

Attachment 4.8.3 Site Consent of contright on the required for any other tree. **Condition Report** 

Sub Section 4.8 IE Licence Application ID LA003577

**Dublin Waste to Energy Limited** 

Project number: 60587300

26 March 2019

# Quality information

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#### 1. Introduction

#### 1.1 **Project Background**

Dublin Waste to Energy Ltd (DWtE) operate a site located on the Poolbeg Peninsula, Ringsend, Dublin (the site) under Industrial Emissions Licence (IEL) W0232-01 granted by the Environmental Protection Agency (EPA).

A proposed increase in the permitted maximum annual quantity of waste accepted at the facility from 600,000 tonnes per year to 690,000 tonnes per year (15% increase) has obliged the site to apply for a revised IEL. As part of the IEL review application DWtE must include a Site Condition Report (SCR). DWtE appointed AECOM Ireland Limited (AECOM) to assist in the preparation of their IEL review application including the production of this SCR.

The site location map and site layout used to support the IEL amendment application are presented in Appendix A.

Details on proposed DWtE activities and supporting infrastructure are presented in Attachment 4.8.1: Operational Report that supports the IEL application.

#### 1.2 **Objective**

The main objective of this report is to complete an SCR for the site in support of DWtE's current IEL Anna Santa and St. Leading of St. amendment application, application reference LA003577 jon puposes

#### 1.3 Scope of Work

This SCR describes the current condition of the SWtE site by presenting information and detail of ground and groundwater quality, and having regard to relevant environmental quality standards or

Within this report are presented those topics which are relevant to the SCR, specifically:

- Site details and site history;
- Environmental setting;
- Permitted activities; and,
- Compliance with requirements of the EC Environmental Objectives (Groundwater) Regulations 2010, S.I. No. 9 of 2010 and as amended by S.I. No. 366 of 2016.

The following documents pertaining to the DWtE site have been consulted in preparing this report:

- Geotechnical Specialists Limited (2003) Factual Report on Ground Investigation, Dublin Waste to **Energy Project;**
- IGSL (2005) Site Investigation at Waste to Energy Project, Ringsend, Dublin City; 2.
- 3. RPS (2005) Soil and Groundwater Investigation at Ringsend, Dublin;
- 4. Arup Consulting Engineers (2006) Environmental Impact Assessment, report reference 246840 -Version 2a:
- 5. Arup Consulting Engineers (2006) Geo-Environmental Engineering Assessment; and,
- PM Group, Soil Reusability Report (2017) IE0311183-22-RP-0055, Issue A, Draft for 6. information.

### 2. Site Details and Site History

#### 2.1 Site Description

The site is located on the Poolbeg Peninsula within the Dublin Docklands and occupies and area of approximately 5.5 ha. Of this, the main process building occupies approximately 2.6 ha. The remaining 2.9 ha consists of soft and hard landscaping and internal road infrastructure.

The site is located in an industrial area. The Ringsend Waste Water Treatment Plant is located to the east of the site; Dublin Bay Power Station (Synergen) is located to the west of the site; Dublin Harbour is located to the north; and, Dublin Bay and Irishtown Nature Park are located to the south.

Four EPA licensed facilities are located within a 1 km radius of the site:

- The Hammond Lane Metal Company Limited (P1002-01);
- ESB Poolbeg Generating Station (P0577-03);
- Synergen Power Limited (P0486-02); and,
- Dublin Port Company (P1022-02).

A detailed description of the site is presented in other documents<sup>1</sup> being provided with IEL application reference LA003577.

### 2.2 Site Development

The site is built on reclaimed land. The site was infilled between 1970 and 1976. The source of fill material is not recorded.

In 1979, Hibernian Molasses established a plant on the western and central portion of the site. The remainder of the site to the north and south of the molasses plant was used in the 1980s as coal storage areas. Between 1995 and the development of the DWtE site, the northern portion of the site operated as a scrap metal yard.

Potential contaminants in soil associated with the site's historic development include:

- Heavy metals from hydraulic fill and from the weathering of scrap metal;
- Polycyclic aromatic hydrocarbons (PAHs) from coal storage;
- Hydrocarbon contamination from various former site operations; and,
- Molasses from the former molasses plant.

A waste to energy facility in Dublin was first proposed in 1997, following a site selection process the Poolbeg site was chosen. Construction on the DWtE facility began in September 2014. The DWtE facility first became operational on 01<sup>st</sup> June 2017.

# 3. Site Investigations

The site investigation reports listed in Section 1.3 were included in the appendix of the 2006 Environmental Impact Assessment (EIA). These reports detail site investigations and/or desk studies for the site and were consulted by AECOM to assess soil and groundwater conditions at the site as summarised below. A figure produced for the 2006 Arup Desk Study showing all of the sampling locations in the following reports is presented as Figure 5 in Appendix D.

<sup>&</sup>lt;sup>1</sup>Attachment 4.8.1: Operational Report

#### 3.1 2003 GSL Site Investigation

The 2003 Geotech Specialists Limited (GSL) site investigation was completed to obtain geotechnical and geoenvironmental information for the site prior to development of the DWtE facility. Ten boreholes, nine trial pits and five slit trenches were completed as part of the investigation. Boreholes depths ranged between 34 m and 49.5 m below ground level (bgl). Six of the boreholes were installed as groundwater monitoring wells to monitor water levels. Details of the boreholes and trial pits are presented as Table 1 in Appendix B. Available borehole and trial pit logs are presented in Appendix H.

Six soil samples were dispatched to an external laboratory to be tested for a range of parameters including: metals, major ions, total petroleum hydrocarbons (TPH), PAHs and phenols. Two soil samples were analysed for dioxins. Laboratory soil results are presented as Appendix E.

PAHs were detected in all the soil samples from the 2003 investigation, in addition lead, zinc and copper concentrations were detected but below Dutch Intervention Values (DIV).

No groundwater samples were taken as part of this investigation.

#### 3.2 2005 RPS Site Investigation

RPS conducted a geo-environmental site investigation in March 2005. From the report on this investigation, only the tables containing the soil and groundwater analytical results, field sampling sheets and the borehole logs were included in the EIA and have been reviewed. The conclusions of the 2005 RPS report are summarised in the 2006 Arup Desk Study. Seven boreholes were advanced across site and 18 trial pits were completed. All seven boreholes were installed as groundwater monitoring wells. Details of well installations and the trial is an be found in Table 2 in Appendix B. Borehole and trial pit logs from this investigation can be found in Appendix H.

3.2.1 2005 RPS Soil Sampling
A total of 64 soil samples were collected during the 2005 RPS site investigation and analysed for a range of parameters including: TPH, PAHS, volatile organic compounds (VOCs), metals, asbestos, ammonia, phenols and coliforms.

Soil sampling identified elevated TPH concentrations in many samples. Elevated TPHs were predominately from the C<sub>16</sub>-C<sub>35</sub> carbon range which is generally not mobile. There is no DIV for TPHs, however the DIV for mineral oil in soil (5,000 mg/kg) was exceeded at depths of 1 m and 7 m bgl at MW2.

The DIV for PAHs in soil (40 mg/kg) was exceeded in eight of the 64 soil samples analysed in 2005. The 2006 study suggests that these results most likely represent local hotspots.

Lead, zinc and copper were detected above the DIV in samples of fill material from several locations.

Several low concentrations of VOCs were detected in soil samples, including:

- 8 detections of trichloroethene (TCE) up to a concentration of 0.067 mg/kg (TP13);
- 38 detections of tetrachloroethene (PCE) up to 3.2 mg/kg (TP4); and
- 43 detections of BTEX compounds (benzene, toluene, ethyl benzene and xylene), up to 343 mg/kg (TP11).

Laboratory soil results are presented as Appendix F.

#### 3.2.2 2005 RPS Groundwater Sampling

A total of 11 groundwater samples were collected during the 2005 RPS site investigation and analysed for a range of parameters including: TPH, PAHs, VOCs, metals, phenols and coliforms.

During groundwater sampling in March 2005, no separate hydrocarbon layer was noted during the dip round. However, hydrocarbon product was noted in purge water from three wells (MW01, MW04A

and MW06A). A deep orange liquid was recovered from well BH4 within the footprint of the former Hibernian Molasses site of which no further details were provided.

Elevated electrical conductivity (2.3-34.6 mS/cm) and elevated concentrations of boron (up to 3.1 mg/L) were noted. The 2006 Arup desk study states that these indicate saline groundwater conditions beneath the site.

Arsenic, lead, nickel and zinc were also slightly elevated but that was considered by Arup in 2006 to be due to seawater mixing.

TPH concentrations in excess of the IGV (10  $\mu$ g/L) were noted in groundwater from six wells (MW01, MW02, MW03, MW06A, MW07 and BR8) with concentrations ranging from 12  $\mu$ g/L (MW02) to 147  $\mu$ g/L (BR8).

PAHs were detected in groundwater from two wells, MW03 (0.89  $\mu$ g/L) and BH1 (32.4  $\mu$ g/L) in excess of the IGV (0.1  $\mu$ g/L).

VOCs and phenols were below detection limits for the most part, with the exception of a single trace detection of toluene (3  $\mu$ g/L, BH1).

Analytical results of the groundwater sampling are presented as Appendix G

#### 3.3 2005 IGSL Site Investigation

IGSL conducted a geotechnical site investigation in October 2005, six boreholes were advanced across site and installed as groundwater monitoring wells.

These boreholes were drilled for geotechnical testing only and no soil or groundwater samples were taken for environmental analysis. Details of well installations and the trial pits can be found in Table 3 in Appendix B. Borehole logs from this investigation can be found in Appendix H.

### 3.4 2006 Arup Desk Study

In 2006 a desk study of existing information and a site walkover was conducted by Arup to assess data collected during previous site investigations to produce a geo-environmental engineering assessment of the site in response to concerns raised regarding the extent of the made ground, beneath site, its depth and the level of contamination present.

The desk study notes that prior to the construction of the DWtE facility a scrap metal company, Clearway Disposal, occupied the northern portion of the site. An unbunded fuel oil tank was noted in the south of the Clearway Disposal site during the site walkover visual evidence of an oil spill was reportedly observed.

Overall, based on results of the earlier site investigations, the 2006 Arup report concluded that there was a high potential for contamination hotspots within excavated materials due to shallow hydrocarbon and PAH contamination in the areas near the Clearway Disposal fuel oil tank and the proposed cooling pipes.

#### 3.5 Soil Reusability Report

A Soil Reusability Report was completed by the PM group in 2017. This is a validation report produced following the completion of construction works on site at the recommendation of the EPA. The report outlines how excavated materials on site was reused and how potential pollutant linkages were broken between contaminated site soils noted in Section 3.4 and identified human health and environmental receptors identified by a risk assessment conducted by Jacobs Engineering<sup>2</sup>.

The risk assessment report derived site-specific assessment criteria which could be used to separate site won material into three categories. The site-specific assessment criteria are presented as Table 4 in Appendix B.

<sup>&</sup>lt;sup>2</sup> Jacobs Engineering (2009) Risk Assessment Report (60556600-05-Rev0), AECOM has not reviewed this report.

- Category A materials were reused under areas of hardstanding or if capped under a 300 mm clean capping layer under soft landscape material.
- Category B materials were used in areas of hardstanding or under a 1 m clean capping layer under soft landscape material.
- Materials in the third category exceed the criteria set for Category A and Category B and were deemed unsuitable for reuse on site.

In general, the top 0.5 m of soil from outside the footprint of the main process building and between 0.5 m and 1.0 m of soil was removed within the main process building to meet design requirements. However, deeper excavations were required in certain areas to meet design requirements. These areas were:

- Waste bunker (4.0 m bgl);
- Bottom Ash Bunker (2.9 m bgl);
- Surface Water Attenuation Tank (4,0 m bgl);
- Cooling Water Pump house (10 m bgl); and,
- Cooling Water Inlet Channel (15 m bgl).

Excavated soil was stockpiled on site and sampled in accordance with ISO 10381-8:2006(E). Composite samples were sent to an external laboratory for quantitative analysis and compared against soil reuse criteria generated in Jacobs' 2009 risk assessment and presented in the Soil Reusability Report. All of the materials excavated on site were found to be within the limits set by the soil reuse criteria with the exception of a small quantity of asbestos tiles located at the southern site boundary.

A total of 80,851 m³ of soil was excavated from across site all excavated soils were found to be within the Category B criteria. The majority of soil, 50,031,003,000 was reused on site with the remaining excess, 30,820 m³, disposed off-site as non-hazardous waste. The asbestos tiles were disposed of to a hazardous waste licenced facility for overseas disposal.

