12/2015 | Logged By |      |

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m) | Level (m) | Legend   | Stratum Description |  |
|------|---------------|----------------------------|------|---------|-----------|-----------|--|---------------------|--|
|      |               | Depth (m)                  | Type | Results |           |           |  |                     |  |
|      |               |                            |      |         | 0.15      |           | Grass onto slightly sandy clayey SILT.                                 |                     |  |
|      |               | 0.50                       | ES   |         |           |           | Firm brown grey slightly silty CLAY with occasional roots and rootlets |                     |  |
|      |               | 1.00                       | ES   |         |           |           |  | 1                   |  |
|      |               | 1.20                       |      |         | 1.20      |           | Soft grey silty CLAY.  |                     |  |
|      |               | 1.50                       | ES   |         |           |           |  |                     |  |
|      |               | 2.00                       | ES   |         | 1.90      |           | Very soft grey black organic rich silty CLAY.                          | 2                   |  |
|      |               | 2.50                       | ES   |         |           |           |  |                     |  |
|      |               | 3.00                       | ES   |         |           |           |  | 3                   |  |
|      |               | 3.40                       |      |         | 3.40      |           | Very soft dark grey brown peaty silty CLAY with peat bands.            |                     |  |
|      |               | 4.00                       | ES   |         |           |           |  | 4                   |  |
|      |               | 5.00                       | ES   |         | 5.00      |           | End of Borehole at 5.00m   | 5                   |  |
|      |               |                            |      |         |           |           |  | 6                   |  |
|      |               |                            |      |         |           |           |  | 7                   |  |
|      |               |                            |      |         |           |           |  | 8                   |  |
|      |               |                            |      |         |           |           |  | 9                   |  |
|      |               |                            |      |         |           |           |  | 10                  |  |

Remarks  
No olfactory evidence of contamination.



# Borehole Log

Borehole No.

**WS5**

Sheet 1 of 1

|   |                    |                   |               |
|---|--------------------|-------------------|---------------|
| Project Name: Derring Way - Gravesend   | Project No. YE2272 | Co-ords:          | Hole Type WLS |
| Location: Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. |                    | Level:            | Scale 1:50    |
| Client: Cowland Ltd   |                    | Dates: 22/12/2015 | Logged By     |

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m) | Level (m)                | Legend   | Stratum Description |
|------|---------------|----------------------------|------|---------|-----------|--------------------------|--|---------------------|
|      |               | Depth (m)                  | Type | Results |           |                          |  |                     |
|      |               |                            |      |         | 0.15      |                          | Grass onto brown slightly sandy silty CLAY with frequent roots and rootlets.<br>Soft to firm brown grey slightly sandy silty CLAY. |                     |
|      |               | 0.50                       | ES   |         |           |                          |  |                     |
|      |               | 1.00                       | ES   |         |           |                          |  |                     |
|      |               | 1.25                       |      |         |           |                          |  |                     |
|      |               | 1.50                       | ES   |         |           |                          | Very soft dark grey organic rich silty CLAY.   |                     |
|      |               | 2.00                       | ES   |         |           |                          |  |                     |
|      |               | 2.50                       | ES   |         |           |                          |  |                     |
|      |               | 3.00                       | ES   |         |           | 2.95                     | Very soft dark grey silty peaty CLAY rare bands of peat.   |                     |
|      | 4.00          | ES                         |      |         |           |                          |  |                     |
|      | 5.00          | ES                         |      |         | 5.00      | End of Borehole at 5.00m |  |                     |

Remarks  
No olfactory evidence of contamination.

# Borehole Log

Borehole No.

**WS6**

Sheet 1 of 1

|               |   |             |        |          |            |           |      |
|---------------|---|-------------|--------|----------|------------|-----------|------|
| Project Name: | Derring Way - Gravesend   | Project No. | YE2272 | Co-ords: |            | Hole Type | WLS  |
| Location:     | Land between Comma Oil and Southern Water Treatment site, Derring Way, Gravesend, DA12 2QH. |             |        | Level:   |            | Scale     | 1:50 |
| Client:       | Cowland Ltd   |             |        | Dates:   | 22/12/2015 | Logged By |      |

| Well | Water Strikes | Sample and In Situ Testing |      |         | Depth (m) | Level (m)                | Legend  | Stratum Description |  |
|------|---------------|----------------------------|------|---------|-----------|--------------------------|---|---------------------|--|
|      |               | Depth (m)                  | Type | Results |           |                          |   |                     |  |
|      |               |                            |      |         | 0.25      |                          | Grass onto brown slightly sandy silty CLAY.         |                     |  |
|      |               | 0.50                       | ES   |         |           |                          | Firm brown grey silty CLAY.                         | 1                   |  |
|      |               | 1.00                       | ES   |         |           |                          |   |                     |  |
|      |               | 1.50                       | ES   |         | 1.40      |                          | Soft grey silty CLAY.                               | 2                   |  |
|      |               | 2.00                       | ES   |         |           |                          |   |                     |  |
|      |               | 2.50                       | ES   |         |           |                          |   |                     |  |
|      |               | 3.00                       | ES   |         | 2.80      |                          | Very soft grey black organic rich peaty silty CLAY. | 3                   |  |
|      |               | 4.00                       | ES   |         |           |                          |   | 4                   |  |
|      | 5.00          | ES                         |      | 5.00    |           | End of Borehole at 5.00m | 5   |                     |  |
|      |               |                            |      |         |           |                          |   | 6                   |  |
|      |               |                            |      |         |           |                          |   | 7                   |  |
|      |               |                            |      |         |           |                          |   | 8                   |  |
|      |               |                            |      |         |           |                          |   | 9                   |  |
|      |               |                            |      |         |           |                          |   | 10                  |  |

Remarks  
No olfactory evidence of contamination.



## APPENDIX E: Monitoring



Site: Dering Way, Gravesend  
 Project Number: YE2272  
 Instrument: GA 5000 +

Gas and Groundwater Monitoring Results Sheet



| Monitoring Point Reference | Date     | Atmospheric pressure (mb) | Flow Range (l/hr) | Methane (% v/v)  |        | Carbon Dioxide (% v/v) |        | Oxygen (% v/v) |        | Methane Gas Screening Value (GSV) (l/hr) | Carbon Dioxide Gas Screening Value (GSV) (l/hr) | Hydrogen Sulphide (ppm) | Carbon Monoxide (ppm) | Standing Water Level (mbgl) | Well Depth (mbgl) |  |
|----------------------------|----------|---------------------------|-------------------|------------------|--------|------------------------|--------|----------------|--------|--|---|-------------------------|-----------------------|-----------------------------|-------------------|--|
|                            |          |                           |                   | Peak             | Steady | Peak                   | Steady | Low            | Steady |  |   |                         |                       |                             |                   |  |
| WS01                       | 29/12/15 | 1018                      | -2.6              | 0.1              | 0.0    | 7.8                    | 0.1    | 17.9           | 20.1   |  |   | 0.0                     | 0.0                   | 0.24                        |                   |  |
|                            | 05/01/16 | 985                       |                   | Flooded Borehole |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            | 12/01/16 | 997                       | 0.3               | 0.4              | 0.1    | 0.2                    | 0.2    | 21.7           | 21.7   |  |   | 0.0                     | 0.0                   | 0.08                        |                   |  |
| WS02                       |          |                           |                   | Not dug          |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            |          |                           |                   |                  |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            |          |                           |                   |                  |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
| WS03                       | 29/12/15 | 1018                      |                   | Could not locate |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            | 05/01/16 | 985                       | 2.6               | 3.6              | 0.0    | 2.5                    | 1.1    | 18.8           | 18.8   |  |   | 0.0                     | 1.1                   | 0.70                        |                   |  |
|                            | 12/01/16 | 997                       | 0.2               | 2.7              | 0.6    | 2                      | 0.8    | 20.1           | 20.1   |  |   | 0.0                     | 0.0                   | 0.46                        |                   |  |
| WS04                       |          |                           |                   | Not dug          |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            |          |                           |                   |                  |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            |          |                           |                   |                  |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
| WS05                       | 29/12/15 | 1018                      | 0.4               | 0.1              | 0.0    | 6.3                    | 0.7    | 19.8           | 20.7   |  |   | 0.0                     | 0.0                   | 0.26                        |                   |  |
|                            | 05/01/16 | 985                       |                   | Flooded Borehole |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            | 12/01/16 | 997                       |                   | Flooded Borehole |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
| WS06                       | 29/12/15 | 1018                      | 7.0               | 1.5              | 1.5    | 2.5                    | 2.5    | 19.7           | 20.1   |  |   | 0.0                     | 3.0                   | 0.91                        |                   |  |
|                            | 05/01/16 | 985                       |                   | Flooded Borehole |        |                        |        |                |        |  |   |                         |                       |                             |                   |  |
|                            | 12/01/16 | 996                       | 0.4               | 0.2              | 0.0    | 0.3                    | 0.3    | 21.0           | 20.9   |  |   | 0.0                     | 0.0                   | 0.32                        |                   |  |

Additional Information:

| Date | Weather | Air Temperature (°C) | Ground Conditions | Pressure Trend | Comments |
|------|---------|----------------------|-------------------|----------------|----------|
|      |         |                      |                   |                |          |
|      |         |                      |                   |                |          |
|      |         |                      |                   |                |          |
|      |         |                      |                   |                |          |

\* All monitoring point locations are monitored for a minimum of 60 seconds, and both the peak reading and the steady / rest readings are recorded  
 \* BD = Below the detection limit of the gas analyser (0.1units)  
 \* NR = No reading taken

## APPENDIX F: Soil Contamination Results







Kevin Brown  
Your Environment  
Chilgrove Business Centre  
Chilgrove Park Road  
Chilgrove  
Chichester  
West Sussex  
PO18 9HU

**QTS Environmental Ltd**  
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Rose Lane  
Lenham Heath  
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t: 01622 850410  
[russell.jarvis@qtsenvironmental.com](mailto:russell.jarvis@qtsenvironmental.com)

## **QTS Environmental Report No: 15-39138**

**Site Reference:** Land Adjacent to Comma Oil and Southern Water Treatment, Derinq Way, Gravesend, DA12 2QH

**Project / Job Ref:** YE2272

**Order No:** None Supplied

**Sample Receipt Date:** 23/12/2015

**Sample Scheduled Date:** 24/12/2015

**Report Issue Number:** 1

**Reporting Date:** 07/01/2016

**Authorised by:** [Redacted]  
Russell Jarvis  
Associate Director of Client Services  
**On behalf of QTS Environmental Ltd**