# 3.6 Groundwater Sampling

Monthly groundwater sampling took place on site during the construction and commissioning phase of the DWtE facility at two monitoring locations (GW1 and GW2). Following the commissioning phase, one well (GW1) continued to be sampled on an annual basis in accordance with the site's IE Licence. The results of the November 2017 and October 2018 groundwater monitoring rounds are presented in Table 5 in Appendix B and summarised below.

Ammonia exceeded the Groundwater Threshold Value (GTV, 0.065 mg/L – 0.175 mg/L) in November 2017 in groundwater from well GW2 (7.1 mg/L)

Arsenic exceeded the GTV (0.0075 mg/L) in groundwater from well GW2 in November 2017 (0.031 mg/L) and in groundwater from well GW1 in October 2018 (0.017 mg/L).

Lead exceeded the GTV (0.075 mg/L) in groundwater from well GW1 in October 2018 (0.082 mg/L).

All other metals (cadmium, chromium, cobalt, copper, manganese, mercury, potassium, thallium, tin and vanadium) were below their corresponding GTVs where defined in 2017 and 2018.

VOCs, semi volatile organic compounds (SVOCs) and pesticides were not detected above their respective GTVs in 2017 and 2018. Although TPHs were not analysed, constituents of diesel such as trimethylbenzene and naphthalene were analysed as part of the VOC analytical suite and were not detected in groundwater in 2017 and 2018.

#### 4. **Environmental Setting**

#### 4.1 Site Setting and Topography

The site is situated on the Poolbeg Peninsula. It is stated in the 2006 EIS that the site is at an elevation of between 3.5 m and 5.0 m above Ordnance Datum (OD) and land across the site slopes gently from north to south toward Dublin Harbour, see Appendix A Figure 2. As previously noted, the site is built on reclaimed land. The area was infilled between 1970 and 1976.

#### 4.2 **Surface Water**

The site is located in the Dodder sub catchment (Water Framework Directive (WFD) catchment and sub-catchment codes Dodder\_SC\_010 and 09\_16) which forms part of the Liffey and Dublin Bay Hydrometric Area (HA09)<sup>3</sup>.

The Liffey Estuary Lower (WFD code IE EA 090 0300) is a transitional water body located to the north of the site. Liffey Estuary Lower water quality has been classified as Moderate by the EPA and is identified as At Risk. The Dublin Bay (WFD code IE\_EA\_090\_0000) costal water body is located to the south. Dublin Bay water quality has been classified as Good by the EPA and is Not at Risk. As the site is reclaimed, and essentially man-made, there are no known streams or rivers located on site.

DWtE uses cooling water which is abstracted from the River Liffey at Dublin Port. The cooling water is dosed with sodium hypochlorite to prevent biofouling, the cooling water is then discharged back to River Liffey following use. This leads to a slight increase in water temperature (generally 1-2 °C) close to the outfall. The water temperature is continuously monitored to ensure it remains compliant with IEL conditions. No other water is discharged to surface water from the site. Storm water and process water are retained on site for reuse, excess storm water may be discharged to the public

4.3 Geology

The site and surrounding areas are constructed on reclaimed land. The 2006 EIS states than the area was infilled between 1970 and 1976.

GSI online geological mapping<sup>4</sup> indicates that bedrock underlying the site and surrounding area consists of dark limestone and shale of the Lucan Formation of Dinantian age (early Carboniferous era).

According to reports on site investigations carried out in 2003 and 2005, the subsoil underlying the site is comprised of made ground, clays, silts, sands and gravel. A generalised geological sequence was provided in the 2006 desk study:

- Made Ground: Areas of tarmacadam and concrete hardstanding and topsoil underlain with gravels, sands, silts and clays including fragments of brick, concrete, glass, timber and cinders. Thickness between 1.6 m and 5.6 m.
- Marine Deposits: loose to medium dense, sandy silt and slightly clayey/silty fine sand. Thickness between 0.3 m and 2.5 m.
- Glacial and Fluvioglacial Deposits: medium to dense, sandy gravel with shell fragments and occasional cobbles and boulders, occasional silty material. Thickness between 10.5 m and 13.3 m.
- Outwash/Glacio-Marine Clay Deposits: upper layer of silt with sand laminations with a thickness between 5.5 m and 6.4 m. The lower layer is described as stiff to very stiff dark grey or black slightly sandy clay with layers and laminations of silt and silty sand with a proven thickness between 15.4 m and 16.5 m.

<sup>&</sup>lt;sup>3</sup> Catchment.ie – accessed 05 February 2019

<sup>&</sup>lt;sup>4</sup> https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx - accessed 05 February 2019

Limestone Bedrock: dark grey, strong, mostly thinly bedded, fine grained limestones with interbedded shales. Localised weathered zones. Rock head depth between 36 m and 45 m bgl.

#### 4.4 Hydrogeology

As the site is in an area that has been reclaimed from Dublin Bay through in-filling, there is no freshwater aguifer beneath the site and none is mapped on the GSI website. However, on the EPA's mapping website<sup>5</sup> the site is shown as being underlain by the Dublin Groundwater Body (WFD code IE EA G 008) which is described by the EPA as a poorly productive bedrock<sup>6</sup> aguifer. The Dublin groundwater body quality is classed as Good and has been identified as Not At Risk.

Approximately 1 km west and south of the site, the GSI has assigned groundwater vulnerability as Low. The thick marine clay overlying limestone bedrock acts as an aquitard limiting downward movement of groundwater. As noted in Section 4.3 depth to bedrock beneath the site is >30 m, and bedrock is overlain by a considerable thickness of low permeability glacial, fluvial and marine deposits, on top of which imported infill material was deposited in the 1970s.

Groundwater level gauging conducted as part of site investigations in 2003 and 2005 recorded water levels of approximately 3 m to 4 m bgl in shallow wells, i.e. close to mean sea level. Shallow groundwater resides within the imported infill material and the level of shallow groundwater is thought to remain close to sea level and may exhibit tidal variation.

In 2005, RPS concluded that the local direction of groundwater flow assessed from groundwater elevations in shallow monitoring wells screened within the infill material, as being to the east, toward the coast. However as groundwater levels are likely to be influenced by the tide, the shallow groundwater flow direction may vary.

Wells and Springs

Given the site's coastal location and situation in an area of reclaimed land, a search of the GSI well database did not identify any wells or springs within a 1 km radius of the site. While, there is no permitting system to govern well drilling and no requirement to register abstraction wells in Ireland with yields less than 25 m<sup>3</sup>/d, due to the likely brackish conditions of groundwater it is unlikely to be used for potable supply near the site.

#### 4.5 **Biodiversity**

Special Areas of Conservation (SAC) are habitats and species which must be protected under the Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna).

Special Protection Areas (SPA) are designated under the Birds Directive (Council Directive 2009/147/EC on the Conservation of Wild Birds) to protect a range of bird populations.

Together, SAC and SPA form a pan-European network of so-called European sites for nature conservation (also known as Natura 2000 sites).

Five European sites have been identified in Dublin Bay downstream of the DWtE site<sup>7</sup>:

- South Dublin Bay and River Tolka Estuary SPA (code 004024);
- North Bull Island SPA (code 004006);
- South Dublin Bay SAC (code 000210);
- North Dublin Bay SAC (code 000206); and,
- Rockabill to Dalkey Island SAC (code 003000).

<sup>7</sup> https://gis.epa.ie/EPAMaps/ - Accessed 05 February 2019

<sup>&</sup>lt;sup>5</sup> https://gis.epa.ie/EPAMaps/ - accessed 05 February 2019

<sup>&</sup>lt;sup>6</sup> www.catchments.ie – accessed 05 February 2019

#### 4.6 Storm Water Runoff Drainage Systems

A storm water drainage network serving roofs, roads and parking areas conveys rainwater run-off by gravity from these areas to a 725 m³ underground attenuation tank where it is stored for reuse on site. All storm water runoff passes through a class 1 hydrocarbon interceptor prior to entering the attenuation tank.

Excess water in the attenuation tank can be discharged to the Ringsend Municipal Waste Water Treatment Plant (MWwTP). Prior to discharging to the MWwTP the discharge is tested as per IEL requirements. If the water in the attenuation tank is found to be unsuitable for the MWwTP it can be sent for disposal to an off-site licensed disposal facility. In the event of a fire and a subsequent requirement for additional fire water retention capacity, water can be pumped from the attenuation tank into the waste bunker.

The main process building is served by an isolated drainage system which acts as tertiary containment in the event of a spill within the building.

The site storm water drainage system was designed in full accordance with the principles of Sustainable Urban Drainage Systems (SUDs).

The OPW flood map<sup>8</sup> for the area indicates that the site is not located in an area of prone to flooding. The Liffey Tidal Flood Extents map, produced for the OPW is presented in Appendix C showing the site to be located outside of 10%, 0.5% and 0.1% Annual Exceedance Probability (AEP) zones.

#### 5. Permitted Activities

The site is licensed for Class 11.1 and 11.3 (a) of listed activities in the First Schedule of the EPA Act 1992 (as amended) defined as requiring an IE Licence.

11.3 (a) Disposal or recovery of waste in waste incineration plants or in waste coincineration plants for non-hazardous waste with a capacity exceeding 3 tonnes per hour

11.1 The recovery or disposal of waste in a facility, within the meaning of the Waste Management Act, 1996, which facility is connected or associated with another activity specified in this Schedule in respect of which a licence or revised licence under Part IV is in force or in respect of which a licence under the said part is or will be required

#### 6. Baseline Assessment and Relevant Hazardous Substances

AECOM completed a Screening for Baseline Assessment<sup>9</sup> in support of the IEL review application for the DWtE site. The assessment was completed at Stage 3 of the eight stage process<sup>10</sup>, as it was concluded that the relevant hazardous substances identified in Stages 1 and 2 would be subject to stringent on-site handling procedures and storage facilities, with the result that their release to open ground was highly unlikely.

In total, more than 50 substances currently identified to be used on site were screened out at Stages 1 and 2.

The substances carried through to assessment at Stage 3 were:

- Ammonia Solution;
- Diesel; and

8 http://www.floodinfo.ie/map/floodmaps/

Attachment 4.8.2 – Screening Baseline Assessment

<sup>&</sup>lt;sup>10</sup> European Commission Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions (2014)

#### Sodium hypochlorite.

Ammonia solution and sodium hypochlorite solution are stored in tanks within the main process building. The ammonia solution and sodium hypochlorite solution are stored in double-skinned tanks providing secondary containment. The isolated internal drainage system provides tertiary containment.

The diesel tank is located below ground level in the main process building. The diesel tank is bunded providing secondary containment. A leak detection system has been fitted to the bund and overfill protection has been installed on the diesel tank.

In the event of a spill or fire from a tanker external to the main process building, the spill or firewater will enter the main surface water drainage system where the diesel would be contained by two Class 1 hydrocarbon interceptor. If the volume of contaminated liquid is too large and it is not contained by the interceptor, it will enter the attenuation tank where it will be contained. Water in the attenuation tank is generally reused on site. Excess water is discharged to the public sewer; however, water is tested to ensure it complies with IEL discharge parameters before discharge.

Any spills of ammonia solution or sodium hypochlorite solution will enter the storm water drainage system and will be contained within the attenuation tank, preventing contaminated material entering the public sewage system. Water in the attenuation tank is generally reused on site. Excess water is discharged to the public sewer; however, water is tested to ensure it complies with IEL discharge parameters before discharge.

The site drainage system is inspected on a five year rotation to ensure its integrity.

Due to the provision of suitable containment and documented procedures on material use and storage, the risk of ammonia solution, diesel or sodium hypochlorite solution entering soil and/or groundwater is considered very low.

## 7. Site Characterisation

Potential pollutant linkages are considered viable where there is a source of contamination on site which can migrate via a defined pathway to identified receptors. Receptors can be either environmental or human, and located either within or outside the site boundary.

#### 7.1 Sources

As discussed in the preceding sections, historic contamination is present on site associated with fill material imported in the 1970s and previous land uses. As part of construction works, site wide excavations removed at least the top 0.5 m of material from across site. The excavated material was sampled on site and sent to an external laboratory for analysis. With the exception of a small quantity of asbestos tiles, excavated materials were found suitable for reuse beneath areas of hard standing or under capping layers. Excess material and the asbestos tiles were sent for disposal off-site to appropriately licensed facilities.

As part of current and future DWtE operations a total of three relevant hazardous substances have been identified: ammonia solution, diesel and sodium hypochlorite. As discussed in Section 5, these are suitably stored on site and the risk of them entering soil or groundwater is considered very low.

#### 7.2 Pathways

As noted, there is contamination on site associated with historic activities. In the case of relevant hazardous substances, storage facilities have been constructed to contain any losses that may occur and prevent ingress to ground.

The 2017 PM Group Soil Reusability Report states that the risk assessment conducted by Jacobs in 2009 concluded that by capping soft landscaped areas, and the presence of structures and hardstanding across the remainder of the site, potential pollutant linkages between site soils and human health and environmental receptors were broken.

There is a considerable thickness of fine grained, low permeability glacial, fluvial and marine deposits beneath the site (>30 m) that, it is considered, would restrict any losses to ground which may have occurred in the past, or that could potentially occur in the future, from migrating vertically downwards. The main pathway is considered to be lateral with shallow groundwater flow to Dublin Bay and the estuary of the River Liffey.

The likelihood of contemporary contamination impacting receptors is low due to containment safeguards built into the storage and drainage systems on site.

Should contamination enter the on-site drainage system it will be contained in the attenuation tank, excess water from the tank is discharged to the sewage system following testing and not to surface water therefore there is no potential for it migrate off site.

#### 7.3 Receptors

As groundwater beneath site is unsuitable for potable use, the main potential receptors of contamination to ground at the site are identified as on-site workers and environmental receptors in Dublin Bay and the estuary of the River Liffey.

With regard to historic contamination present within fill material, the capping of contaminated material and/or the construction of hardstanding across it has broken potential pathways for controlled waters or on-site human receptors to be exposed. With regard to hazardous substances being stored and used on site, as a result of the relatively small quantities and containment safeguards built into storage and drainage networks on site the overall risk to the receptors is considered to be low.

# 7.4 Environmental Objectives (Groundwater) Regulations

Compliance with the groundwater regulations is assessed on both the Chemical and Quantitative status of the groundwater body. The bedrock groundwater body beneath the site is currently classified as being of *Good Status* and *Not At Risk*.

The site is not, and has no plans to, abstract from or recharge groundwater to the aquifer; therefore, it will have no likely impact on the Quantitative status of groundwater.

The Chemical status of groundwater is assessed by comparing the results of groundwater samples to the published GTVs, as issued in 2010 and amended in 2016. Available groundwater results for 2017 and 2018 are compared against GTVs in Appendix B Table 5 and summarised in section 3.6.

#### 8. Conclusion

On the basis of the containment safeguards implemented on site, there is considered to be a Low Risk of soil and/or groundwater beneath the site being impacted by contemporary hazardous substances.

Results of previous site investigations indicate that soil and groundwater were contaminated prior to construction of the DWtE facility. Evidence of hydrocarbon and molasses free product has been recorded in groundwater monitoring wells and evidence of heavy metal contamination has been noted in site investigations prior to the development of the site.

As contaminated soil on site is located under areas of hardstanding or under capped areas there is no pathway from historic contaminated soils to identified receptors.

Given the thickness of low permeability, fine grained, glacial, fluvial and marine deposits beneath the site (>30 m) it is considered that this would restrict any losses to ground which have occurred in the past, or that could potentially occur in the future, from migrating vertically downwards. Thus, the thick overburden affords protection to the bedrock aquifer beneath the site.

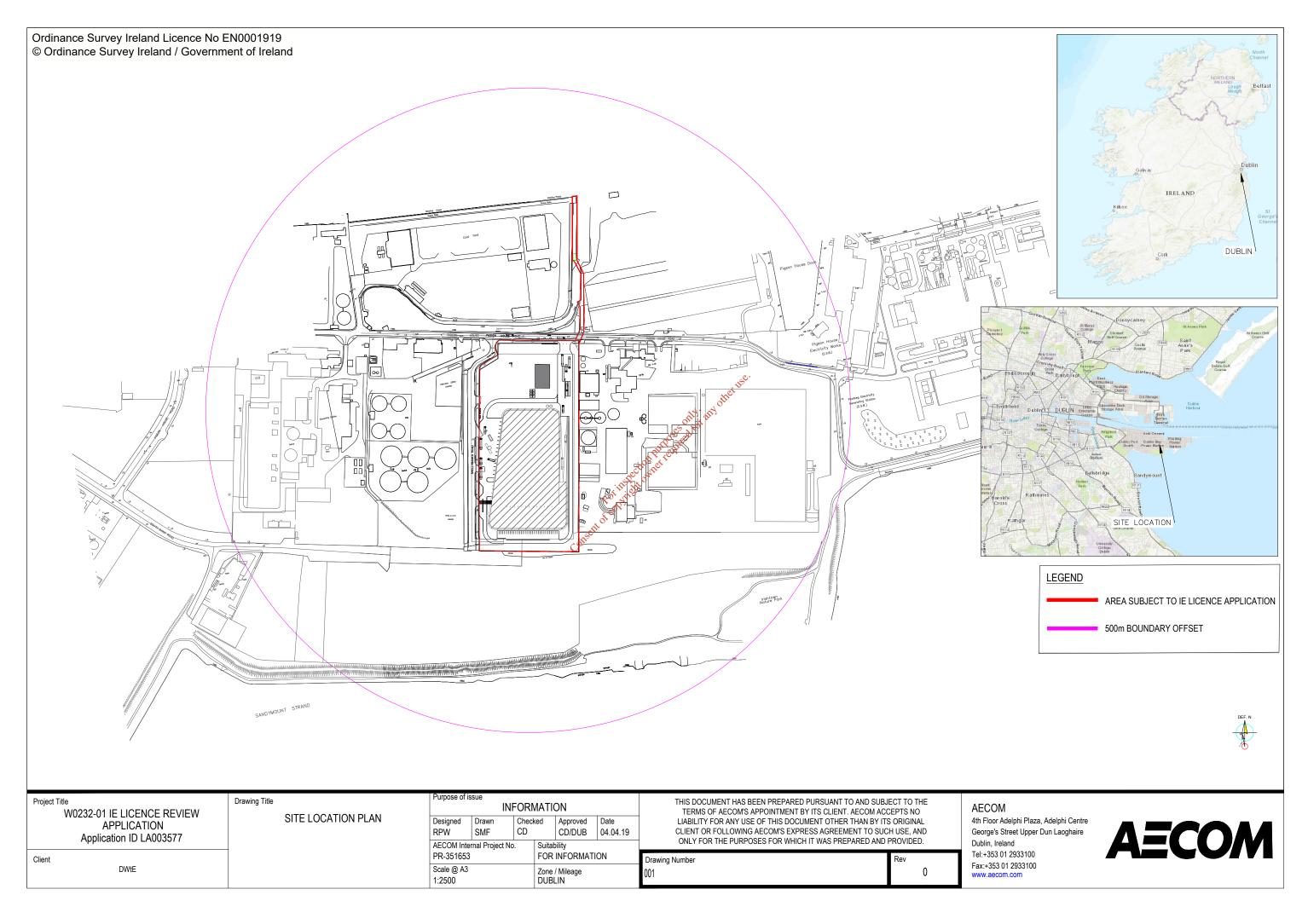
Safeguards have been included during the site construction to provide secondary and tertiary containment where significant volumes are to be stored and transferred. Therefore, proposed site

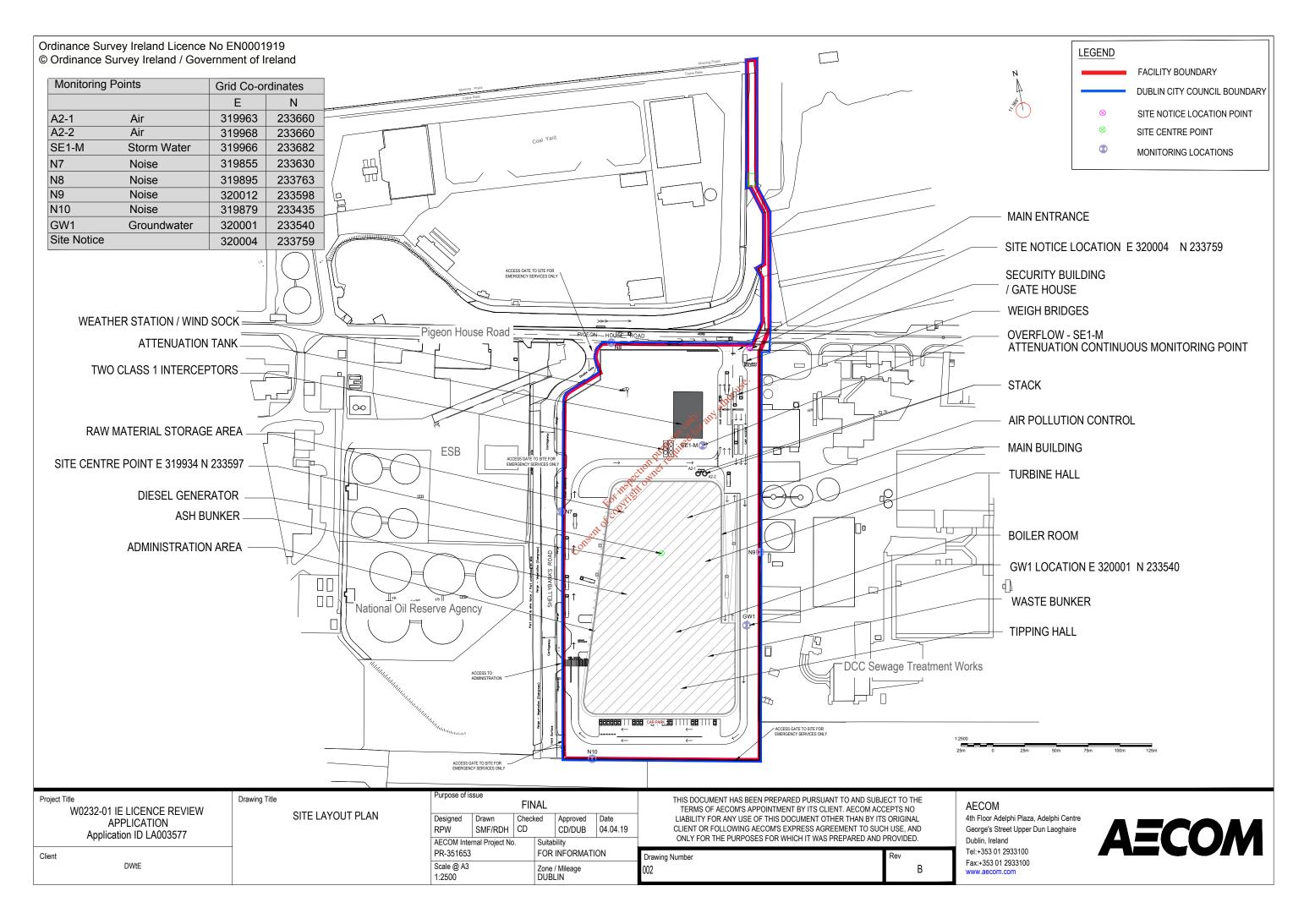
operations are also considered to be a Low Risk of soil and/or groundwater beneath the site being impacted by hazardous substances in the future.

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# **Appendix A Figures**

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# **Appendix B Tables**

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	Depth	Elevation	Depth	Installation	Installation Depth	Top of Screen	Base of Screen	
Location	m bgl	mAOD	mAOD	IIIStaliation	m bgl	m bgl	m bgl	
	Boreholes							
BH1	65.5	3.64	32.66	Yes	12	2	12	
BH2	34	3.99	30.01	No	-	-	-	
BH3A	35.5	3.59	31.91	No	-	-	-	
BH4	33.5	3.49	30.01	Yes	20	2	20	
BH5	34	4.38	29.62	Yes	12	2.5	12	
BH6	40.2	3.91	36.29	Yes	40.2	34.2	40.2	
BH7A	40.2	3.66	35.54	No	-	-	-	
BH8	46.5	3.95	42.55	Yes	46.5	40.5	46.5	
BH9	49.5	4.29	45.21	Yes	49.5	<sup>&amp;</sup> 44.7	49.5	
BH10	43.17	4.3	38.87	No	- ather	•	-	
				Trial Pits	aly any			
TP1	4	3.81	0.19	-	as tot	-	-	
TP2	4.4	3.72	0.68	-	170 stred	-	-	
TP3	3.4	3.67	-0.27	-	a Pittedit -	•	-	
TP4	4.2	3.7	0.50	خي -	of et l	-	-	
TP5	3.1	3.35	-0.25	-inspec	-	-	-	
TP6	3.7	3.45	0.25	For Tible	-	-	-	
TP7	3.5	3.77	-0.27	ું છે.	-	-	-	
TP8	4	4.26	-0.26	attor-	-	-	-	
TP9	3.5	4.36	-0.86	hser -	-	-	-	