**Authorised by:** [Redacted]  
Kevin Old  
Associate Director of Laboratory  
**On behalf of QTS Environmental Ltd**

Gravesham Borough Council

| <b>Soil Analysis Certificate</b>  |                        |               |               |               |               |               |
|---|------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>QTS Environmental Report No: 15-39138</b>  | <b>Date Sampled</b>    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |
| <b>Your Environment</b>   | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH</b> | <b>TP / BH No</b>      | WS1           | WS1           | WS1           | WS3           | WS3           |
| <b>Project / Job Ref: YE2272</b>  | <b>Additional Refs</b> | MG            | MG            | NAT           | NAT           | NAT           |
| <b>Order No: None Supplied</b>  | <b>Depth (m)</b>       | 0.20          | 0.50          | 1.00          | 0.50          | 2.00          |
| <b>Reporting Date: 07/01/2016</b>   | <b>QTSE Sample No</b>  | 184696        | 184697        | 184698        | 184699        | 184700        |

| <b>Determinand</b>                    | <b>Unit</b> | <b>RL</b> | <b>Accreditation</b> |              |              |       |       |      |
|---------------------------------------|-------------|-----------|----------------------|--------------|--------------|-------|-------|------|
| Asbestos Screen                       | N/a         | N/a       | ISO17025             | Not Detected | Not Detected |       |       |      |
| pH                                    | pH Units    | N/a       | MCERTS               | 7.8          | 8.0          |       | 7.6   | 7.7  |
| Total Cyanide                         | mg/kg       | < 2       | NONE                 | < 2          | < 2          | < 2   | < 2   | < 2  |
| Free Cyanide                          | mg/kg       | < 2       | NONE                 | < 2          | < 2          |       |       |      |
| W/S Sulphate as SO <sub>4</sub> (2:1) | mg/l        | < 10      | MCERTS               | 184          | 158          | 216   | 141   | 324  |
| W/S Sulphate as SO <sub>4</sub> (2:1) | g/l         | < 0.01    | MCERTS               | 0.18         | 0.16         | 0.22  | 0.14  | 0.32 |
| Organic Matter                        | %           | < 0.1     | MCERTS               | 4.9          | 2.6          | 1.4   | 7.3   | 3.5  |
| W/S Chloride (2:1)                    | mg/kg       | < 1       | MCERTS               | 34           | 109          |       |       |      |
| W/S Chloride (2:1)                    | mg/l        | < 0.5     | MCERTS               | 16.9         | 54.5         |       |       |      |
| Arsenic (As)                          | mg/kg       | < 2       | MCERTS               | 12           | 21           | 22    | 8     | 14   |
| Barium (Ba)                           | mg/kg       | < 5       | NONE                 | 117          | 48           |       |       |      |
| Beryllium (Be)                        | mg/kg       | < 0.5     | NONE                 | 0.9          | 1.7          |       |       |      |
| W/S Boron                             | mg/kg       | < 1       | NONE                 | 1.5          | 3.8          |       |       |      |
| Cadmium (Cd)                          | mg/kg       | < 0.2     | MCERTS               | 1.2          | < 0.2        | < 0.2 | < 0.2 | 2.3  |
| Chromium (Cr)                         | mg/kg       | < 2       | MCERTS               | 27           | 50           | 47    | 13    | 38   |
| Chromium (hexavalent)                 | mg/kg       | < 2       | NONE                 | < 2          | < 2          | < 2   | < 2   | < 2  |
| Copper (Cu)                           | mg/kg       | < 4       | MCERTS               | 24           | 13           | 11    | 24    | 12   |
| Lead (Pb)                             | mg/kg       | < 3       | MCERTS               | 95           | 24           | 20    | 69    | 18   |
| Mercury (Hg)                          | mg/kg       | < 1       | NONE                 | < 1          | < 1          | < 1   | 1.2   | < 1  |
| Nickel (Ni)                           | mg/kg       | < 3       | MCERTS               | 16           | 29           | 32    | 9     | 25   |
| Selenium (Se)                         | mg/kg       | < 3       | NONE                 | < 3          | < 3          | < 3   | < 3   | < 3  |
| Vanadium (V)                          | mg/kg       | < 2       | NONE                 | 50           | 93           |       |       |      |
| Zinc (Zn)                             | mg/kg       | < 3       | MCERTS               | 92           | 98           | 89    | 112   | 82   |
| Total Phenols (monohydric)            | mg/kg       | < 2       | NONE                 | < 2          | < 2          | < 2   | < 2   | < 2  |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

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

Asbestos Analyst: Wioletta Goral

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis <sup>(5)</sup>



| <b>Soil Analysis Certificate</b>  |                        |               |               |               |               |
|---|------------------------|---------------|---------------|---------------|---------------|
| <b>QTS Environmental Report No: 15-39138</b>  | <b>Date Sampled</b>    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |
| <b>Your Environment</b>   | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH</b> | <b>TP / BH No</b>      | WS4           | WS4           | WS5           | WS6           |
| <b>Project / Job Ref: YE2272</b>  | <b>Additional Refs</b> | NAT           | NAT           | NAT           | NAT           |
| <b>Order No: None Supplied</b>  | <b>Depth (m)</b>       | 0.50          | 2.00          | 1.00          | 0.50          |
| <b>Reporting Date: 07/01/2016</b>   | <b>QTSE Sample No</b>  | 184701        | 184702        | 184703        | 184704        |

| <b>Determinand</b>                    | <b>Unit</b> | <b>RL</b> | <b>Accreditation</b> |       |       |       |       |
|---------------------------------------|-------------|-----------|----------------------|-------|-------|-------|-------|
| Asbestos Screen                       | N/a         | N/a       | ISO17025             |       |       |       |       |
| pH                                    | pH Units    | N/a       | MCERTS               | 8.0   | 7.8   | 7.7   | 7.5   |
| Total Cyanide                         | mg/kg       | < 2       | NONE                 | < 2   | < 2   | < 2   | < 2   |
| Free Cyanide                          | mg/kg       | < 2       | NONE                 |       |       |       |       |
| W/S Sulphate as SO <sub>4</sub> (2:1) | mg/l        | < 10      | MCERTS               | 427   | 557   | 746   | 78    |
| W/S Sulphate as SO <sub>4</sub> (2:1) | g/l         | < 0.01    | MCERTS               | 0.43  | 0.56  | 0.75  | 0.08  |
| Organic Matter                        | %           | < 0.1     | MCERTS               | 1.4   | 1.5   | 1.2   | 2.5   |
| W/S Chloride (2:1)                    | mg/kg       | < 1       | MCERTS               |       |       |       |       |
| W/S Chloride (2:1)                    | mg/l        | < 0.5     | MCERTS               |       |       |       |       |
| Arsenic (As)                          | mg/kg       | < 2       | MCERTS               | 32    | 14    | 21    | 19    |
| Barium (Ba)                           | mg/kg       | < 5       | NONE                 |       |       |       |       |
| Beryllium (Be)                        | mg/kg       | < 0.5     | NONE                 |       |       |       |       |
| W/S Boron                             | mg/kg       | < 1       | NONE                 |       |       |       |       |
| Cadmium (Cd)                          | mg/kg       | < 0.2     | MCERTS               | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Chromium (Cr)                         | mg/kg       | < 2       | MCERTS               | 39    | 43    | 43    | 47    |
| Chromium (hexavalent)                 | mg/kg       | < 2       | NONE                 | < 2   | < 2   | < 2   | < 2   |
| Copper (Cu)                           | mg/kg       | < 4       | MCERTS               | 9     | 8     | 9     | 13    |
| Lead (Pb)                             | mg/kg       | < 3       | MCERTS               | 18    | 19    | 18    | 25    |
| Mercury (Hg)                          | mg/kg       | < 1       | NONE                 | < 1   | < 1   | < 1   | < 1   |
| Nickel (Ni)                           | mg/kg       | < 3       | MCERTS               | 25    | 25    | 26    | 29    |
| Selenium (Se)                         | mg/kg       | < 3       | NONE                 | < 3   | < 3   | < 3   | < 3   |
| Vanadium (V)                          | mg/kg       | < 2       | NONE                 |       |       |       |       |
| Zinc (Zn)                             | mg/kg       | < 3       | MCERTS               | 80    | 82    | 81    | 94    |
| Total Phenols (monohydric)            | mg/kg       | < 2       | NONE                 | < 2   | < 2   | < 2   | < 2   |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

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Asbestos Analyst: Wioletta Goral

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis <sup>(5)</sup>

| <b>Soil Analysis Certificate - Speciated PAHs</b>   |                        |               |               |               |               |               |
|---|------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>QTS Environmental Report No: 15-39138</b>  | <b>Date Sampled</b>    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |
| <b>Your Environment</b>   | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH</b> | <b>TP / BH No</b>      | WS1           | WS1           | WS1           | WS3           | WS3           |
| <b>Project / Job Ref: YE2272</b>  | <b>Additional Refs</b> | MG            | MG            | NAT           | NAT           | NAT           |
| <b>Order No: None Supplied</b>  | <b>Depth (m)</b>       | 0.20          | 0.50          | 1.00          | 0.50          | 2.00          |
| <b>Reporting Date: 07/01/2016</b>   | <b>QTSE Sample No</b>  | 184696        | 184697        | 184698        | 184699        | 184700        |

| Determinand            | Unit  | RL    | Accreditation |       |       |       |       |       |
|------------------------|-------|-------|---------------|-------|-------|-------|-------|-------|
| Naphthalene            | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Acenaphthylene         | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Acenaphthene           | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Fluorene               | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Phenanthrene           | mg/kg | < 0.1 | MCERTS        | 1.10  | 0.27  | < 0.1 | 0.88  | < 0.1 |
| Anthracene             | mg/kg | < 0.1 | MCERTS        | 0.32  | < 0.1 | < 0.1 | 0.29  | < 0.1 |
| Fluoranthene           | mg/kg | < 0.1 | MCERTS        | 3.21  | 0.73  | < 0.1 | 3.18  | < 0.1 |
| Pyrene                 | mg/kg | < 0.1 | MCERTS        | 2.76  | 0.60  | < 0.1 | 2.83  | < 0.1 |
| Benzo(a)anthracene     | mg/kg | < 0.1 | MCERTS        | 1.69  | 0.36  | < 0.1 | 1.74  | < 0.1 |
| Chrysene               | mg/kg | < 0.1 | MCERTS        | 1.52  | 0.31  | < 0.1 | 1.57  | < 0.1 |
| Benzo(b)fluoranthene   | mg/kg | < 0.1 | MCERTS        | 2.66  | 0.55  | < 0.1 | 2.48  | < 0.1 |
| Benzo(k)fluoranthene   | mg/kg | < 0.1 | MCERTS        | 0.89  | 0.18  | < 0.1 | 0.85  | < 0.1 |
| Benzo(a)pyrene         | mg/kg | < 0.1 | MCERTS        | 2.04  | 0.43  | < 0.1 | 1.96  | < 0.1 |
| Indeno(1,2,3-cd)pyrene | mg/kg | < 0.1 | MCERTS        | 1.53  | 0.32  | < 0.1 | 1.30  | < 0.1 |
| Dibenz(a,h)anthracene  | mg/kg | < 0.1 | MCERTS        | 0.22  | < 0.1 | < 0.1 | 0.24  | < 0.1 |
| Benzo(ghi)perylene     | mg/kg | < 0.1 | MCERTS        | 1.30  | 0.27  | < 0.1 | 1.14  | < 0.1 |
| Total EPA-16 PAHs      | mg/kg | < 1.6 | MCERTS        | 19.2  | 4     | < 1.6 | 18.5  | < 1.6 |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