#### Notes:

m bgl: metres below ground level m AOD: metres above ordinance datum

- Not Applicable

Installation: Installed as groundwater monitoring well

	Depth	Elevation	Depth	Installation	Installation Depth	Top of Screen	Base of Screen
Location	m bgl	mAOD	mAOD		m bgl	m bgl	m bgl
				Borehol	es		
MW01	7	NR	NR	NR	5	2	5
MW02	8	NR	NR	Yes	8	6	8
MW03	7	NR	NR	Yes	5	2	5
MW04	1.5	NR	NR	No	-	-	-
MW04(A)	7	NR	NR	Yes	6	3	6
MW05	12	NR	NR	Yes	12	8.5	12
MW06	2.7	NR	NR	No	-	-	-
MW06(A)	7.3	NR	NR	Yes	7	3.5	7
MW07	6.8	NR	NR	Yes	6.8	3.5	6.8
				Trial Pi	ts		g.:
TP01	3.7	NR	NR	-	-	-	- tils.
TP02	3.2	NR	NR	-	-	-	other.
TP03	3.4	NR	NR	-	-	-	20 for -
TP04	3.6	NR	NR	-	-	-	or for -
TP05	3	NR	NR	-	-	- quide de la company de la co	geo -
TP06	2.4	NR	NR	-	-	- Dinedi	-
TP07	3.7	NR	NR	-	-	ction net r	-
TP08	3.4	NR	NR	-	-	Spec on	-
TP09	2.2	NR	NR	-	-	of it delit	-
TP10	2.8	NR	NR	-	-	ON THE PLANT	-
TP11	4	NR	NR	-		-	-
TP12	4	NR	NR	-	- sent	-	-
TP13	3.7	NR	NR	-	- Cateario	-	-
TP14	3.6	NR	NR	-	-	-	-
TP15	3.6	NR	NR	-	-	-	-
TP16	3.1	NR	NR	-	-	-	-
TP17	2.6	NR	NR	-	-	-	-
TP18	3	NR	NR	-	-	-	-

#### Notes:

m bgl: metres below ground level m AOD: metres above ordinance datum

- Not Applicable

Installation: Installed as groundwater monitoring well

NR: Not Recorded

	Depth	Elevation	Depth	Installation	Installation Depth	Top of Screen	Base of Screen
Location	m bgl	mAOD	mAOD		m bgl	m bgl	m bgl
				Boreho	les		
BH1	39.2	NR	NR	Yes	NR	NR	NR
BH2	37.7	NR	NR	Yes	NR	NR	NR
BH3	16	NR	NR	Yes	NR	NR	NR
BH4	3	NR	NR	Yes	NR	NR	NR
RC1	46	NR	NR	Yes	NR	NR	NR
RC2	52	NR	NR	Yes	NR	NR	NR

#### Notes:

m bgl: metres below ground level m AOD: metres above ordinance datum

Installation: Installed as groundwater monitoring well

NR: Not Recorded

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O and a main a met	Osto som A	Category B	Category B		
Contaminant	Category A	Hardstanding	Landscaping		
	Units mg/				
	Metals/Metal	lloids			
Antimony	22	N/A	N/A		
Arsenic	55	N/A	N/A		
Barium	475	N/A	N/A		
Chromium	55	N/A	N/A		
Lead	405	N/A	N/A		
Nickel	57	N/A	N/A		
Copper	127	N/A	N/A		
Molybdenum	190	N/A	N/A		
Zinc	450	N/A	N/A		
Total Pe	etroleum Hydro	carbons (TPH)			
Total TPH	2,500	33,000	5,500		
	Aliphatic	S			
C5-C6	288				
C6-C8	1,020				
C8-C10	317				
C10-C12	30,400				
C12-C16	30,400				
C16-C21	627,000				
C21-C35	627,000				
	Aromatic	S	ortoses out of any other		
C6-C7	121		<b>1</b> 8		
C7-C8	139		14. 24 Of		
C8-C10	513		Off of alt.		
C10-C12	2,600		ases all		
C12-C16	12,400		dil din		
C16-C21	9,350	action of	eric		
C21-C35	9,410	20,0			
Po	lyaromatic Hyd	rocarbons			
Total PAH Duct 10	40	\$ coldy.			
Benz(a)anthracene	30	0			
Benzo(a)pyrene	30	130	22		
Total PAH (16 USEPA		7,300	220		
PCB	10	11,100	11,100		
Leachate Metals					
Antimony	N/A	2.90	0.80		
Arsenic	N/A	5.80	0.96		
Barium	N/A	58.00	9.6		
Chromium	N/A	18.00	2.9		
Lead	N/A	5.80	0.96		
Nickel	N/A	12.00	1		
Copper	N/A	18.00	2.88		
Molybdenum	N/A	51.00	6.7		
Zinc	N/A	58.00	9.60		

#### Notes:

Category A Soils: Suitable for use in all landscaping areas below 300 mm or under buildings or hardstanding areas

Category B Soils: Suitable for use in all landscaping areas below 1 m or under buildings or hardstanding areas

Analyte	GTV	G\	W1	GW2
Allalyte	GIV	Nov-17	Oct-18	Nov-17
Ammonia	0.065-0.175	<0.08	< 0.013	7.1
COD		-	131	-
Arsenic	0.0075	0.006	0.017	0.031
Cadmium		<0.001	0.0006	< 0.001
Chromium	0.0375	0.009	0.0133	0.027
Cobalt		-	0.0045	0.005
Copper		0.009	0.045	0.006
Lead	0.0075	0.007	0.082	< 0.001
Manganese		0.04	0.34	4.67
Mercury	0.00075	<0.0001	0.0002	<0.0001
Nickel		0.036	0.045	0.015
Potassium		34	28	234
Thallium		<0.001	< 0.003	< 0.001
Tin		0.002	< 0.003	< 0.001
Vanadium		0.172	-	0.002
VOCs	Varies	ND	ND	ND
SVOCS	Varies	ND	-	ND
Pesticides	Varies	ND	-	ND

#### Notes:

#### Indicates result above

GTV Groundwater Threshold Value

--- GTV not defined

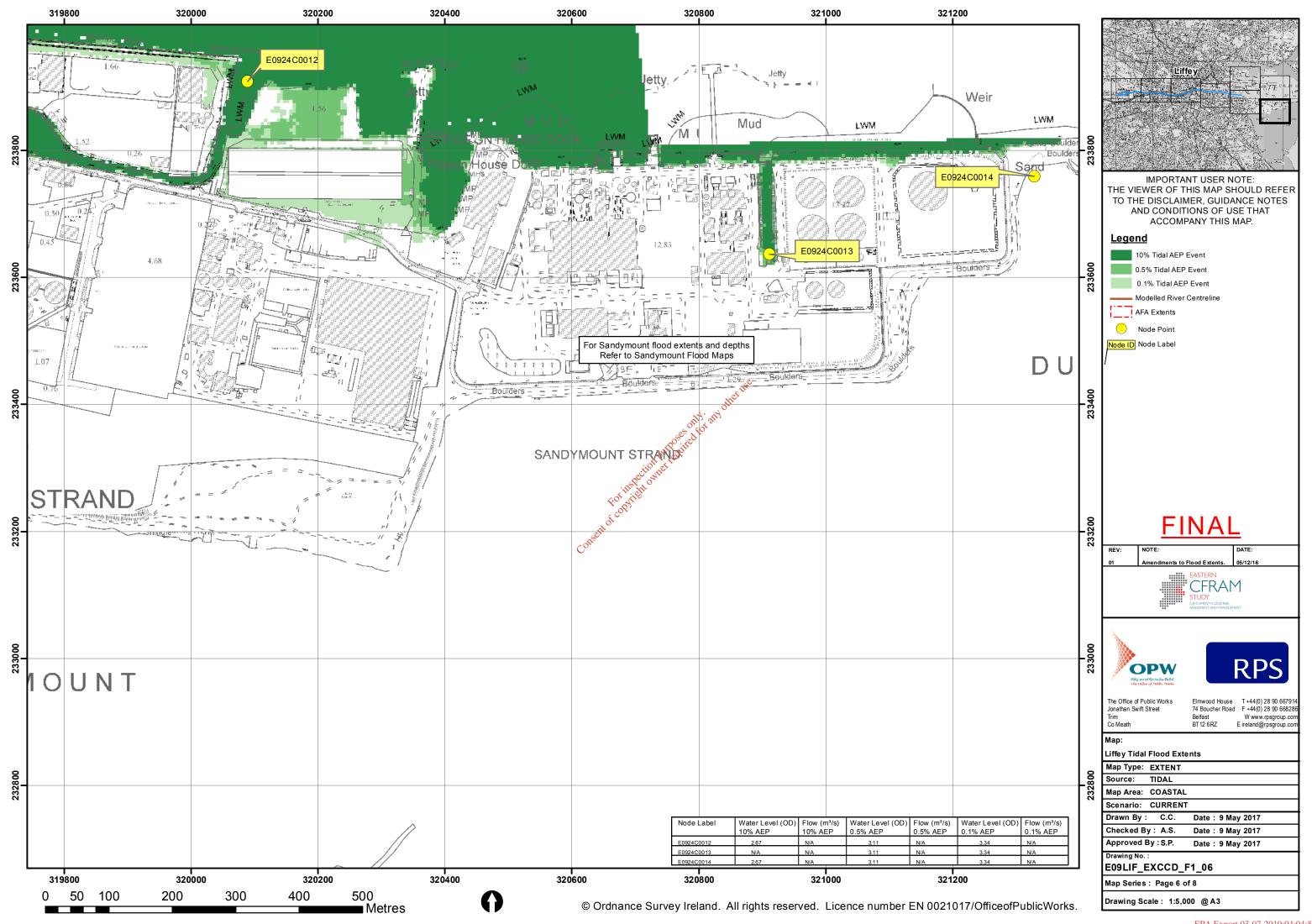
- Not Analysed

ND Not Detected



# **Appendix C Flood Map**

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# Appendix D 2006 Arup Desk Study

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# **Arup Consulting Engineers**

#### Elsam

# Dublin Waste to Energy Project, Ringsend, Dublin

Geo-Environmental Engineering Assessment

June 2006

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

Job number D5072/30

Job title		Dublin Waste	e to Energy Project, Ring	Job number	
					D5072/30
Document t	itle	Geo-Environ	mental Engineering Asse	essment	File reference
Document i	ref				
Revision	Date	Filename			
Draft 1	31/05/06	Description	First draft		
			Prepared by	Checked by	Approved by
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		Signature			
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		Description	Issue	od other tise.	
			Prepared by	Checked by	Approved by
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#### 1. INTRODUCTION

Dublin Waste to Energy Limited are the preferred bidder for the Dublin Waste to Energy Project, in association with Dublin City Council (DCC) as a public private partnership arrangement.

The site for the proposed facility is situated on the Poolbeg Penninsula, Ringsend, Dublin (See Figure 1). A number of previous site investigations had taken place on the site between 2001 and 2005 and these investigations identified a considerable thickness of made ground beneath the site and also noted observations of hydrocarbon contamination.

Arup Consulting Engineers have been appointed by Elsam A/S to complete a desk study of the site including a review of previous intrusive geotechnical and environmental ground investigations in order to produce a geo-environmental engineering assessment of the site as a response to concerns regarding the precise extent of the made ground/ fill material, its depth and the levels of contamination present. No additional site investigation or chemical testing of soil or groundwater from the site was undertaken to complete this assessment.

Section 2 of the report describes the proposed development in relation to the site. A desk study of the site is presented in Section 3. Section 4 describes the site investigations previously carried out on the site. Section 5 presents the ground conditions specific to the site. An appraisal of the available environmental data is presented in Section 6 followed by an appraisal of the geotechnical data in Section 7. Engineering studies undertaken are presented in Section 8 and conclusions and recommendations in Section 9 of the report.

# 2. PROPOSED DEVELOPMENT CONTROL

Cos

## 2.1 General Site Description

The proposed facility will comprise a waste to energy facility which will be constructed on a reclaimed site at Pigeon Fouse Road, Ringsend, Dublin (See Figure 1).

#### 2.2 Concept Design

The proposed layout and elevations of the facility are contained on the following drawings produced by Elsam A/S. Relevant drawings include:

Drawing BE002 Layout Permanent Waste Facility
Drawing BE101 Layout Elevation and Distances
Drawing BH001 Layout Longitudinal Section
Drawing BH002 Layout Elevation East
Drawing BH003 Layout Elevation West
Drawing BH004 Layout Elevation North
Drawing BH005 Layout Elevation South

These drawings show the main elements to the facility including the waste bunker, waste reception hall, plant and turbine rooms and flues. External areas comprising roads / parking and landscaped areas are also indicated. A full description of the proposed facility is provided in the EIS.

#### 2.3 Site Formation and Landscaping

The principal areas of cut and fill and land-uses within the site are shown on Figure 2. In the course of construction an amount of material will need to be excavated from portions of the site whilst fill material will be required in other parts of the site. Estimates of the main quantities are given below:

**Table 2.1: Approximate Earthworks Quantities** 

Cut areas	Un-bulked Volume (m <sup>3</sup> )	
Main Building (including Waste	16,000	
Bunker)	10,000	
Cooling water pipes	2,000	
External Areas	2,000	
Fill areas	Un-bulked Volume (m³)	
Main Building (incl. Ramp)	6,500	
Roads / Hardstanding	7,000	
Soft Landscaped Areas	6,000	

The principal options of using excavated material opsite will be:

- Filling of soft landscaped area in the northern part of the site;
- Filling beneath the access ramp to the main building.

The implications and viability of realizing the excavated material on site or whether excavated material will be unsuitable for reuse onsite and will require disposal off site are discussed in Section 8 of this report.

#### 3. DESK STUDY

#### 3.1 Site Location

The site is located in an area known as the Poolbeg Penninsula which forms the southern boundary to the entrance to Dublin Port. The principal part of the site itself is situated to the south of Pigeon House Road, east of the Synergen Dublin Bay Power Plant. The Ringsend Wastewater Treatment Plant is located immediately to the west. The auxiliary part of the site which will house the cooling water pipes is located to the north of Pigeon House Road.

#### 3.2 Site Description

The site is rectangular in outline and extends for a distance of approximately 335 metres SSW from Pigeon House Road and is approximately 160 metres from WNW to ESE. The area of the site is approximately 5.5 Ha.

The northern portion of the site, adjoining Pigeon House Road, is currently used as a scrap metal storage and processing yard by the Clearway Disposal. Much of this area is covered by piles of scrap metal. A number of loading bays are present in the west-centre of this area.

A small office building and substantial sheet metal shed are situated in the south-western part of this area. An unbunded fuel oil tank is situated close to the east of this shed; there is evidence of recent fuel oil spillage beside this tank. The ground surface throughout this portion of the site appears to be rubble/gravel/soil with no hard standing evident.

The west-central portion of the site is occupied by Hibernian Molasses Limited and is dominated by one large and three smaller, circular above ground steel storage tanks which contain molasses. These tanks are bunded and there is a concrete surface inside the bunds. Two unbunded rectangular cylindrical steel tanks are present immediately to the northeast, located on a gravel surface – this area is used for loading/unloading. It is understood that these tanks contain blended molasses. Tanker trucks were also seen to be parked in this area. A light fuel oil tank is situated close to the site entrance on a gravel surface.

The east-central portion of the site, separated from the Hibernian Molasses premises by a high steel fence, is understood to be vacant and in the ownership of Dublin City Council and forms part of their waste water treatment facility.

A pipeline runs along the eastern boundary of the scrap yard premises, then along the northern boundary of the east-central portion of the site and continues into the Hibernian Molasses premises. We understand that this is a supply pipeline taking molasses material from ship into the molasses plant (Hibernian Molasses Limited).

The southern part of the site is largely surfaced in tarmac except for portions of the periphery which appear to be gravelled. A number of truck trailers are parked and there are also a considerable number of portable plastic storage tanks in the northern part. There is a substantial prefabricated office/storage building situated near the eastern perimeter and a smaller, similar building in the north-centre.

Pigeon House Road is at an elevation of between about +3.8 and +4.8mOD at the northern margin of the site. In general ground levels on the site itself are between approximately +3.6 and +4.7 mOD, with the scrap metal yard in the northern part of the site being slightly higher than the remainder of the site (see Figure 3). There is no appreciable sloping ground on the site.

### 3.3 Surrounding Lang Use

The surrounding area is currently dominated by industrial utilities and fuel storage facilities including some derelict and disused industrial sites. There is also some public amenity/open space south of the site.

The Synergen Dublin Bay Power Plant is situated to the west of Shellybanks Road which runs along the western boundary of the site. The northern portion of this road is currently used by vehicles accessing Hibernian Molasses' plant.

The Ringsend Wastewater Treatment Plant is situated to the east of the site.

To the north of the site, immediately to the north of Pigeon House Road, there is an open channel which carries cooling water from the power plant into the Liffey Estuary.

The Irishtown Nature Park is situated to the southeast of the site whilst Sean Moore Park, Irishtown Stadium and Ringsend Park are situated to the east.

#### 3.4 Site History

An historical review of the site and surrounding area has been undertaken for Dublin City Council by the RPS Group (ref. RPS 2005) and reported on under a separate cover (See EIS Chapter 16 – Archaeology). This assessment of the site was based on a review of historical maps and aerial photographs.

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The study showed the site was largely underwater up to the 1970s except for a small amount of beach shingle in the northern portion of the site adjoining Pigeon House Road. In the late 1930's the old Poolbeg power station was built to the west of the site and was enlarged by subsequent land reclamation towards the east where a number of oil tanks were installed. An outfall from the power station discharged onto the existing site which was described as a lagoon contained by a sand and gravel bund situated to the south.

A sewage works and outfall is described as situated to the north of Pigeon House Road from the 1930s and possibly earlier. The Ringsend Wastewater Treatment Plant east of the site dates from c.1976-78.

The RPS report records that the site was infilled between 1970 and 1976 with a mixture of glass, rubble, concrete, ash waste, bricks, gravel and clay. A Dublin Port and Docks Board map shows the northern and central portions of the site as infilled in September 1972 (Figure 4). A handwritten addition to this drawing notes that this infilled material may possibly have consisted of hydraulic fill.

The RPS report noted that Hibernian Molasses established a plant on the site in 1979 and that the five above ground storage tanks which currently exist were recorded on the 1988 Ordnance Survey 1:1000 scale map for the area. The tanks were described in the RPS report as currently containing molasses except in the case of one smaller tank which contained light fuel oil.

The northern and southern portions of the site were reported to be coal storage sites in 1982. The northern portion of the site is mentioned as having been leased to Coal Distributors Limited prior to 1995 and since then it has been operated as a scrap metal yard.

# 3.5 Ground Conditions and Geology

General geological information or the study area was obtained from the following sources:

- GSI 1:100,000 scale Bedrock Geology map, Sheet 16 (Kildare-Wicklow)
- The GSI 1:50,000 soale Quaternary map of Dublin
- Nolan, S.C. 1986 The Carboniferous Geology of the Dublin Area. Unpubl. PhD thesis, Univ.Dub.
- Naylor, D. 1965 Pleistocene and post-Pleistocene sediments in Dublin Bay, *Sci. Proc. Roy.Dub. Soc.*, Series A, Vol. 2, 175-188
- Farrell, E. R., and Wall D., 1990 The soils of Dublin, *Trans. Instn. Engrs. Ireland*, 115, 78-97

Detailed geological information, data on ground conditions and environmental information was inferred from available ground investigation data for the site and adjoining areas, see Section 4.

#### 4. PREVIOUS GROUND INVESTIGATIONS ON SITE

#### 4.1 General

Previous geotechnical and environmental investigations have been carried out by others to provide data on the ground conditions, the contamination levels of the soil and the hydrogeological conditions relating to the site. These investigations fall into two categories:

- Previous ground investigations on site, see Table 4.1 below and Figure 5;
- Archival ground investigations undertaken in the surrounding areas, see Table 4.2 below. Unless specifically stated otherwise these investigations have not been considered in this appraisal.

**Table 4.1: Previous ground investigations on site** 

Contractor	Description of Investigation	Number of Explorations	Date work carried out
Geotech Specialists Limited	Factual Report on Ground Investigation, Dublin Waste to Energy Project	5 shell & auger 5 rotary core 9 trial pits 5 slit trenches	May-June 2003
RPS	Soil and Groundwater Investigation at Dublin Waste to Energy Sites, Ringsend, Dublin	7 shell & auger 18 trial pits	March 2005
IGSL	Site Investigation at Waste to Energy Project, Ringsend, Dublin City	4 shell & auger 2 rotary core 2 CPT	October 2005

Table 4.2: Archival ground investigations in the surrounding area

Contractor	Description of Investigation	Number of Explorations	Issue date
IGSL	Poolbeg Generating Station Site Investigation (Report available but no borehole logs or maps included)	14 shell & auger with rotary coring 4 trial pits	1992
Norwest Holst	Ringsend Wastewater Treatment Works Investigation	125 trial pits, 114 percussive boreholes, 35 rotary cored holes, 59 dynamic and 36 static cone probe holes	1997

#### 4.2 Fieldworks

#### 4.2.1 Cable Percussive Boreholes

In total, 16 no. cable percussive boreholes were undertaken at the site (Figure 5). They typically extended to a depth of up to 34m bgl. Disturbed samples were taken at typically 1-2m intervals from the drill holes undertaken. Standard Penetration Tests (SPT's) were typically undertaken at 1.5-2m intervals from ground level in all of the cable percussive boreholes, except in the RPS 2005 investigations.

## 4.2.2 Rotary Core Drill-Holes

A total of 7 no. rotary core drill-holes were completed at the site (Figure 5). They generally were drilled to depths of 40-52m bgl. The holes undertaken during the 2003 Geotech investigation were open hole drilled to bedrock; Standard Penetration Tests (SPT's) were typically carried out at 1.5 m intervals between ground level and bedrock in the 2003 drill-holes.

#### 4.2.3 Trial Pits

27 no. trial pits were completed within the site, see Figure 5. Disturbed bulk samples were taken from each pit.

#### 4.2.4 Slit Trenches

5 no. slit trenches were excavated during the Geotech investigation in 2003 (Figure 5). The slit trenches were situated along the perimeter in the western and south-western portions of the site. The trenches were dug to a depth of 1.2m bgl and were 10.0 - 10.5 m in length. The slit trenches where undertaken primarily to locate services.

## 4.2.5 Cone Penetration Testing

Cone penetrometer (CPT) tests were carried out at two locations in the southern portion of the site during the 2005 IGSL investigation. The tests were subcontracted to the Civil Engineering Department of Trinity College, Dubling

## 4.2.6 Groundwater Monitoring

Standpipes were installed in 15 no. of the drillholes, as follows (see Figure 5):

- BH1, BH4, BH5, BR6, BR8, BR9 (2003);
- BH3, BH4 (2005)
- MW01, MW02, MW03, MW04a, MW05, MW06A and MW07 (2005).

Water level monitoring was carried out in 2003 in all of the 2003 installations, and in 2005 for 4 of the 2003 installations (BH1, BH4, BR6 and BR8) and all of the 2005 installations (MW01 - MW07).

## 4.2.7 Gas Monitoring

Gas barrel headworks were installed on the following drill holes: BH1, BH4, BH5, BR6, BR8 and BR9 (Figure 5). Gases measured included O<sub>2</sub>, CO<sub>2</sub> and CH<sub>4</sub> and barometric pressure on one occasion only.

## 4.3 Environmental Laboratory Testing

Laboratory testing of selected soil and groundwater samples recovered was undertaken as follows:

#### 4.3.1 2003 Geotech Investigations (Environmental Testing)

6 no. soil samples were tested for metals (As, Ba, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Se, Zn), free/total cyanide, thiocyanate, elemental sulphur, sulphate, sulphide, hexavalent chromium, pH, TPH, PAHs and phenol index. 2 no. samples were tested for dioxins and 28 no. samples for pH/sulphates.

It should be noted that no groundwater samples were tested as part of this investigation.

## 4.3.2 2005 RPS Investigations (Environmental Testing)

64 no. soil samples were tested for TPH, PAHs, VOCs, metals, asbestos, pH, ammonia, total/faecal coliforms and phenols.

11 No. groundwater samples (7 from new installations /4 from 2003 installations) were tested for TPH, PAHs, VOCs, metals, pH, total/faecal coliforms and phenols.

## 4.4 Geotechnical Laboratory Testing

Particle size distribution and classification tests were carried out on selected disturbed samples of soil recovered from the cable percussive drill holes. Unconsolidated undrained triaxial tests and 1-D consolidation tests were carried out on selected samples recovered. Point load index tests and uniaxial compressive strength tests were carried out on rock cores recovered during rotary coring.

## 5. GROUND CONDITIONS

## 5.1 Overview

## 5.1.1 Geotechnical setting

A detailed geological cross section and layout of the existing boreholes at the site are presented in Figures 5 and 6. The general strattgraphy is summarised in tabular form below:

Table 5.1: Summary of General Stratigraphy

	ratigraphic ivisions	Lithostratigraphy and Genetic Classification	Principal Materials
	Recent	Made ground (fill)	Natural earth and man made waste / made ground.
	Recent Conse	Marine (beach, estuarine and seabed) deposits	Generally mixed silts/clays and fine sands with shell fragments
Quaternary	Pleistocene- Recent	Glacial and Fluvioglacial deposits	Generally well sorted sand and gravels, typically with some cobbles, and boulders in places.  Some boulder clay layers reported in places
	Pleistocene	Outwash/ glacio-marine clay deposit	Slightly sandy clays with some silt and sand layers. Thicker sandy silt/clay at top in places
		Lodgement till/ weathered rock	Boulders, cobbles, gravel, clay, silt
Lower (	Carboniferous	Calp Formation	Dark grey, fine grained limestone with interbedded black shale, and locally common chert

Reviews of site investigation data in the Dublin port area (Naylor, 1965; Farrell and Wall, 1990) indicate local thickening of the Quaternary deposits in a deep channel in the bedrock surface, from -20mOD in the Ringsend/Irishtown area to -40mOD in the in the area of the site. This channel extends north-westwards through the Alexandra Basin on the northern side of the Liffey.