| Soil Analysis Certificate - Speciated PAHs   |                 |               |               |               |               |
|--|-----------------|---------------|---------------|---------------|---------------|
| QTS Environmental Report No: 15-39138  | Date Sampled    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |
| Your Environment   | Time Sampled    | None Supplied | None Supplied | None Supplied | None Supplied |
| Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH | TP / BH No      | WS4           | WS4           | WS5           | WS6           |
| Project / Job Ref: YE2272  | Additional Refs | NAT           | NAT           | NAT           | NAT           |
| Order No: None Supplied  | Depth (m)       | 0.50          | 2.00          | 1.00          | 0.50          |
| Reporting Date: 07/01/2016   | QTSE Sample No  | 184701        | 184702        | 184703        | 184704        |

| Determinand            | Unit  | RL    | Accreditation |       |       |       |       |
|------------------------|-------|-------|---------------|-------|-------|-------|-------|
| Naphthalene            | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Acenaphthylene         | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Acenaphthene           | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Fluorene               | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Phenanthrene           | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Anthracene             | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Fluoranthene           | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Pyrene                 | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(a)anthracene     | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Chrysene               | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(b)fluoranthene   | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(k)fluoranthene   | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(a)pyrene         | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Indeno(1,2,3-cd)pyrene | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Dibenz(a,h)anthracene  | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Benzo(ghi)perylene     | mg/kg | < 0.1 | MCERTS        | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Total EPA-16 PAHs      | mg/kg | < 1.6 | MCERTS        | < 1.6 | < 1.6 | < 1.6 | < 1.6 |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



**Soil Analysis Certificate - TPH CWG Banded**

|   |                        |               |               |               |               |               |
|---|------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>QTS Environmental Report No: 15-39138</b>  | <b>Date Sampled</b>    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |
| <b>Your Environment</b>   | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH</b> | <b>TP / BH No</b>      | WS1           | WS1           | WS1           | WS3           | WS3           |
| <b>Project / Job Ref: YE2272</b>  | <b>Additional Refs</b> | MG            | MG            | NAT           | NAT           | NAT           |
| <b>Order No: None Supplied</b>  | <b>Depth (m)</b>       | 0.20          | 0.50          | 1.00          | 0.50          | 2.00          |
| <b>Reporting Date: 07/01/2016</b>   | <b>QTSE Sample No</b>  | 184696        | 184697        | 184698        | 184699        | 184700        |

| Determinand          | Unit  | RL     | Accreditation |        |        |        |        |        |
|----------------------|-------|--------|---------------|--------|--------|--------|--------|--------|
| Aliphatic >C5 - C6   | mg/kg | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Aliphatic >C6 - C8   | mg/kg | < 0.05 | NONE          | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Aliphatic >C8 - C10  | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    | < 2    |
| Aliphatic >C10 - C12 | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    | < 2    |
| Aliphatic >C12 - C16 | mg/kg | < 3    | MCERTS        | < 3    | < 3    | < 3    | < 3    | < 3    |
| Aliphatic >C16 - C21 | mg/kg | < 3    | MCERTS        | < 3    | < 3    | < 3    | < 3    | < 3    |
| Aliphatic >C21 - C34 | mg/kg | < 10   | MCERTS        | 19     | < 10   | < 10   | 22     | < 10   |
| Aliphatic (C5 - C34) | mg/kg | < 21   | NONE          | < 21   | < 21   | < 21   | 22     | < 21   |
| Aromatic >C5 - C7    | mg/kg | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Aromatic >C7 - C8    | mg/kg | < 0.05 | NONE          | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Aromatic >C8 - C10   | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    | < 2    |
| Aromatic >C10 - C12  | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    | < 2    |
| Aromatic >C12 - C16  | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    | < 2    |
| Aromatic >C16 - C21  | mg/kg | < 3    | MCERTS        | 23     | 6      | < 3    | 13     | < 3    |
| Aromatic >C21 - C35  | mg/kg | < 10   | MCERTS        | 142    | 20     | < 10   | 99     | < 10   |
| Aromatic (C5 - C35)  | mg/kg | < 21   | NONE          | 165    | 26     | < 21   | 112    | < 21   |
| Total >C5 - C35      | mg/kg | < 42   | NONE          | 184    | < 42   | < 42   | 134    | < 42   |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Gravesend Borough Council



**QTS Environmental Ltd**  
**Unit 1, Rose Lane Industrial Estate**  
**Rose Lane**  
**Lenham Heath**  
**Maidstone**  
**Kent ME17 2JN**  
**Tel : 01622 850410**



**Soil Analysis Certificate - TPH CWG Banded**

|   |                        |               |               |               |               |
|---|------------------------|---------------|---------------|---------------|---------------|
| <b>QTS Environmental Report No: 15-39138</b>  | <b>Date Sampled</b>    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |
| <b>Your Environment</b>   | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH</b> | <b>TP / BH No</b>      | WS4           | WS4           | WS5           | WS6           |
| <b>Project / Job Ref: YE2272</b>  | <b>Additional Refs</b> | NAT           | NAT           | NAT           | NAT           |
| <b>Order No: None Supplied</b>  | <b>Depth (m)</b>       | 0.50          | 2.00          | 1.00          | 0.50          |
| <b>Reporting Date: 07/01/2016</b>   | <b>QTSE Sample No</b>  | 184701        | 184702        | 184703        | 184704        |

| Determinand          | Unit  | RL     | Accreditation |        |        |        |        |
|----------------------|-------|--------|---------------|--------|--------|--------|--------|
| Aliphatic >C5 - C6   | mg/kg | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Aliphatic >C6 - C8   | mg/kg | < 0.05 | NONE          | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Aliphatic >C8 - C10  | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    |
| Aliphatic >C10 - C12 | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    |
| Aliphatic >C12 - C16 | mg/kg | < 3    | MCERTS        | < 3    | < 3    | < 3    | < 3    |
| Aliphatic >C16 - C21 | mg/kg | < 3    | MCERTS        | < 3    | < 3    | < 3    | < 3    |
| Aliphatic >C21 - C34 | mg/kg | < 10   | MCERTS        | < 10   | < 10   | < 10   | < 10   |
| Aliphatic (C5 - C34) | mg/kg | < 21   | NONE          | < 21   | < 21   | < 21   | < 21   |
| Aromatic >C5 - C7    | mg/kg | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Aromatic >C7 - C8    | mg/kg | < 0.05 | NONE          | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Aromatic >C8 - C10   | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    |
| Aromatic >C10 - C12  | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    |
| Aromatic >C12 - C16  | mg/kg | < 2    | MCERTS        | < 2    | < 2    | < 2    | < 2    |
| Aromatic >C16 - C21  | mg/kg | < 3    | MCERTS        | < 3    | < 3    | < 3    | < 3    |
| Aromatic >C21 - C35  | mg/kg | < 10   | MCERTS        | < 10   | < 10   | < 10   | < 10   |
| Aromatic (C5 - C35)  | mg/kg | < 21   | NONE          | < 21   | < 21   | < 21   | < 21   |
| Total >C5 - C35      | mg/kg | < 42   | NONE          | < 42   | < 42   | < 42   | < 42   |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Gravesend Borough Council



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**Rose Lane**  
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**Maidstone**  
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| Soil Analysis Certificate - BTEX / MTBE  |                 |               |               |               |               |               |
|--|-----------------|---------------|---------------|---------------|---------------|---------------|
| QTS Environmental Report No: 15-39138  | Date Sampled    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |
| Your Environment   | Time Sampled    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH | TP / BH No      | WS1           | WS1           | WS1           | WS3           | WS3           |
| Project / Job Ref: YE2272  | Additional Refs | MG            | MG            | NAT           | NAT           | NAT           |
| Order No: None Supplied  | Depth (m)       | 0.20          | 0.50          | 1.00          | 0.50          | 2.00          |
| Reporting Date: 07/01/2016   | QTSE Sample No  | 184696        | 184697        | 184698        | 184699        | 184700        |

| Determinand  | Unit  | RL  | Accreditation |     |     |     |     |     |
|--------------|-------|-----|---------------|-----|-----|-----|-----|-----|
| Benzene      | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | < 2 | < 2 |
| Toluene      | ug/kg | < 5 | MCERTS        | < 5 | < 5 | < 5 | < 5 | < 5 |
| Ethylbenzene | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | < 2 | < 2 |
| p & m-xylene | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | 5   | < 2 |
| o-xylene     | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | < 2 | < 2 |
| MTBE         | ug/kg | < 5 | MCERTS        | < 5 | < 5 | < 5 | < 5 | < 5 |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Gravesend Borough Council