## 5.2 Geotechnical Materials

#### 5.2.1 Made Ground

During site investigations undertaken on the site the made ground was logged as being between 1.6 m and 5.6 m in thickness across the site. It consists of a mixture of gravels, sands, silts and clays and includes rubble, bricks, concrete, glass, timber and cinder. By its nature the composition of the material is variable as can be seen from the drill-hole logs and photographs taken.

The inferred extent and thickness of the fill material at the site is shown graphically on Figure 6.

## 5.2.2 Recent Marine Deposits

This material generally consists of loose to medium dense sandy silt and slightly clayey/silty fine sand with shells and, where logged, ranged in thickness from 0.3m to 2.5m in thickness.

## 5.2.3 Glacial and Fluvioglacial Deposits

This material consists of sands and gravels (generally medium dense to dense sandy gravel with shell fragments and occasional cobbles and boulders). Occasionally the material is silty in nature. Where proven, thicknesses logged varied between 10.5m and 13.3m.

## 5.2.4 Outwash/Glacio-Marine Clay Deposits

The upper layer of this stratum has been described as a silt with sand laminations. Where logged this material varied between 5.5 m and 6.4 m in thickness. The sand laminations of this material make it susceptible to between without good control of groundwater during drilling, as is evident from the low SPT values reported for the IGSL 2005 investigations. This material may be a glacial outwash deposit.

Below this layer a thick, possibly glacio-marine deposit is encountered. This is generally described as stiff to very soff dark grey or black slightly sandy clay with layers and laminations of silt and silty sand. Where proven, thicknesses ranged between 15.4 m and 16.5m.

#### 5.2.5 Limestone Bedrock

The bedrock underlying the site is described as strong, mostly thinly bedded, fine grained Limestone. Rockhead was confirmed at a number of locations within the site. Depths to rockhead varied between 36 and 45mbgl (-32mOD and -40mOD).

Closely to medium spaced fractures were described as occurring in this limestone. Some weathering of the limestone was recorded, with localised zones of brown clay, and infill along fracture planes.

## 5.3 Groundwater

The main aquifer beneath the site is the sand/gravel unit below the made ground (i.e. fluvioglacial sands/gravels). The made ground and underlying sands/gravels are expected to be in hydraulic continuity. The clays underlying the sands/gravels act as aquitards, restricting the downward movement of groundwater.

The water table was monitored at a depth of approximately 3-4 m bgl towards the base of the fill material across the site, close to mean sea level. The elevation of the water table at the site is expected to be heavily influenced by tidal effects given the close proximity to Dublin Bay.

7 no. monitoring wells were installed across the site during the RPS site investigation in 2005. The monitoring wells were installed to shallow depths, mostly screened across the fill material/natural ground boundary. Groundwater levels reported by RPS in March 2005 indicate a hydraulic gradient to the east towards Dublin Bay. Deeper groundwater in the limestone bedrock has not been monitored however it would be expected to be brackish to saline, discharging to Dublin Bay.

The sands/gravels although permeable do not represent a potable supply of groundwater given the close proximity to the sea and the recent history of landfilling in the area. The Ringsend area is served by a mains water supply and it is unlikely that there are any private groundwater abstractions in the area. The limestone bedrock (Calp) is classified regionally as a Locally Important Aquifer, moderately productive only in local zones (Ll).

## 6. APPRAISAL OF ENVIRONMENTAL DATA

## 6.1 Overview of Legislative Context

#### 6.1.1 Soils

Ireland lacks specific legislation for dealing with contaminated land, however current legislation provides certain powers for dealing with contaminated land such as the Waste Management Acts 1996 – 2003 (and arising Regulations), the Local Government (Water Pollution) Acts 1977-1990, the Building Control Act 1990 (and arising 'Building Regulations'), and the Protection of Environment Act 2003.

In the absence of any national guidelines regulating levels of contamination in soils and groundwater in Ireland, it has been common industry practice to compare contaminant levels with the Dutch guideline values for soil remediation (RIVM 2000). The Dutch guidelines do not have any statutory basis in Ireland however they are widely accepted by the Irish environmental industry and by Irish regulatory authorities. This approach was applied to the sample results to initially assess the levels of possible contamination within the site. This is considered a qualitative assessment as it involves screening the results against guideline values such as the Dutch guideline values.

The Dutch soil remediation guidelines provide "Target" and "Intervention" values for a wide range of soil and groundwater contaminants. "Target" values generally represent clean up levels for soil remediation and are based on the principal of multi-functionality, where remediation must fully recover the functional properties of the soil for humans, plant and animal life. "Intervention" values represent the level of contamination above which there is a serious case of soil contamination. If the Intervention values are exceeded, clean up should be considered (unless a subsequent site specific risk assessment proves otherwise). In Ireland the "suitable for use" principle is adopted for soil remediation, where remedial action is only necessary if there are unacceptable risks to human health or the environment.

If material were to be reused or stored on site, or left in situ, a site-specific risk assessment may be required depending on the level of contamination. Site-specific risk assessment is quantitative, in that a given site (with unique characteristics) is quantitatively assessed as to the potential for hazards to impact on specific receptors, either human or environmental.

However, if soil is excavated and taken offsite it becomes a waste and there are regulations determining the levels of contamination in waste materials. The EU Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills, which formed an annex to the Landfill Directive (1999/31/EC), took effect in Ireland on 12 July 2005. This Council Decision sets limit values on waste for each landfill type based on total pollutant contents and leachate concentrations.

The transport of contaminated soils of a hazardous nature for onward disposal/recovery requires compliance with the 'C1' Waste Management (Movement of Hazardous Waste) Regulations 1998 for movement between counties, or the 'TFS' Waste Management (Transfrontier Shipment of Waste) Regulations 1998 for movement between countries in the EU. Where soil has non-hazardous concentrations of contaminants, its movement off-site is subject to the Waste Management (Collection Permit) Regulations 2001, which require the haulier to hold a waste collection permit issued by a Local Authority. The waste collection permit specifies which facilities a haulier is permitted to transport waste to and lists the registration numbers of the vehicles to be used. Hauliers are liable to prosecution if they transfer waste to a site not listed on their waste collection permit.

It is our experience that the Environmental Protection Authority (EPA) will prefer an approach whereby the excavated materials are not moved off site and the material is kept in the proximity of where it is currently situated (i.e. material is retained with the site boundary), unless the level of contamination dictates that the material is causing a significant environmental risk.

#### 6.1.2 Groundwater

The discharge of groundwater off site to sewer or to surface water requires a trade effluent discharge license from Dublin City Council, as per Section 4 of the Water Pollution Act 1977.

Recirculating groundwater within the site is subject to prior investigation and permitting by Dublin City Council under the Protection of Groundwater Regulations, 1999 (S.I. 41 of 1999) which give effect to the Groundwater Directive 80/68/EEC. The purpose of the Regulations is to prevent pollution of groundwater by substances in List I and List II in the Annex to the Directive. The substances listed as either List I or List II are harmful to the environment because of their properties, i.e. toxic, persistent or bioaccumulable. Hydrocarbon compounds are considered List I substances under the Directive.

## 6.2 Site History – Potential Contaminants

The history of the site has been discussed in detail in Section 3.4 and is summarised below in relation to potential contaminants that may be present in soils and groundwater.

The site was reclaimed in the 1970's possibly with hydraulic fill. Depending on where this hydraulic fill was sourced potential contaminants present in these soils could include heavy metals and hydrocarbon compounds, as well as increased organic matter content.

The northern and southern portions of the site were historically used as a coal storage yards. The principle releases to the environment from coal storage are dust to air/soils and leachate to groundwater. Coal particles in shallow soils may give rise to elevated PAHs and TOC. Leachate from coal is governed by coal composition, in particular the presence of pyrite, and can be acidic containing PAHs and heavy metals.

The northern portion of the site is currently used as a scrap metal storage yard which may lead to elevated metals in shallow soils due to weathering of stockpiled waste metals.

The middle portion of the site is used as a storage facility for Molasses. Spillages during loading operations may lead to shallow soil and groundwater contamination with molasses. Molasses is not hazardous to human health and is naturally biodegradable, therefore is not of concern if present in shallow soils on site. Molasses may lead to reduced groundwater conditions (low dissolved oxygen) if present in groundwater.

The containment of fuels for vehicles and on site machinery across the site may give rise to additional hydrocarbon contamination of shallow soils and groundwater.

## 6.3 Screening of Data

In the absence of any Irish soil quality standards, the analytical results for soils have been screened against the Dutch Intervention values (RIVM 2000). Dutch Intervention values are only used for guideline purpose in Ireland as they have no statutory basis outside the Netherlands however they are widely accepted by the environmental industry and by Irish regulatory authorities. Therefore it provides an opportunity to assess the levels of possible contamination onsite against an internationally accepted set of assessment criteria. Sulphate concentrations in soil are compared to the Irish concrete standard I.S.EN 206-1:2002.

Groundwater results have been screened against the Environmental Protection Agency (EPA) Interim Guideline Values for groundwater ("Towards Setting Guideline Values for the Protection of Groundwater in Ireland", 2002). Groundwater beneath the site does not represent a drinking water source, given the history of the area and the close proximity to the sea.

Landfill gas results have been screened against guidelines published by the Department of the Environment, "Protection of New Buildings and Occupants from Landfill Gas", 1994.

## 6.4 Environmental Laboratory Testing

#### 6.4.1 Soils

## 2003 Geotech Investigations

All soil samples were collected from the fill material and show elevated Polycyclic Aromatic Hydrocarbons (PAHs), ranging from 20.5020mg/kg.

Elevated concentrations of sulphate were detected in the fill material (811-8350mg/kg). A single high concentration (13100g/kg) was detected in one sample of estuarine sand below the fill material (borehole BH2 at 4m depth). The lowest protective threshold for sulphate for ordinary concrete is 2000mg/kg (Irish Concrete Standard I.S.EN 206-1:2002).

Total concentrations of certain metals in the fill (lead, zinc and copper) are slightly elevated but are below Dutch Intervention Values.

## 2005 RPS Investigations

Total Petroleum Hydrocarbons (TPH) was elevated in most soil samples analysed, ranging from 0.721-44,374mg/kg, concentrated in the fill material. There is no Dutch Intervention value for TPH however 2 no. of these samples exceed the Dutch Intervention value for Mineral Oil (5000mg/kg) – MW2 at depths of 1 m and 7 m. Speciated TPH analyses show that the elevated TPH results in the soils are predominantly concentrated within the heavier, less mobile C16-C35 carbon ranges. TPH generally decreases with depth through the fill in most locations sampled.

Elevated concentrations of PAHs (Sum of 16 compounds) were detected in the majority of samples, ranging from 0.042-120.6mg/kg. The Dutch Intervention value for PAHs (40mg/kg, based on 10 compounds) is exceeded in 8 no. samples of the fill material, probably representing local hotspots.

Trace concentrations of Benzene, Toluene, Ethylbenzene and Xylene (BTEX compounds) were detected at various depths in the fill material, the concentrations of which are well below Dutch Intervention values. Trace concentrations of Trichloroethene (TCE) up to 0.067mg/kg and Tetrachloroethene (PCE) up to 3.2mg/kg were detected in the fill material at various depths, below the Dutch Intervention values.

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Total concentrations of certain metals (lead, zinc and copper) were elevated above Dutch Intervention values in the fill material in a number of samples.

No asbestos fibres were detected in the soil samples analysed.

#### 6.4.2 Groundwater Monitoring

## 2005 RPS Investigations

Physical evidence of hydrocarbon contamination was noted in the soils across the water table in all 7 No. monitoring wells installed by GES in 2005, suggesting historic free-phase product. No free-phase product was detected floating on the water surface in the monitoring wells, however some hydrocarbon product was observed in purged groundwater from 3 No. monitoring wells (MW01, MW04A, MW06A). In addition, a deep orange odourless liquid was recovered from one monitoring well during purging within the Hibernian Molasses site (BH4).

Groundwater conductivity is elevated, ranging from 2.3-34.6mS/cm indicating a high dissolved load and probable brackish-saline conditions. Groundwater temperatures were elevated up to 17.4 degrees which would suggest that degradation of waste in the fill material is still continuing.