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| Soil Analysis Certificate - BTEX / MTBE  |                 |               |               |               |               |  |
|--|-----------------|---------------|---------------|---------------|---------------|--|
| QTS Environmental Report No: 15-39138  | Date Sampled    | 22/12/15      | 22/12/15      | 22/12/15      | 22/12/15      |  |
| Your Environment   | Time Sampled    | None Supplied | None Supplied | None Supplied | None Supplied |  |
| Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH | TP / BH No      | WS4           | WS4           | WS5           | WS6           |  |
| Project / Job Ref: YE2272  | Additional Refs | NAT           | NAT           | NAT           | NAT           |  |
| Order No: None Supplied  | Depth (m)       | 0.50          | 2.00          | 1.00          | 0.50          |  |
| Reporting Date: 07/01/2016   | QTSE Sample No  | 184701        | 184702        | 184703        | 184704        |  |

| Determinand  | Unit  | RL  | Accreditation |     |     |     |     |
|--------------|-------|-----|---------------|-----|-----|-----|-----|
| Benzene      | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | < 2 |
| Toluene      | ug/kg | < 5 | MCERTS        | < 5 | < 5 | < 5 | < 5 |
| Ethylbenzene | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | < 2 |
| p & m-xylene | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | 4   |
| o-xylene     | ug/kg | < 2 | MCERTS        | < 2 | < 2 | < 2 | < 2 |
| MTBE         | ug/kg | < 5 | MCERTS        | < 5 | < 5 | < 5 | < 5 |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Gravesend Borough Council

| Soil Analysis Certificate - Volatile Organic Compounds (VOC)   |                 |               |               |  |  |
|--|-----------------|---------------|---------------|--|--|
| QTS Environmental Report No: 15-39138  | Date Sampled    | 22/12/15      | 22/12/15      |  |  |
| Your Environment   | Time Sampled    | None Supplied | None Supplied |  |  |
| Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH | TP / BH No      | WS1           | WS1           |  |  |
| Project / Job Ref: YE2272  | Additional Refs | MG            | MG            |  |  |
| Order No: None Supplied  | Depth (m)       | 0.20          | 0.50          |  |  |
| Reporting Date: 07/01/2016   | QTSE Sample No  | 184696        | 184697        |  |  |

| Determinand                 | Unit  | RL   | Accreditation |      |      |
|-----------------------------|-------|------|---------------|------|------|
| Dichlorodifluoromethane     | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Vinyl Chloride              | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Chloromethane               | ug/kg | < 10 | MCERTS        | < 10 | < 10 |
| Chloroethane                | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Bromomethane                | ug/kg | < 10 | MCERTS        | < 10 | < 10 |
| Trichlorofluoromethane      | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,1-Dichloroethene          | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| MTBE                        | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| trans-1,2-Dichloroethene    | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,1-Dichloroethane          | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| cis-1,2-Dichloroethene      | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 2,2-Dichloropropane         | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Chloroform                  | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Bromochloromethane          | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,1,1-Trichloroethane       | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,1-Dichloropropene         | ug/kg | < 10 | MCERTS        | < 10 | < 10 |
| Carbon Tetrachloride        | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,2-Dichloroethane          | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Benzene                     | ug/kg | < 2  | MCERTS        | < 2  | < 2  |
| 1,2-Dichloropropane         | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Trichloroethene             | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Bromodichloromethane        | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Dibromomethane              | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| TAME                        | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| cis-1,3-Dichloropropene     | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Toluene                     | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| trans-1,3-Dichloropropene   | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,1,2-Trichloroethane       | ug/kg | < 10 | MCERTS        | < 10 | < 10 |
| 1,3-Dichloropropane         | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Tetrachloroethene           | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Dibromochloromethane        | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,2-Dibromoethane           | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Chlorobenzene               | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,1,1,2-Tetrachloroethane   | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Ethyl Benzene               | ug/kg | < 2  | MCERTS        | < 2  | < 2  |
| m,p-Xylene                  | ug/kg | < 2  | MCERTS        | < 2  | < 2  |
| o-Xylene                    | ug/kg | < 2  | MCERTS        | < 2  | < 2  |
| Styrene                     | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Bromoform                   | ug/kg | < 10 | MCERTS        | < 10 | < 10 |
| Isopropylbenzene            | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,1,2,2-Tetrachloroethane   | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,2,3-Trichloropropane      | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| n-Propylbenzene             | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| Bromobenzene                | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 2-Chlorotoluene             | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,3,5-Trimethylbenzene      | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 4-Chlorotoluene             | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| tert-Butylbenzene           | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,2,4-Trimethylbenzene      | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| sec-Butylbenzene            | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| p-Isopropyltoluene          | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,3-Dichlorobenzene         | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,4-Dichlorobenzene         | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| n-Butylbenzene              | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,2-Dichlorobenzene         | ug/kg | < 5  | MCERTS        | < 5  | < 5  |
| 1,2-Dibromo-3-chloropropane | ug/kg | < 10 | MCERTS        | < 10 | < 10 |
| Hexachlorobutadiene         | ug/kg | < 5  | MCERTS        | < 5  | < 5  |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

| <b>Soil Analysis Certificate - Semi Volatile Organic Compounds (SVOC)</b>                                       |                        |               |               |  |  |
|---|------------------------|---------------|---------------|--|--|
| <b>QTS Environmental Report No: 15-39138</b>  | <b>Date Sampled</b>    | 22/12/15      | 22/12/15      |  |  |
| <b>Your Environment</b>   | <b>Time Sampled</b>    | None Supplied | None Supplied |  |  |
| <b>Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH</b> | <b>TP / BH No</b>      | WS1           | WS1           |  |  |
| <b>Project / Job Ref: YE2272</b>  | <b>Additional Refs</b> | MG            | MG            |  |  |
| <b>Order No: None Supplied</b>  | <b>Depth (m)</b>       | 0.20          | 0.50          |  |  |
| <b>Reporting Date: 07/01/2016</b>   | <b>QTSE Sample No</b>  | 184696        | 184697        |  |  |

| <b>Determinand</b>          | <b>Unit</b> | <b>RL</b> | <b>Accreditation</b> |        |        |
|-----------------------------|-------------|-----------|----------------------|--------|--------|
| Phenol                      | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| 1,2,4-Trichlorobenzene      | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| 2-Nitrophenol               | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| Nitrobenzene                | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| 0-Cresol                    | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| bis(2-chloroethoxy)methane  | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| bis(2-chloroethyl)ether     | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| 2,4-Dichlorophenol          | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| 2-Chlorophenol              | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| 1,3-Dichlorobenzene         | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| 1,4-Dichlorobenzene         | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| 1,2-Dichlorobenzene         | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| 2,4-Dimethylphenol          | mg/kg       | < 0.15    | ISO17025             | < 0.15 | < 0.15 |
| Isophorone                  | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| Hexachloroethane            | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| p-Cresol                    | mg/kg       | < 0.15    | MCERTS               | < 0.15 | < 0.15 |
| 2,4,6-Trichlorophenol       | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| 2,4,5-Trichlorophenol       | mg/kg       | < 0.15    | MCERTS               | < 0.15 | < 0.15 |
| 2-Nitroaniline              | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| 4-Chloro-3-methylphenol     | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| 2-Methylnaphthalene         | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| Hexachlorocyclopentadiene   | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| Hexachlorobutadiene         | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| 2,6-Dinitrotoluene          | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| Dimethyl phthalate          | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| 2-Chloronaphthalene         | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| 4-Chloroaniline             | mg/kg       | < 0.15    | NONE                 | < 0.15 | < 0.15 |
| 4-Nitrophenol               | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| 4-Chlorophenyl phenyl ether | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| 3-Nitroaniline              | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| 4-Nitroaniline              | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| 4-Bromophenyl phenyl ether  | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| Hexachlorobenzene           | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| 2,4-Dinitrotoluene          | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| Diethyl phthalate           | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| Dibenzofuran                | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| Azobenzene                  | mg/kg       | < 0.1     | NONE                 | < 0.1  | < 0.1  |
| Dibutyl phthalate           | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| Carbazole                   | mg/kg       | < 0.1     | ISO17025             | < 0.1  | < 0.1  |
| bis(2-ethylhexyl)phthalate  | mg/kg       | < 0.15    | MCERTS               | < 0.15 | < 0.15 |
| Benzyl butyl phthalate      | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |
| Di-n-octyl phthalate        | mg/kg       | < 0.1     | MCERTS               | < 0.1  | < 0.1  |

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



|   |  |
|---|--|
| <b>Soil Analysis Certificate - Sample Descriptions</b>                                    |  |
| QTS Environmental Report No: 15-39138   |  |
| Your Environment  |  |
| Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Grav |  |
| Project / Job Ref: YE2272   |  |
| Order No: None Supplied   |  |
| Reporting Date: 07/01/2016  |  |

| QTSE Sample No | TP / BH No | Additional Refs | Depth (m) | Moisture Content (%) | Sample Matrix Description                 |
|----------------|------------|-----------------|-----------|----------------------|---|
| 184696         | WS1        | MG              | 0.20      | 17.5                 | Brown sandy clay with brick               |
| 184697         | WS1        | MG              | 0.50      | 27.8                 | Brown sandy clay                          |
| 184698         | WS1        | NAT             | 1.00      | 27.2                 | Brown sandy clay                          |
| 184699         | WS3        | NAT             | 0.50      | 8.9                  | Black sandy clay with stones and concrete |
| 184700         | WS3        | NAT             | 2.00      | 43.2                 | Brown sandy clay                          |
| 184701         | WS4        | NAT             | 0.50      | 33.2                 | Brown sandy clay with vegetation          |
| 184702         | WS4        | NAT             | 2.00      | 35.8                 | Blue sandy clay                           |
| 184703         | WS5        | NAT             | 1.00      | 30.9                 | Brown sandy clay                          |
| 184704         | WS6        | NAT             | 0.50      | 27.6                 | Brown sandy clay with vegetation          |

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample <sup>1/5</sup>

Unsuitable Sample <sup>1/5</sup>

Gravesham Borough

**Soil Analysis Certificate - Methodology & Miscellaneous Information**

QTS Environmental Report No: 15-39138

Your Environment

Site Reference: Land Adjacent to Comma Oil and Southern Water Treatment, Dering Way, Gravesend, DA12 2QH