Trace concentrations of hydrocarbons were detected in shallow groundwater from monitoring wells MW1 (TPH 14ug/l), MW2 (TPH 269ug/l), MW6a (TPH 15ug/l) and MW7 (TPH 14ug/l), as well as the deep monitoring well BR8 installed in 2003 (TPH 147ug/l). These concentrations exceed the EPA's interim guideline value for TPH in groundwater of 10ug/l.

PAHs (Sum of 16 compounds) were only detected in 2 no. wells, MW3 (0.89ug/l – lighter, more soluble PAHs) and BH1 (32.40g/l). These concentrations exceed the EPA's interim guideline value of 0.1ug/l for total PAHs in groundwater.

Boron was the only dissolved metal in groundwater that was significantly elevated above the EPA's interim guideline value of 1mg/l (maximum concentration 3.1mg/l), probably as a result of mixing with seawater, the highest concentrations are found in the samples with the highest electrical conductivities. Detected concentrations of arsenic, lead, nickel and zinc in groundwater are also slightly elevated above their respective interim guideline values, probably as a result of mixing with seawater.

No VOCs/phenols were detected in groundwater, apart from a trace concentration of Toluene (3ug/l) detected in one of the deeper wells (BH1) installed in 2003. This is below the EPA's interim guideline value for Toluene of 10ug/l.

#### 6.4.3 Gas Monitoring

Landfill gases were measured on one occasion only (5 July 2003) for the 6 no. shallow monitoring wells fitted with gas heads. Oxygen was lower than typical atmospheric concentrations in one well (BH1 - 4.1%), suggesting ongoing degradation of organic matter. Carbon dioxide was above the 0.5% long-term exposure limit in 4 no. of the monitoring wells, indicating some continuing gas production within the fill. Methane was not detected. Note: the gas measurements were taken on a day of relatively high barometric pressure (1021mb), therefore higher concentrations/flow rates may be detected on days of lower atmospheric pressure.

Landfill gases were measured in a number of monitoring wells as part of the site investigation of the adjacent Ringsend Wastewater Treatment Plant site in 1997. Three monitoring wells were monitored adjacent to the Waste to Energy Project site: BH63, BH64 and BH67. These wells were monitored for  $CH_4$ ,  $CO_2$ ,  $O_2$ , and barometric pressure on 8 no. occasions in July 1997.

Carbon dioxide was detected at concentrations above the 0.5% long-term exposure limit in all three wells (maximum 13.2%). Methane was occasionally detected at trace concentrations (0.1%), below the Lower Explosive Limit of 5%. The range of variation in the concentrations detected would suggest that concentrations/flow rates vary with the tidal response of the water table. Higher concentrations of carbon dioxide and methane were detected to the southeast of the waste water treatment plant site (maximum CO<sub>2</sub> 21%, maximum CH<sub>4</sub> 19%).

Elevated landfill gases were detected to the south/southwest of the Waste to Energy Project site as part of the Ringsend Wastewater Treatment Plant site investigation in 1997. Three monitoring wells were monitored: BH72 (200m southwest of site), BH73 (100m southwest of site), and BH74 (50m south of site). These wells were monitored for CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub>, and barometric pressure on 5 no. occasions in July 1997, and 2 no. occasions in September 1997. Methane was detected at elevated concentrations of between 27-59%, carbon dioxide was detected at concentrations between 22-32% and oxygen was either absent or detected at trace concentrations. A reclamation map by Dublin Port and Docks Board indicates that the area to the south of the site was infilled at an earlier date from 1969-1970 (see Figure 4), and a handwritten addition to this drawing notes that the infilled material consisted predominantly of domestic waste.

## 6.5 Summary of Results

The fill material across the site generally shows evidence of hydrocarbon contamination however concentrations of TPH and PAHs are mostly below the Dutch Intervention values. Concentrations that exceed Dutch Intervention values are likely to be associated with localised hotspots of contaminated soils. Trace concentrations of BTEX, PCE, and TCE were also detected in the fill material at concentrations below the Dutch Intervention values.

Elevated concentrations of metals (tead, copper and zinc) were detected within the fill material in a number of locations above the Dutch Intervention values, possibly related to the waste included in the fill (waste metals, etc.). Some high sulphate concentrations have also been measured in the fill material above the threshold for the protection of ordinary concrete.

There was evidence of free product in groundwater during sampling of the monitoring wells in March 2005 (i.e. an oily film), as well as a deep orange liquid in one well within the Hibernian Molasses site. Groundwater results show trace concentrations of TPH and PAHs, which slightly exceed the EPA's interim guideline values for groundwater, as well as elevated Boron probably as a result of mixing with seawater.

Limited landfill gas data for the site shows elevated concentrations of Carbon Dioxide within the fill material above the long-term exposure limit, indicating some continuing gas production. More comprehensive gas monitoring on the adjacent Ringsend Wastewater Treatment Plant site indicates highly variable concentrations of carbon dioxide, probably as a result of tidal variation of the water table. Significantly elevated concentrations of methane and carbon dioxide have been detected further to the southeast of the Ringsend Wastewater Treatment Plant site, as well as 50-100 m south/southwest of the Waste to Energy Project site.

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#### 6.6 Conclusions

#### 6.6.1 Option: Disposal of Excavated Soils off site

#### **6.6.1.1** Excavation Areas

For the proposed Plant Area the ground level will be reduced to a formation level of about +3mOD therefore the top 0.5-1 m of the existing ground will be excavated. This area includes the gravel-covered Hibernian Molasses yard, part of a bunded molasses tank, a fuel oil tank in the Clearway site with obvious surface oil contamination, and a storage area to the east of the Hibernian Molasses site.

Therefore the potential for hotspots of soil contamination within this area is high. The existing shallow soil results for this area (<1m) indicate TPH concentrations ranging from 3-386mg/kg and PAHs ranging from 14-100mg/kg (Sum of 16 compounds).

The proposed Waste Bunker location will be reduced to a formation level of approximately -1.5mOD which will involve an excavation of approximately 5.5m. The present ground surface in this area is mostly tarmac-covered and currently used for storage. The fill material is approximately 3.5-4 m thick in this area therefore most of the excavated spoil will be fill material. The existing soil results for this area (<5.5m) indicate TPH concentrations ranging from 4-572mg/kg and PAHs ranging from 0.1-147mg/kg. (Sum of 16 compounds).

The proposed route for the cooling pipes will be reduced to a formation level of approximately 2mOD therefore the top 2.5-3m will be excavated. The route of the proposed cooling pipes lies within the Clearway site of the existing soil results for this area (<3m) indicate TPH concentrations ranging from 2-21051mg/kg and PAHs ranging from 0-27mg/kg Sum of 16 compounds).

## 6.6.1.2 Classification of Excavated Soils

It is not possible to determine the exact classification of the soils for disposal to landfill without carrying out a detailed targeted environmental investigation.

However, based on the existing results the soils in the proposed Plant Area and Waste Bunker area would be considered non-hazardous waste for disposal. The concentrations of metals in these soils are not elevated to hazardous concentrations. Hydrocarbon (TPH) concentrations are below the generic hazardous threshold for oil (0.1% by weight – 1000mg/kg) where the specific nature of the oil contaminating the soil is unknown. Shallow hydrocarbon contamination in the vicinity of the proposed cooling pipes route exceeds this generic threshold and may be considered hazardous for disposal, depending on the nature of the contaminating oil. Note: the probability of local hotspots of contamination within the excavation areas is high based on the nature of the fill and current site usage.

## 6.6.2 Option: Retention of Excavated Soils on site

## 6.6.2.1 Retention as Landscaping

It would be possible to retain the excavated soils on site as landscaping, however to do this a detailed quantitative risk assessment will be required for the final retention design to prove that the retention does not pose a risk to human health or the environment.

A detailed quantitative risk assessment would consider all source-pathway-receptor linkages (i.e. pollutant linkages) associated with the retained soils, and estimate the risk associated with each pollutant linkage. Site-specific target levels (SSTLs) could then be calculated for the final retention design which would be protective of all identified human and environmental receptors.

Only soils with contaminant concentrations below the SSTLs would be retained on site; soils that exceed the SSTLs would be disposed off site to an appropriately licenced facility. Hotspots of contaminated soils encountered during excavation would be segregated and sampled; if the concentrations detected were above the SSTLs the soils would be disposed off site.

A key consideration if the soils are re-used as landscaping would be the effect of leaching rainwater on groundwater quality. The landscaped feature could be capped with a low permeability soil cap beneath the topsoil to limit infiltration of rainwater and minimize leaching of the soils to groundwater. Consideration would have to be given in the design to venting any landfill gases that may be produced.

The potential leaching to groundwater would depend on the size, shape and slope of the designed landscaping, as well as the permeability of the soil cap. At the detailed design phase a representative number of soil samples will be collected from the areas to be excavated in order to assess the potential leaching from these soils in a landscaped feature.

There are several precedents in the Dublin area of old local authority landfills being excavated/re-deposited within a development site as landscaping without the need for waste permitting by the local authority or waste licencing by the EPA (e.g. Dublin Port Tunnel, Pfizer Deansgrange, etc.). In these cases, it had to be shown that the proposed re-use would not create a risk to human health or the environment either during construction or in the final development. Hotspots encountered during these excavations were isolated and assessed separately.

## 6.6.2.2 Retention beneath Main Building

The excavated soils could be re-used as an engineering fill beneath the main building.

The geotechnical properties of the excavated soils would have to be shown to be suitable as a fill material for use beneath the main building (e.g. beneath the access ramp). Such a design would need to incorporate venting for any landfill gases generated by the retained fill material. It is unlikely however that the fill material could be used as an engineering fill without treatment to improve its geotechnical properties.

#### 6.6.3 Disposatof Groundwater off site

## 6.6.3.1 Option: Discharge directly into Dublin Bay

Laboratory analyses of groundwater carried out to date have only shown trace concentrations of hydrocarbons in the shallow groundwater below levels protective of seawater aquatic life (e.g. UK Saltwater EQSs). The number of parameters analysed are limited however and a number of other parameters would be required to fully assess the potential impact of abstracted groundwater on seawater quality (e.g. BOD, ammonical nitrogen, suspended solids, etc.).

Evidence of free-product was noted during groundwater sampling in March 2005 but is not apparent from the laboratory analyses. If free-product is present on site then Dublin City Council would require groundwater to be treated prior to discharge to Dublin Bay.

An example of such treatment would be an oil/water separator to remove any free-product, a bunded fuel tank for the storage of recovered product, followed by passage through an activated carbon filter to remove any dissolved hydrocarbons. For a flow rate of 80m3/hour 3 no. oil/water separators would be needed in parallel (each handling approximately 30m3/hr.) followed by 4 no. carbon filter units (each handling approximately 20m3/hr.). If there are high suspended solids in groundwater then either sand filters or a settlement unit would be required dependent on loading.

It is unlikely that Dublin City Council would grant a discharge licence to discharge directly to Dublin Bay without treatment based on the existing groundwater information.

## 6.6.3.2 Option: Discharge into Dublin City Council Sewerage System

Abstracted groundwater from the construction dewatering could be discharged directly to the foul sewer, subject to a trade effluent discharge licence from Dublin City Council. Dublin City Council may accept the existing groundwater results as sufficient for a discharge licence however it is likely that further analyses would be required.

Prior to applying for a discharge licence, it would need to be confirmed with Dublin City Council that the existing foul sewer/treatment facility has the capacity to take the estimated 80m3/hour of water for 6 months and whether or not pre-treatment is required (i.e. removal of any free-product prior to discharge to sewer).

This option is the preferred option and may prove to be the simplest, most cost effective solution if the existing foul sewer/treatment facility has the capacity.

#### 6.6.4 Option: Recirculation of Groundwater within the site

The legislative context of re-circulating groundwater within the site is discussed in Section 6.1.2.

The fact that evidence of free-product was detected during sampling would mean that Dublin City Council may require groundwater to be treated prior to recirculation on site so as not to pollute groundwater in previously uncontaminated areas. The level of treatment required would similar to that required to discharge directly to Dublin Bay. In addition, this option would require an assessment as to how sest to recharge 80m3/hour of water to ground and would require the installation of injection wells or infiltration trenches on site prior to excavation.

Recharging the abstracted groundwater within the site would not be as simple as discharging to sewer, or treating groundwater and discharging directly to Dublin Bay. We do not favour this option at this stage.

## 7. APPRAISAL OF GEOTECHNICAL DATA

## 7.1 General

This section presents geotechnical information obtained during the site investigations relating to the soil and rock encountered on the site.

## 7.2 In-situ testing

Standard Penetration tests were typically undertaken at 1.5-2 m intervals from ground level in all of the cable percussive drillholes. The SPT 'N' values obtained in made ground, sands and gravels and glacial tills are shown plotted against depth in Figures 7 to 9 respectively.