Project / Job Ref: YE2272

Order No: None Supplied

Reporting Date: 07/01/2016

| Matrix | Analysed On | Determinand   | Brief Method Description   | Method No |
|--------|-------------|---|--|-----------|
| Soil   | D           | Boron - Water Soluble   | Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES  | E012      |
| Soil   | AR          | BTEX  | Determination of BTEX by headspace GC-MS   | E001      |
| Soil   | D           | Cations   | Determination of cations in soil by aqua-regia digestion followed by ICP-OES   | E002      |
| Soil   | D           | Chloride - Water Soluble (2:1)  | Determination of chloride by extraction with water & analysed by ion chromatography  | E009      |
| Soil   | AR          | Chromium - Hexavalent   | Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphénylcarbazine followed by colorimetry | E016      |
| Soil   | AR          | Cyanide - Complex   | Determination of complex cyanide by distillation followed by colorimetry   | E015      |
| Soil   | AR          | Cyanide - Free  | Determination of free cyanide by distillation followed by colorimetry  | E015      |
| Soil   | AR          | Cyanide - Total   | Determination of total cyanide by distillation followed by colorimetry   | E015      |
| Soil   | D           | Cyclohexane Extractable Matter (CEM)  | Gravimetrically determined through extraction with cyclohexane   | E011      |
| Soil   | AR          | Diesel Range Organics (C10 - C24)   | Determination of hexane/acetone extractable hydrocarbons by GC-FID   | E004      |
| Soil   | AR          | Electrical Conductivity   | Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement                             | E022      |
| Soil   | AR          | Electrical Conductivity   | Determination of electrical conductivity by addition of water followed by electrometric measurement  | E023      |
| Soil   | D           | Elemental Sulphur   | Determination of elemental sulphur by solvent extraction followed by GC-MS   | E020      |
| Soil   | AR          | EPH (C10 - C40)   | Determination of acetone/hexane extractable hydrocarbons by GC-FID   | E004      |
| Soil   | AR          | EPH Product ID  | Determination of acetone/hexane extractable hydrocarbons by GC-FID   | E004      |
| Soil   | AR          | EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)   | Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS  | E004      |
| Soil   | D           | Fluoride - Water Soluble  | Determination of Fluoride by extraction with water & analysed by ion chromatography  | E009      |
| Soil   | D           | FOC (Fraction Organic Carbon)   | Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate                     | E010      |
| Soil   | D           | Loss on Ignition @ 450oC  | Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace                                       | E019      |
| Soil   | D           | Magnesium - Water Soluble   | Determination of water soluble magnesium by extraction with water followed by ICP-OES  | E025      |
| Soil   | D           | Metals  | Determination of metals by aqua-regia digestion followed by ICP-OES  | E002      |
| Soil   | AR          | Mineral Oil (C10 - C40)   | Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge  | E004      |
| Soil   | AR          | Moisture Content  | Moisture content; determined gravimetrically   | E003      |
| Soil   | D           | Nitrate - Water Soluble (2:1)   | Determination of nitrate by extraction with water & analysed by ion chromatography   | E009      |
| Soil   | D           | Organic Matter  | Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate                                 | E010      |
| Soil   | AR          | PAH - Speciated (EPA 16)  | Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards                | E005      |
| Soil   | AR          | PCB - 7 Congeners   | Determination of PCB by extraction with acetone and hexane followed by GC-MS   | E008      |
| Soil   | D           | Petroleum Ether Extract (PEE)   | Gravimetrically determined through extraction with petroleum ether   | E011      |
| Soil   | AR          | pH  | Determination of pH by addition of water followed by electrometric measurement   | E007      |
| Soil   | AR          | Phenols - Total (monohydric)  | Determination of phenols by distillation followed by colorimetry   | E021      |
| Soil   | D           | Phosphate - Water Soluble (2:1)   | Determination of phosphate by extraction with water & analysed by ion chromatography   | E009      |
| Soil   | D           | Sulphate (as SO4) - Total   | Determination of total sulphate by extraction with 10% HCl followed by ICP-OES   | E013      |
| Soil   | D           | Sulphate (as SO4) - Water Soluble (2:1)   | Determination of sulphate by extraction with water & analysed by ion chromatography  | E009      |
| Soil   | D           | Sulphate (as SO4) - Water Soluble (2:1)   | Determination of water soluble sulphate by extraction with water followed by ICP-OES   | E014      |
| Soil   | AR          | Sulphide  | Determination of sulphide by distillation followed by colorimetry  | E018      |
| Soil   | D           | Sulphur - Total   | Determination of total sulphur by extraction with aqua-regia followed by ICP-OES   | E024      |
| Soil   | AR          | SVOC  | Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS   | E006      |
| Soil   | AR          | Thiocyanate (as SCN)  | Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry  | E017      |
| Soil   | D           | Toluene Extractable Matter (TEM)  | Gravimetrically determined through extraction with toluene   | E011      |
| Soil   | D           | Total Organic Carbon (TOC)  | Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate                                 | E010      |
| Soil   | AR          | TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)         | Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS       | E004      |
| Soil   | AR          | TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44) | Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS       | E004      |
| Soil   | AR          | VOCs  | Determination of volatile organic compounds by headspace GC-MS   | E001      |
| Soil   | AR          | VPH (C6-C8 & C8-C10)  | Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID  | E001      |

**D Dried**  
**AR As Received**

## APPENDIX G: Groundwater Contamination Results







Chris Gordon  
Your Environment  
Chilgrove Business Centre  
Chilgrove Park Road  
Chilgrove  
Chichester  
West Sussex  
PO18 9HU

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## **QTS Environmental Report No: 16-39254**

**Site Reference:** Derinq Way  
**Project / Job Ref:** YE2272  
**Order No:** None Supplied  
**Sample Receipt Date:** 06/01/2016  
**Sample Scheduled Date:** 07/01/2016  
**Report Issue Number:** 1  
**Reporting Date:** 14/01/2016

**Authorised by:** [REDACTED]  
Russell Jarvis  
Associate Director of Client Services  
**On behalf of QTS Environmental Ltd**

**Authorised by:** [REDACTED]  
Kevin Old  
Associate Director of Laboratory  
**On behalf of QTS Environmental Ltd**



**QTS Environmental Ltd**  
**Unit 1, Rose Lane Industrial Estate**  
**Rose Lane**  
**Lenham Heath**  
**Maidstone**  
**Kent ME17 2JN**  
**Tel : 01622 850410**



| <b>Water Analysis Certificate</b>            |                        |               |               |               |               |               |
|--|------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>QTS Environmental Report No: 16-39254</b> | <b>Date Sampled</b>    | 29/12/15      | 29/12/15      | 29/12/15      | 29/12/15      | 05/01/16      |
| <b>Your Environment</b>                      | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Site Reference: Dering Way</b>            | <b>TP / BH No</b>      | WS1           | WS3           | WS5           | WS6           | WS1           |
| <b>Project / Job Ref: YE2272</b>             | <b>Additional Refs</b> | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Order No: None Supplied</b>               | <b>Depth (m)</b>       | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Reporting Date: 14/01/2016</b>            | <b>QTSE Sample No</b>  | 185244        | 185245        | 185246        | 185247        | 185248        |

| Determinand                 | Unit                   | RL     | Accreditation |        |        |        |        |        |
|-----------------------------|------------------------|--------|---------------|--------|--------|--------|--------|--------|
| pH                          | pH Units               | N/a    | ISO17025      | 7.1    | 7.1    | 6.7    | 7.1    | 7.2    |
| Electrical Conductivity     | uS/cm                  | < 5    | NONE          | 6140   | 5310   | 8050   | 10600  | 3040   |
| Total Cyanide               | ug/l                   | < 5    | NONE          | < 5    | < 5    | < 5    | < 5    | < 5    |
| Sulphate as SO <sub>4</sub> | mg/l                   | < 1    | ISO17025      | 701    | 149    | 2160   | 657    | 371    |
| Total Organic Carbon (TOC)  | mg/l                   | < 0.1  | NONE          | 4.6    | 42.4   | 19.7   | 16.1   | 19.8   |
| Hardness - Total            | mgCaCO <sub>3</sub> /l | < 1    | NONE          | 1320   | 781    | 3250   | 1810   | 636    |
| Arsenic (dissolved)         | ug/l                   | < 5    | ISO17025      | < 5    | 8      | < 5    | 6      | 7      |
| Barium (dissolved)          | ug/l                   | < 5    | ISO17025      | 47     | 31     | 128    | 62     | 43     |
| Beryllium (dissolved)       | ug/l                   | < 3    | ISO17025      | < 3    | < 3    | < 3    | < 3    | < 3    |
| Boron (dissolved)           | ug/l                   | < 5    | ISO17025      | 1450   | 1080   | 2590   | 1810   | 738    |
| Cadmium (dissolved)         | ug/l                   | < 0.4  | ISO17025      | < 0.4  | < 0.4  | < 0.4  | < 0.4  | < 0.4  |
| Chromium (dissolved)        | ug/l                   | < 5    | ISO17025      | < 5    | < 5    | < 5    | < 5    | < 5    |
| Copper (dissolved)          | ug/l                   | < 5    | ISO17025      | < 5    | 6      | < 5    | < 5    | 17     |
| Lead (dissolved)            | ug/l                   | < 5    | ISO17025      | < 5    | < 5    | < 5    | < 5    | < 5    |
| Mercury (dissolved)         | ug/l                   | < 0.05 | ISO17025      | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Nickel (dissolved)          | ug/l                   | < 5    | ISO17025      | 18     | 14     | 20     | 14     | 11     |
| Selenium (dissolved)        | ug/l                   | < 5    | ISO17025      | < 5    | < 5    | < 5    | < 5    | < 5    |
| Vanadium (dissolved)        | ug/l                   | < 5    | ISO17025      | < 5    | 7      | < 5    | < 5    | 11     |
| Zinc (dissolved)            | ug/l                   | < 2    | ISO17025      | 90     | 47     | 94     | 47     | 69     |
| Total Phenols (monohydric)  | ug/l                   | < 10   | NONE          | < 10   | < 10   | < 10   | < 10   | < 10   |

Subcontracted analysis <sup>(S)</sup>  
 Insufficient sample <sup>I/S</sup>  
 Unsuitable Sample <sup>U/S</sup>

Gravesham Borehole

| <b>Water Analysis Certificate</b>            |                        |               |               |               |  |
|--|------------------------|---------------|---------------|---------------|--|
| <b>QTS Environmental Report No: 16-39254</b> | <b>Date Sampled</b>    | 05/01/16      | 05/01/16      | 05/01/16      |  |
| <b>Your Environment</b>                      | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied |  |
| <b>Site Reference: Dering Way</b>            | <b>TP / BH No</b>      | WS3           | WS5           | WS6           |  |
| <b>Project / Job Ref: YE2272</b>             | <b>Additional Refs</b> | None Supplied | None Supplied | None Supplied |  |
| <b>Order No: None Supplied</b>               | <b>Depth (m)</b>       | None Supplied | None Supplied | None Supplied |  |
| <b>Reporting Date: 14/01/2016</b>            | <b>QTSE Sample No</b>  | 185249        | 185250        | 185251        |  |

| <b>Determinand</b>          | <b>Unit</b>            | <b>RL</b> | <b>Accreditation</b> |        |        |        |
|-----------------------------|------------------------|-----------|----------------------|--------|--------|--------|
| pH                          | pH Units               | N/a       | ISO17025             | 7.1    | 6.8    | 7.6    |
| Electrical Conductivity     | uS/cm                  | < 5       | NONE                 | 3390   | 17800  | 2370   |
| Total Cyanide               | ug/l                   | < 5       | NONE                 | < 5    | < 5    | < 5    |
| Sulphate as SO <sub>4</sub> | mg/l                   | < 1       | ISO17025             | 151    | 1930   | 100    |
| Total Organic Carbon (TOC)  | mg/l                   | < 0.1     | NONE                 | 30.8   | 16.3   | 14.1   |
| Hardness - Total            | mgCaCO <sub>3</sub> /l | < 1       | NONE                 | 880    | 2520   | 340    |
| Arsenic (dissolved)         | ug/l                   | < 5       | ISO17025             | 9      | 8      | < 5    |
| Barium (dissolved)          | ug/l                   | < 5       | ISO17025             | 33     | 98     | 17     |
| Beryllium (dissolved)       | ug/l                   | < 3       | ISO17025             | < 3    | < 3    | < 3    |
| Boron (dissolved)           | ug/l                   | < 5       | ISO17025             | 1220   | 2150   | 468    |
| Cadmium (dissolved)         | ug/l                   | < 0.4     | ISO17025             | < 0.4  | < 0.4  | < 0.4  |
| Chromium (dissolved)        | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | < 5    |
| Copper (dissolved)          | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | 6      |
| Lead (dissolved)            | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | < 5    |
| Mercury (dissolved)         | ug/l                   | < 0.05    | ISO17025             | < 0.05 | < 0.05 | < 0.05 |
| Nickel (dissolved)          | ug/l                   | < 5       | ISO17025             | 12     | 16     | 6      |
| Selenium (dissolved)        | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | < 5    |
| Vanadium (dissolved)        | ug/l                   | < 5       | ISO17025             | 5      | < 5    | < 5    |
| Zinc (dissolved)            | ug/l                   | < 2       | ISO17025             | 39     | 54     | 49     |
| Total Phenols (monohydric)  | ug/l                   | < 10      | NONE                 | < 10   | < 10   | < 10   |

Subcontracted analysis <sup>(S)</sup>  
 Insufficient sample <sup>I/S</sup>  
 Unsuitable Sample <sup>U/S</sup>





**QTS Environmental Ltd**  
**Unit 1, Rose Lane Industrial Estate**  
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**Tel : 01622 850410**

| Water Analysis Certificate - Speciated PAH |                 |               |               |               |               |               |
|--|-----------------|---------------|---------------|---------------|---------------|---------------|
| QTS Environmental Report No: 16-39254      | Date Sampled    | 29/12/15      | 29/12/15      | 29/12/15      | 29/12/15      | 05/01/16      |
| Your Environment                           | Time Sampled    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Site Reference: Dering Way                 | TP / BH No      | WS1           | WS3           | WS5           | WS6           | WS1           |
| Project / Job Ref: YE2272                  | Additional Refs | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Order No: None Supplied                    | Depth (m)       | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Reporting Date: 14/01/2016                 | QTSE Sample No  | 185244        | 185245        | 185246        | 185247        | 185248        |

| Determinand            | Unit | RL     | Accreditation |        |        |        |        |        |
|------------------------|------|--------|---------------|--------|--------|--------|--------|--------|
| Naphthalene            | ug/l | < 0.01 | NONE          | < 0.01 | 0.06   | < 0.01 | < 0.01 | < 0.01 |
| Acenaphthylene         | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Acenaphthene           | ug/l | < 0.01 | NONE          | < 0.01 | 0.03   | < 0.01 | < 0.01 | < 0.01 |
| Fluorene               | ug/l | < 0.01 | NONE          | < 0.01 | 0.03   | < 0.01 | < 0.01 | < 0.01 |
| Phenanthrene           | ug/l | < 0.01 | NONE          | < 0.01 | 0.07   | 0.08   | 0.06   | < 0.01 |
| Anthracene             | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Fluoranthene           | ug/l | < 0.01 | NONE          | < 0.01 | 0.03   | 0.03   | 0.04   | < 0.01 |
| Pyrene                 | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | 0.03   | 0.03   | < 0.01 |
| Benzo(a)anthracene     | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Chrysene               | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(b)fluoranthene   | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(k)fluoranthene   | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(a)pyrene         | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Indeno(1,2,3-cd)pyrene | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Dibenz(a,h)anthracene  | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Benzo(ghi)perylene     | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 |
| Total EPA-16 PAHs      | ug/l | < 0.01 | NONE          | < 0.01 | 0.22   | 0.14   | 0.13   | < 0.01 |



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**Maidstone**  
**Kent ME17 2JN**  
**Tel : 01622 850410**

| Water Analysis Certificate - Speciated PAH |                 |               |               |               |  |
|--|-----------------|---------------|---------------|---------------|--|
| QTS Environmental Report No: 16-39254      | Date Sampled    | 05/01/16      | 05/01/16      | 05/01/16      |  |
| Your Environment                           | Time Sampled    | None Supplied | None Supplied | None Supplied |  |
| Site Reference: Dering Way                 | TP / BH No      | WS3           | WS5           | WS6           |  |
| Project / Job Ref: YE2272                  | Additional Refs | None Supplied | None Supplied | None Supplied |  |
| Order No: None Supplied                    | Depth (m)       | None Supplied | None Supplied | None Supplied |  |
| Reporting Date: 14/01/2016                 | QTSE Sample No  | 185249        | 185250        | 185251        |  |

| Determinand            | Unit | RL     | Accreditation |        |        |        |  |
|------------------------|------|--------|---------------|--------|--------|--------|--|
| Naphthalene            | ug/l | < 0.01 | NONE          | 0.06   | 0.15   | 0.02   |  |
| Acenaphthylene         | ug/l | < 0.01 | NONE          | < 0.01 | 0.04   | < 0.01 |  |
| Acenaphthene           | ug/l | < 0.01 | NONE          | 0.03   | < 0.01 | < 0.01 |  |
| Fluorene               | ug/l | < 0.01 | NONE          | 0.03   | 0.05   | < 0.01 |  |
| Phenanthrene           | ug/l | < 0.01 | NONE          | 0.09   | 0.17   | 0.05   |  |
| Anthracene             | ug/l | < 0.01 | NONE          | < 0.01 | 0.03   | < 0.01 |  |
| Fluoranthene           | ug/l | < 0.01 | NONE          | 0.03   | 0.04   | 0.02   |  |
| Pyrene                 | ug/l | < 0.01 | NONE          | 0.02   | 0.03   | 0.02   |  |
| Benzo(a)anthracene     | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Chrysene               | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Benzo(b)fluoranthene   | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Benzo(k)fluoranthene   | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Benzo(a)pyrene         | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Indeno(1,2,3-cd)pyrene | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Dibenz(a,h)anthracene  | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Benzo(ghi)perylene     | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Total EPA-16 PAHs      | ug/l | < 0.01 | NONE          | 0.26   | 0.51   | 0.11   |  |



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**Kent ME17 2JN**  
**Tel : 01622 850410**

**Water Analysis Certificate - TPH CWG Banded**

|  |                        |               |               |               |               |               |
|--|------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>QTS Environmental Report No: 16-39254</b> | <b>Date Sampled</b>    | 29/12/15      | 29/12/15      | 29/12/15      | 29/12/15      | 05/01/16      |
| <b>Your Environment</b>                      | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Site Reference: Dering Way</b>            | <b>TP / BH No</b>      | WS1           | WS3           | WS5           | WS6           | WS1           |
| <b>Project / Job Ref: YE2272</b>             | <b>Additional Refs</b> | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Order No: None Supplied</b>               | <b>Depth (m)</b>       | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| <b>Reporting Date: 14/01/2016</b>            | <b>QTSE Sample No</b>  | 185244        | 185245        | 185246        | 185247        | 185248        |

| Determinand          | Unit | RL    | Accreditation |       |       |       |       |       |       |
|----------------------|------|-------|---------------|-------|-------|-------|-------|-------|-------|
| Aliphatic >C5 - C6   | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C6 - C8   | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C8 - C10  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C10 - C12 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C12 - C16 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C16 - C21 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C21 - C34 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aliphatic (C5 - C34) | ug/l | < 70  | NONE          | < 70  | < 70  | < 70  | < 70  | < 70  | < 70  |
| Aromatic >C5 - C7    | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C7 - C8    | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C8 - C10   | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C10 - C12  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C12 - C16  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C16 - C21  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C21 - C35  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  | < 10  | < 10  |
| Aromatic (C5 - C35)  | ug/l | < 70  | NONE          | < 70  | < 70  | < 70  | < 70  | < 70  | < 70  |
| Total >C5 - C35      | ug/l | < 140 | NONE          | < 140 | < 140 | < 140 | < 140 | < 140 | < 140 |

Gravesham Borough





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**Tel : 01622 850410**

**Water Analysis Certificate - TPH CWG Banded**

|  |                        |               |               |               |  |  |
|--|------------------------|---------------|---------------|---------------|--|--|
| <b>QTS Environmental Report No: 16-39254</b> | <b>Date Sampled</b>    | 05/01/16      | 05/01/16      | 05/01/16      |  |  |
| <b>Your Environment</b>                      | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied |  |  |
| <b>Site Reference: Dering Way</b>            | <b>TP / BH No</b>      | WS3           | WS5           | WS6           |  |  |
| <b>Project / Job Ref: YE2272</b>             | <b>Additional Refs</b> | None Supplied | None Supplied | None Supplied |  |  |
| <b>Order No: None Supplied</b>               | <b>Depth (m)</b>       | None Supplied | None Supplied | None Supplied |  |  |
| <b>Reporting Date: 14/01/2016</b>            | <b>QTSE Sample No</b>  | 185249        | 185250        | 185251        |  |  |

| Determinand          | Unit | RL    | Accreditation |       |       |       |       |
|----------------------|------|-------|---------------|-------|-------|-------|-------|
| Aliphatic >C5 - C6   | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C6 - C8   | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C8 - C10  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C10 - C12 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C12 - C16 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C16 - C21 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aliphatic >C21 - C34 | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aliphatic (C5 - C34) | ug/l | < 70  | NONE          | < 70  | < 70  | < 70  | < 70  |
| Aromatic >C5 - C7    | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C7 - C8    | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C8 - C10   | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C10 - C12  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C12 - C16  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C16 - C21  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aromatic >C21 - C35  | ug/l | < 10  | NONE          | < 10  | < 10  | < 10  | < 10  |
| Aromatic (C5 - C35)  | ug/l | < 70  | NONE          | < 70  | < 70  | < 70  | < 70  |
| Total >C5 - C35      | ug/l | < 140 | NONE          | < 140 | < 140 | < 140 | < 140 |

Gravesham Borough Council



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| Water Analysis Certificate - BTEX / MTBE |                 |               |               |               |               |               |
|--|-----------------|---------------|---------------|---------------|---------------|---------------|
| QTS Environmental Report No: 16-39254    | Date Sampled    | 29/12/15      | 29/12/15      | 29/12/15      | 29/12/15      | 05/01/16      |
| Your Environment                         | Time Sampled    | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Site Reference: Dering Way               | TP / BH No      | WS1           | WS3           | WS5           | WS6           | WS1           |
| Project / Job Ref: YE2272                | Additional Refs | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Order No: None Supplied                  | Depth (m)       | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| Reporting Date: 14/01/2016               | QTSE Sample No  | 185244        | 185245        | 185246        | 185247        | 185248        |

| Determinand  | Unit | RL   | Accreditation |      |      |      |      |      |
|--------------|------|------|---------------|------|------|------|------|------|
| Benzene      | ug/l | < 1  | ISO17025      | < 1  | < 1  | < 1  | < 1  | < 1  |
| Toluene      | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  | < 5  | < 5  |
| Ethylbenzene | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  | < 5  | < 5  |
| p & m-xylene | ug/l | < 10 | ISO17025      | < 10 | < 10 | < 10 | < 10 | < 10 |
| o-xylene     | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  | < 5  | < 5  |
| MTBE         | ug/l | < 10 | ISO17025      | < 10 | < 10 | < 10 | < 10 | < 10 |

Gravesham Borough Council



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**Maidstone**  
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| Water Analysis Certificate - BTEX / MTBE |                 |               |               |               |  |  |
|--|-----------------|---------------|---------------|---------------|--|--|
| QTS Environmental Report No: 16-39254    | Date Sampled    | 05/01/16      | 05/01/16      | 05/01/16      |  |  |
| Your Environment                         | Time Sampled    | None Supplied | None Supplied | None Supplied |  |  |
| Site Reference: Dering Way               | TP / BH No      | WS3           | WS5           | WS6           |  |  |
| Project / Job Ref: YE2272                | Additional Refs | None Supplied | None Supplied | None Supplied |  |  |
| Order No: None Supplied                  | Depth (m)       | None Supplied | None Supplied | None Supplied |  |  |
| Reporting Date: 14/01/2016               | QTSE Sample No  | 185249        | 185250        | 185251        |  |  |

| Determinand  | Unit | RL   | Accreditation |      |      |      |  |
|--------------|------|------|---------------|------|------|------|--|
| Benzene      | ug/l | < 1  | ISO17025      | < 1  | < 1  | < 1  |  |
| Toluene      | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  |  |
| Ethylbenzene | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  |  |
| p & m-xylene | ug/l | < 10 | ISO17025      | < 10 | < 10 | < 10 |  |
| o-xylene     | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  |  |
| MTBE         | ug/l | < 10 | ISO17025      | < 10 | < 10 | < 10 |  |

Gravesham Borough Council



|  |
|--|
| <b>Soil Analysis Certificate - Methodology &amp; Miscellaneous Information</b> |
| <b>QTS Environmental Report No: 16-39254</b>                                   |
| <b>Your Environment</b>  |
| <b>Site Reference: Dering Way</b>  |
| <b>Project / Job Ref: YE2272</b>   |
| <b>Order No: None Supplied</b>   |
| <b>Reporting Date: 14/01/2016</b>  |

| Matrix   | Analysed On | Determinand   | Brief Method Description  | Method No |
|----------|-------------|---|---|-----------|
| Water    | UF          | Alkalinity  | Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point                                 | E103      |
| Water    | UF          | BTEX  | Determination of BTEX by headspace GC-MS  | E101      |
| Water    | F           | Cations   | Determination of cations by filtration followed by ICP-MS   | E102      |
| Water    | UF          | Chemical Oxygen Demand (COD)  | Determination using a COD reactor followed by colorimetry   | E112      |
| Water    | F           | Chloride  | Determination of chloride by filtration & analysed by ion chromatography  | E109      |
| Water    | F           | Chromium - Hexavalent   | Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by  | E116      |
| Water    | UF          | Cyanide - Complex   | Determination of complex cyanide by distillation followed by colorimetry  | E115      |
| Water    | UF          | Cyanide - Free  | Determination of free cyanide by distillation followed by colorimetry   | E115      |
| Water    | UF          | Cyanide - Total   | Determination of total cyanide by distillation followed by colorimetry  | E115      |
| Water    | UF          | Cyclohexane Extractable Matter (CEM)  | Gravimetrically determined through liquid:liquid extraction with cyclohexane  | E111      |
| Water    | F           | Diesel Range Organics (C10 - C24)   | Determination of liquid:liquid extraction with hexane followed by GC-FID  | E104      |
| Water    | F           | Dissolved Organic Content (DOC)   | Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection                                  | E110      |
| Water    | UF          | Electrical Conductivity   | Determination of electrical conductivity by electrometric measurement   | E123      |
| Water    | F           | EPH (C10 - C40)   | Determination of liquid:liquid extraction with hexane followed by GC-FID  | E104      |
| Water    | F           | EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)   | Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS                         | E104      |
| Water    | F           | Fluoride  | Determination of Fluoride by filtration & analysed by ion chromatography  | E109      |
| Water    | F           | Hardness  | Determination of Ca and Mg by ICP-MS followed by calculation  | E102      |
| Leachate | F           | Leachate Preparation - NRA  | Based on National Rivers Authority leaching test 1994   | E301      |
| Leachate | F           | Leachate Preparation - WAC  | Based on BS EN 12457 Pt1, 2, 3  | E302      |
| Water    | F           | Metals  | Determination of metals by filtration followed by ICP-MS  | E102      |
| Water    | F           | Mineral Oil (C10 - C40)   | Determination of liquid:liquid extraction with hexane followed by GI-FID  | E104      |
| Water    | F           | Nitrate   | Determination of nitrate by filtration & analysed by ion chromatography   | E109      |
| Water    | UF          | Monohydric Phenol   | Determination of phenols by distillation followed by colorimetry  | E121      |
| Water    | F           | PAH - Speciated (EPA 16)  | Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS                      | E105      |
| Water    | F           | PCB - 7 Congeners   | Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane  | E108      |
| Water    | UF          | Petroleum Ether Extract (PEE)   | Gravimetrically determined through liquid:liquid extraction with petroleum ether  | E111      |
| Water    | UF          | pH  | Determination of pH by electrometric measurement  | E107      |
| Water    | F           | Phosphate   | Determination of phosphate by filtration & analysed by ion chromatography   | E109      |
| Water    | UF          | Redox Potential   | Determination of redox potential by electrometric measurement   | E113      |
| Water    | F           | Sulphate (as SO4)   | Determination of sulphate by filtration & analysed by ion chromatography  | E109      |
| Water    | UF          | Sulphide  | Determination of sulphide by distillation followed by colorimetry   | E118      |
| Water    | F           | SVOC  | Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS    | E106      |
| Water    | UF          | Toluene Extractable Matter (TEM)  | Gravimetrically determined through liquid:liquid extraction with toluene  | E111      |
| Water    | UF          | Total Organic Carbon (TOC)  | Low heat with persulphate addition followed by IR detection   | E110      |
| Water    | F           | TPH CWG (all: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)          | Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS | E104      |
| Water    | F           | TPH LQM (all: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44) | Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS | E104      |
| Water    | UF          | VOCs  | Determination of volatile organic compounds by headspace GC-MS  | E101      |
| Water    | UF          | VPH (C6-C8 & C8-C10)  | Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID   | E101      |

Key

**F Filtered**  
**UF Unfiltered**



Chris Gordon  
Your Environment  
Chilgrove Business Centre  
Chilgrove Park Road  
Chilgrove  
Chichester  
West Sussex  
PO18 9HU

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## **QTS Environmental Report No: 16-39468**

**Site Reference:** Dering Way  
**Project / Job Ref:** YE2272  
**Order No:** None Supplied  
**Sample Receipt Date:** 14/01/2016  
**Sample Scheduled Date:** 14/01/2016  
**Report Issue Number:** 1  
**Reporting Date:** 19/01/2016

**Authorised by:** [REDACTED]

Russell Jarvis  
Associate Director of Client Services  
**On behalf of QTS Environmental Ltd**

**Authorised by:** [REDACTED]

Kevin Old  
Associate Director of Laboratory  
**On behalf of QTS Environmental Ltd**

| <b>Water Analysis Certificate</b>            |                        |               |               |               |  |
|--|------------------------|---------------|---------------|---------------|--|
| <b>QTS Environmental Report No: 16-39468</b> | <b>Date Sampled</b>    | 12/01/16      | 12/01/16      | 12/01/16      |  |
| <b>Your Environment</b>                      | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied |  |
| <b>Site Reference: Dering Way</b>            | <b>TP / BH No</b>      | WS1           | WS3           | WS6           |  |
| <b>Project / Job Ref: YE2272</b>             | <b>Additional Refs</b> | None Supplied | None Supplied | None Supplied |  |
| <b>Order No: None Supplied</b>               | <b>Depth (m)</b>       | None Supplied | None Supplied | None Supplied |  |
| <b>Reporting Date: 19/01/2016</b>            | <b>QTSE Sample No</b>  | 186368        | 186369        | 186371        |  |

| <b>Determinand</b>          | <b>Unit</b>            | <b>RL</b> | <b>Accreditation</b> |        |        |        |
|-----------------------------|------------------------|-----------|----------------------|--------|--------|--------|
| pH                          | pH Units               | N/a       | ISO17025             | 7.9    | 7.1    | 7.2    |
| Electrical Conductivity     | uS/cm                  | < 5       | NONE                 | 2240   | 6250   | 3730   |
| Total Cyanide               | ug/l                   | < 5       | NONE                 | < 5    | < 5    | < 5    |
| Sulphate as SO <sub>4</sub> | mg/l                   | < 1       | ISO17025             | 276    | 176    | 136    |
| Total Organic Carbon (TOC)  | mg/l                   | < 0.1     | NONE                 | 109    | 132    | 156    |
| Hardness - Total            | mgCaCO <sub>3</sub> /l | < 1       | NONE                 | 623    | 1090   | 607    |
| Arsenic (dissolved)         | ug/l                   | < 5       | ISO17025             | 8      | 5      | 9      |
| Barium (dissolved)          | ug/l                   | < 5       | ISO17025             | 34     | 28     | 38     |
| Beryllium (dissolved)       | ug/l                   | < 3       | ISO17025             | < 3    | < 3    | < 3    |
| Boron (dissolved)           | ug/l                   | < 5       | ISO17025             | 593    | 1260   | 718    |
| Cadmium (dissolved)         | ug/l                   | < 0.4     | ISO17025             | < 0.4  | < 0.4  | < 0.4  |
| Chromium (dissolved)        | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | < 5    |
| Copper (dissolved)          | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | < 5    |
| Lead (dissolved)            | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | < 5    |
| Mercury (dissolved)         | ug/l                   | < 0.05    | ISO17025             | < 0.05 | < 0.05 | < 0.05 |
| Nickel (dissolved)          | ug/l                   | < 5       | ISO17025             | 8      | 10     | 5      |
| Selenium (dissolved)        | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | < 5    |
| Vanadium (dissolved)        | ug/l                   | < 5       | ISO17025             | < 5    | < 5    | 5      |
| Zinc (dissolved)            | ug/l                   | < 2       | ISO17025             | 3      | 6      | 3      |
| Total Phenols (monohydric)  | ug/l                   | < 10      | NONE                 | < 10   | < 10   | < 10   |

Subcontracted analysis <sup>(1)</sup>  
 Insufficient sample <sup>1/5</sup>  
 Unsuitable Sample <sup>1/5</sup>

Gravesham Borough Council





**QTS Environmental Ltd**  
**Unit 1, Rose Lane Industrial Estate**  
**Rose Lane**  
**Lenham Heath**  
**Maidstone**  
**Kent ME17 2JN**  
**Tel : 01622 850410**

| Water Analysis Certificate - Speciated PAH |                 |               |               |               |  |
|--|-----------------|---------------|---------------|---------------|--|
| QTS Environmental Report No: 16-39468      | Date Sampled    | 12/01/16      | 12/01/16      | 12/01/16      |  |
| Your Environment                           | Time Sampled    | None Supplied | None Supplied | None Supplied |  |
| Site Reference: Dering Way                 | TP / BH No      | WS1           | WS3           | WS6           |  |
| Project / Job Ref: YE2272                  | Additional Refs | None Supplied | None Supplied | None Supplied |  |
| Order No: None Supplied                    | Depth (m)       | None Supplied | None Supplied | None Supplied |  |
| Reporting Date: 19/01/2016                 | QTSE Sample No  | 186368        | 186369        | 186371        |  |

| Determinand            | Unit | RL     | Accreditation |        |        |        |  |
|------------------------|------|--------|---------------|--------|--------|--------|--|
| Naphthalene            | ug/l | < 0.01 | NONE          | < 0.01 | 0.04   | 0.02   |  |
| Acenaphthylene         | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Acenaphthene           | ug/l | < 0.01 | NONE          | < 0.01 | 0.07   | < 0.01 |  |
| Fluorene               | ug/l | < 0.01 | NONE          | < 0.01 | 0.19   | < 0.01 |  |
| Phenanthrene           | ug/l | < 0.01 | NONE          | 0.10   | 0.79   | 0.12   |  |
| Anthracene             | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Fluoranthene           | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Pyrene                 | ug/l | < 0.01 | NONE          | < 0.01 | 0.07   | < 0.01 |  |
| Benzo(a)anthracene     | ug/l | < 0.01 | NONE          | < 0.01 | 0.09   | < 0.01 |  |
| Chrysene               | ug/l | < 0.01 | NONE          | < 0.01 | 0.08   | < 0.01 |  |
| Benzo(b)fluoranthene   | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Benzo(k)fluoranthene   | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Benzo(a)pyrene         | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Indeno(1,2,3-cd)pyrene | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Dibenz(a,h)anthracene  | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Benzo(ghi)perylene     | ug/l | < 0.01 | NONE          | < 0.01 | < 0.01 | < 0.01 |  |
| Total EPA-16 PAHs      | ug/l | < 0.01 | NONE          | 0.10   | 1.33   | 0.14   |  |



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| Water Analysis Certificate - TPH CWG Banded  |                        |               |               |               |  |
|--|------------------------|---------------|---------------|---------------|--|
| <b>QTS Environmental Report No: 16-39468</b> | <b>Date Sampled</b>    | 12/01/16      | 12/01/16      | 12/01/16      |  |
| <b>Your Environment</b>                      | <b>Time Sampled</b>    | None Supplied | None Supplied | None Supplied |  |
| <b>Site Reference: Dering Way</b>            | <b>TP / BH No</b>      | WS1           | WS3           | WS6           |  |
| <b>Project / Job Ref: YE2272</b>             | <b>Additional Refs</b> | None Supplied | None Supplied | None Supplied |  |
| <b>Order No: None Supplied</b>               | <b>Depth (m)</b>       | None Supplied | None Supplied | None Supplied |  |
| <b>Reporting Date: 19/01/2016</b>            | <b>QTSE Sample No</b>  | 186368        | 186369        | 186371        |  |

| Determinand          | Unit | RL    | Accreditation |       |      |       |
|----------------------|------|-------|---------------|-------|------|-------|
| Aliphatic >C5 - C6   | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aliphatic >C6 - C8   | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aliphatic >C8 - C10  | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aliphatic >C10 - C12 | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aliphatic >C12 - C16 | ug/l | < 10  | NONE          | < 10  | 16   | < 10  |
| Aliphatic >C16 - C21 | ug/l | < 10  | NONE          | < 10  | 108  | 22    |
| Aliphatic >C21 - C34 | ug/l | < 10  | NONE          | 31    | 140  | 38    |
| Aliphatic (C5 - C34) | ug/l | < 70  | NONE          | < 70  | 265  | < 70  |
| Aromatic >C5 - C7    | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aromatic >C7 - C8    | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aromatic >C8 - C10   | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aromatic >C10 - C12  | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aromatic >C12 - C16  | ug/l | < 10  | NONE          | < 10  | < 10 | < 10  |
| Aromatic >C16 - C21  | ug/l | < 10  | NONE          | < 10  | 60   | 13    |
| Aromatic >C21 - C35  | ug/l | < 10  | NONE          | < 10  | 124  | 15    |
| Aromatic (C5 - C35)  | ug/l | < 70  | NONE          | < 70  | 185  | < 70  |
| Total >C5 - C35      | ug/l | < 140 | NONE          | < 140 | 449  | < 140 |



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| Water Analysis Certificate - BTEX / MTBE |                 |               |               |               |  |  |
|--|-----------------|---------------|---------------|---------------|--|--|
| QTS Environmental Report No: 16-39468    | Date Sampled    | 12/01/16      | 12/01/16      | 12/01/16      |  |  |
| Your Environment                         | Time Sampled    | None Supplied | None Supplied | None Supplied |  |  |
| Site Reference: Dering Way               | TP / BH No      | WS1           | WS3           | WS6           |  |  |
| Project / Job Ref: YE2272                | Additional Refs | None Supplied | None Supplied | None Supplied |  |  |
| Order No: None Supplied                  | Depth (m)       | None Supplied | None Supplied | None Supplied |  |  |
| Reporting Date: 19/01/2016               | QTSE Sample No  | 186368        | 186369        | 186371        |  |  |

| Determinand  | Unit | RL   | Accreditation |      |      |      |  |
|--------------|------|------|---------------|------|------|------|--|
| Benzene      | ug/l | < 1  | ISO17025      | < 1  | < 1  | < 1  |  |
| Toluene      | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  |  |
| Ethylbenzene | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  |  |
| p & m-xylene | ug/l | < 10 | ISO17025      | < 10 | < 10 | < 10 |  |
| o-xylene     | ug/l | < 5  | ISO17025      | < 5  | < 5  | < 5  |  |
| MTBE         | ug/l | < 10 | ISO17025      | < 10 | < 10 | < 10 |  |

Gravesham Borough Council



**Soil Analysis Certificate - Methodology & Miscellaneous Information**

QTS Environmental Report No: 16-39468

Your Environment

Site Reference: Dering Way

Project / Job Ref: YE2272

Order No: None Supplied

Reporting Date: 19/01/2016

| Matrix   | Analysed On | Determinand   | Brief Method Description  | Method No |
|----------|-------------|---|---|-----------|
| Water    | UF          | Alkalinity  | Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point                                 | E103      |
| Water    | UF          | BTEX  | Determination of BTEX by headspace GC-MS  | E101      |
| Water    | F           | Cations   | Determination of cations by filtration followed by ICP-MS   | E102      |
| Water    | UF          | Chemical Oxygen Demand (COD)  | Determination using a COD reactor followed by colorimetry   | E112      |
| Water    | F           | Chloride  | Determination of chloride by filtration & analysed by ion chromatography  | E109      |
| Water    | F           | Chromium - Hexavalent   | Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by  | E116      |
| Water    | UF          | Cyanide - Complex   | Determination of complex cyanide by distillation followed by colorimetry  | E115      |
| Water    | UF          | Cyanide - Free  | Determination of free cyanide by distillation followed by colorimetry   | E115      |
| Water    | UF          | Cyanide - Total   | Determination of total cyanide by distillation followed by colorimetry  | E115      |
| Water    | UF          | Cyclohexane Extractable Matter (CEM)  | Gravimetrically determined through liquid:liquid extraction with cyclohexane  | E111      |
| Water    | F           | Diesel Range Organics (C10 - C24)   | Determination of liquid:liquid extraction with hexane followed by GC-FID  | E104      |
| Water    | F           | Dissolved Organic Content (DOC)   | Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection                                  | E110      |
| Water    | UF          | Electrical Conductivity   | Determination of electrical conductivity by electrometric measurement   | E123      |
| Water    | F           | EPH (C10 - C40)   | Determination of liquid:liquid extraction with hexane followed by GC-FID  | E104      |
| Water    | F           | EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)   | Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS                         | E104      |
| Water    | F           | Fluoride  | Determination of Fluoride by filtration & analysed by ion chromatography  | E109      |
| Water    | F           | Hardness  | Determination of Ca and Mg by ICP-MS followed by calculation  | E102      |
| Leachate | F           | Leachate Preparation - NRA  | Based on National Rivers Authority leaching test 1994   | E301      |
| Leachate | F           | Leachate Preparation - WAC  | Based on BS EN 12457 Pt1, 2, 3  | E302      |
| Water    | F           | Metals  | Determination of metals by filtration followed by ICP-MS  | E102      |
| Water    | F           | Mineral Oil (C10 - C40)   | Determination of liquid:liquid extraction with hexane followed by GI-FID  | E104      |
| Water    | F           | Nitrate   | Determination of nitrate by filtration & analysed by ion chromatography   | E109      |
| Water    | UF          | Monohydric Phenol   | Determination of phenols by distillation followed by colorimetry  | E121      |
| Water    | F           | PAH - Speciated (EPA 16)  | Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS                      | E105      |
| Water    | F           | PCB - 7 Congeners   | Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane  | E108      |
| Water    | UF          | Petroleum Ether Extract (PEE)   | Gravimetrically determined through liquid:liquid extraction with petroleum ether  | E111      |
| Water    | UF          | pH  | Determination of pH by electrometric measurement  | E107      |
| Water    | F           | Phosphate   | Determination of phosphate by filtration & analysed by ion chromatography   | E109      |
| Water    | UF          | Redox Potential   | Determination of redox potential by electrometric measurement   | E113      |
| Water    | F           | Sulphate (as SO4)   | Determination of sulphate by filtration & analysed by ion chromatography  | E109      |
| Water    | UF          | Sulphide  | Determination of sulphide by distillation followed by colorimetry   | E118      |
| Water    | F           | SVOC  | Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS    | E106      |
| Water    | UF          | Toluene Extractable Matter (TEM)  | Gravimetrically determined through liquid:liquid extraction with toluene  | E111      |
| Water    | UF          | Total Organic Carbon (TOC)  | Low heat with persulphate addition followed by IR detection   | E110      |
| Water    | F           | TPH CWG (all: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)          | Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS | E104      |
| Water    | F           | TPH LQM (all: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44) | Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS | E104      |
| Water    | UF          | VOCs  | Determination of volatile organic compounds by headspace GC-MS  | E101      |
| Water    | UF          | VPH (C6-C8 & C8-C10)  | Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID   | E101      |

Key

**F Filtered**  
**UF Unfiltered**