#### 7.2.1 Made Ground

Figure 7 shows the SPT values within this material vary between 2 and 50. Values are variable reflecting the uncontrolled nature of the filling.

#### 7.2.2 Marine/Fluvio-Glacial Sands and Gravels

Figure 8 shows the SPT values within these materials vary between 3 and 60, most of the values being between 11 and 50. SPT values of less than 15 occur above 6m bgl indicating that the upper parts may be recent marine deposits.

#### 7.2.3 Glacio-Marine/Glacial Tills

Figure 9 shows the SPT values within this material vary between 1 and 57; however most of the values are between 17 and 50. As referred to in Section 5.2.4, low SPT values recorded during the 2005 IGSL investigation for the upper laminated silts have been interpreted as relating to blowing in the sand laminations in this unit.

## 7.3 Geotechnical Laboratory Soil Testing

Geotechnical testing was carried out on selected samples taken from drillholes and trail pits in all soils. The following tests were performed:

- Atterberg limits;
- Particle Size Distribution testing;
- Undrained unconsolidated triaxial testing;
- Consolidation testing.

#### 7.3.1 Made Ground

Classification testing carried out on the made ground is summarised below.

Material	Moisture Content (%)	Plastic Limit	Liquid Limit	Plasticity Index
Made Ground	13% - 28% (3)	18% - 30%	30% - 39%	7% - 13%

Using Casagrande's Plasticity charts the fill material sampled can be classified as inorganic silts and clays of low to intermediate plasticity.

Bulk densities and dry densities were not measured.

MCV values on selected clayey samples ranged between 5.6 and 14.1.

#### 7.3.2 Fluvio-Glacial Sands and Gravels

No laboratory testing of this material was undertaken.

#### 7.3.3 Glacio-Marine/Glacial Tills

Classification testing carried out on these materials are summarised below.

Material	Moisture Content (%)	Plastic Limit	Liquid Limit	Plasticity Index
Laminated Silts	21% - 30%	NP	22% - 25%	NP
Glacial Tills	16% - 23%	16%- 18%	28% - 36%	12% - 18%

Using Casagrande's Plasticity charts the glacial tills can be classified as inorganic clays of low plasticity.

Bulk densities and dry densities were not measured.

6 no. unconsolidated undrained triaxial tests were undertaken on glacial till samples recovered. The shear strengths recorded in these tests were all less than 100kPa. These results are considered unrealistically low given the SPT's values recorded and information known about this material from elsewhere in Dublin. Sample disturbance and inappropriate test method are considered to be the reasons for the low results recorded.

Consolidation testing was carried out on 6 no. of the glacial till samples recovered. Over the highest stress ranges applied (400kPa)  $c_v$  values recorded varied between  $6.5\text{m}^2/\text{year}$  and  $50\text{m}^2/\text{year}$ . Published information on tills in Dublin quote  $c_v$  values in the range of  $20\text{m}^2/\text{year}$  and  $60\text{m}^2/\text{year}$ . Sample disturbance and low stresses applied to the samples could account for the low values recorded.

## 7.4 Laboratory Rock Testing

The site is underlain by Limestone. The strength of intact bedrock was obtained using two conventional test methods, the unconfined compressive strength (UCS) test; and the point load index test (PLI) expressed in Is50. UCS and PLI tests were carried out on samples recovered. The factor adopted between UCS/Is50 has been assumed to be 20 (IGSL, unpublished).

The adjusted UCS of intact rock samples tested varied from 66MPa to 172MPa.

## 8. ENGINEERING STUDIES

#### 8.1 General

This section describes some of the key design issues and preliminary engineering studies, undertaken for the substructure works for the proposed facility. Brief descriptions of works are included along with envisaged construction methods. The subsurface profiles used have been based on the ground conditions and groundwater regime inferred from the ground investigations. Geotechnical design parameters have not been selected at this stage.

## 8.2 Substructure works and envisaged construction methods

## 8.2.1 Main Building

Within the main building a subsurface waste storage bunker is proposed which will require an excavation to a level of approximately – 1.5mOD (~5mbgl). As this excavation will be carried out to a depth of about 2m below groundwater level it is envisaged that the bunker will be constructed within a sheetpile cofferdam. The sheetpiles will be founded at a depth to ensure stability. Lateral support in the form of internal bracing or possibly anchors will be provided. Spoil and groundwater will be generated during the excavation.

It is proposed to support the main building and venting flues on deep foundations. Where possible it is proposed to support the structure on driven piles founded in soils above bedrock. For heavily loaded areas or areas with sensitive equipment bored piles end bearing on bedrock may be necessary. Spoil will be generated from bored piling works.

#### 8.2.2 Cooling water facilities

The laying of part of the cooling water inlet and outlet pipes will require an excavation to a level of approximately +0.5mOD (~3mbgl).

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The excavation will be carried out in open cut where possible although sheet piled support may be necessary close to existing structures or if groundwater levels are higher than expected. Spoil and possibly groundwater will be generated during the excavation.

#### 8.2.3 External areas

External areas will comprise roadways, parking and areas of soft landscaping.

Conventional materials used in road construction will be imported for the construction of the roads and parking areas.

The main area of soft landscaping is in the northern part of the site. Where possible it is intended to re-deposit excavated material from within the site to make up levels for the landscaped areas. Refer to Section 8.3 below.

## 8.3 Disposal off site/ Retention of excavated soil material

## 8.3.1 Appraisal of Contamination

The soil results have been discussed in Section 6.4 and summarised in Section 6.5. Conclusions regarding disposal off site/retention on site have been made in Sections 6.6.1 and 6.6.2 respectively.

## 8.3.2 Engineering Options

Refer to Section 2.3 for approximate un-bulked quantities of excavated material that will be generated. Engineering options for using this material are as follows:

#### 8.3.2.1 Option 1 – Dispose of Material off site

Based on the existing results the soils in the proposed Plant Area and Waste Bunker area would generally be considered non-hazardous waste for disposal. Shallow hydrocarbon contaminated soils in the vicinity of the proposed cooling pipes route may possibly be considered hazardous for disposal. Note: the probability of local hotspots of contamination within the excavation areas is high (See Section 6.6.1).

## 8.3.2.2 Option 2 – Retain material on site in Landscaped Area

It would be possible to retain the excavated soils on site as landscaping, subject to the findings of a detailed quantitative risk assessment which would be required for the retention design to ensure that the excavated soils do not pose a risk to human health or the environment (See Section 6.6.2.1).

## 8.3.2.3 Option 3 – Retain material on site beneath Main Building

Excavated soils could only be re-used as an engineering fill beneath the main building (See Section 6.6.2.2), subject to the findings of a risk assessment and the improvement of the soil.

#### 8.3.3 Construction Issues

Not withstanding the above options, procedures will need to be implemented / considered when undertaking the works:

1. Establishment of a materials handling protocol: This should ensure that excavated material is moved around the site in a controlled manner. Excavations would proceed according to a grid system to allow for traceability of all materials. The protocol should also ensure that all health and safety requirements are adhered to. This will include occupational exposure monitoring of site workers and at the perimeter of the site.

2. Since elevated levels of hydrocarbons were found in most soil samples and the potential for finding hotspots of contaminated soils is considered high, any excavation work should be supervised by an environmental engineer to observe for hydrocarbon hot spots within the fill material. If encountered, hotspots of hydrocarbon contamination would have to be segregated and stockpiled in a controlled manner temporarily. Analysis of the materials stockpiled would be required and depending on the results these materials may have to be removed from site for disposal, with the landfill acceptance criteria determining where the material could be disposed.

## 8.4 Disposal off site/ Retention of groundwater

#### 8.4.1 Appraisal of Groundwater Contamination

The groundwater results have been discussed in Section 6.4 and summarised in Section 6.5. Conclusions regarding disposal off site/recirculation of groundwater on site have been made in Sections 6.6.3 and 6.6.4 respectively.

## 8.4.2 Engineering Options

During the construction phase the water table will have to be lowered during the construction of the waste bunker and possibly during the laying of the cooling pipelines below ground. For the excavation for the waste bunker we have carried out a seepage analysis and estimated the maximum unfactored steady state seepage generated during this excavation would be approximately 80m3 / hour. Approximate duration of construction has been assumed to be six months.

## 8.4.2.1 Option 1 – Discharge directly into Dublin Bay

It is unlikely that Dublin City Council would grant a discharge licence to discharge directly to Dublin Bay without treatment based on the existing groundwater information (See Section 6.6.3.1).

## 8.4.2.2 Option 2 – Discharge into Dublin City Council Sewerage System

Abstracted groundwater from the construction dewatering could be discharged directly to the foul sewer, subject to a trade effluent discharge licence from Dublin City Council. This option is the preferred option and may prove to be the simplest, most cost effective solution (See Section 6.6.3.2).

## 8.4.2.3 Option 3 – Recharge back into the ground within the site

Abstracted groundwater could be recirculated within the site however this option would not be as simple as discharging to sewer, or treating groundwater and discharging directly to Dublin Bay (See Section 6.6.4).

## 8.5 Bearing capacity of shallow footings

The bearing capacity for a soil is not a unique value. It depends on the following:

- foundation depth below ground;
- foundation dimensions;
- proximity to the crest of sloping ground;
- presence of groundwater above the foundation base

Ignoring the site topography issues, we have estimated minimum allowable bearing capacity as follows:

Soil Type	Allowable Bearing Capacity (kPa)
Cohesionless Fluvio- Glacial Soils	175
Cohesive Glacial Till	250

Note that the values given above are presumed values. The capacity for each foundation type will need to be reviewed in the content of its depth, dimensions etc. to establish a specific capacity for individual foundation.

## 8.6 Deep Foundation Design

The design methodology is highly dependent on the pile type adopted and the founding levels of the foundations. This will covered in detail during detailed design.

## 9. CONCLUSIONS AND RECOMMENDATIONS

The ground investigations carried out at the site indicate the site is covered by up to 5 m of fill below which are extensive deposits of sand and gravels and glacial soils overlying limestone bedrock. Groundwater levels are typically im below ground level.

## Geotechnical

- 1. Excavations required to construct the waste bunker within the waste building will extend into the water bearing sands and gravels. It is envisaged that the excavation will be carried out within braced retaining walls founded sufficiently deep to ensure stability of the excavation and groundwater control.
- 2. Excavated material generated from within the site would not be suitable for use as engineering fill without treatment to improve its geotechnical properties (beneath the main building / ramp).
- 3. Deep foundations required to support the main facility building will have to be installed through the water bearing sands and gravels and potentially through the underlying laminated silts which can become unstable without control of water pressures.
- 4. In external areas where roads / parking are proposed the constituents of the hard surfacing and the formation material provided will need to account for the variable composition of the existing fill material beneath.

#### **Environmental**

1. Elevated hydrocarbons are the main contaminants detected within the fill material on site. These soils would mostly be considered non-hazardous for disposal purposes however hotspots of contaminated soils are likely given the history of infilling and current site use.

- 2. The cost of disposing of the excavated soils off-site would be considerable and is the least attractive option. The preferred option would be to retain the excavated soils on site as beneath the soft landscaped areas. This will only be carried out if proven safe to both human health and the environmental through a site specific risk assessment. If the landscaping option is considered we recommend further sampling of the soils to be excavated in order to assess the potential for leaching and associated risk to the receiving environment.
- 3. Elevated sulphate concentrations were detected within the fill material at a number of locations above the threshold for the protection of ordinary concrete. We recommend that further soil sampling for sulphate is carried out during detailed design to better characterise sulphates in areas where concrete will be placed. The results of these analyses would determine whether a more chemically resistant concrete would need to be specified.
- 4. Elevated carbon dioxide was detected within the fill material above the long-term exposure limit, indicating some continuing gas production. We recommend that further gas monitoring is carried out on the existing monitoring wells at different atmospheric pressures to determine the range of gas concentrations and flow rates on site. The range of gas concentrations/flow rates with the tidal response of the water table should also be investigated. This information will be necessary to determine if any gas protection measures will be required beneath the buildings and in service trenches.
- 5. It is unlikely that Dublin City Council would grant a discharge licence to discharge groundwater directly to Dublin Bay without treatment based on the existing groundwater results. Confirmatory groundwater samples should be collected and analysed for the full suite of parameters required to support an application for a discharge licence to discharge groundwater off-site. The preferred option would be to discharge the abstracted groundwater directly to the foul sewer, otherwise costly treatment will most likely be required prior to discharge to Dublin Bay or recirculation within the site.

## **REFERENCES**

GSI 1:100,000 scale Bedrock Geology map, Sheet 16 (Kildare-Wicklow)

GSI 1:50,000 scale Quaternary map of Dublin

Nolan, S.C. 1986 The Carboniferous Geology of the Dublin Area. Unpubl. PhD thesis, Univ.Dub.

Naylor, D. 1965 Pleistocene and post-Pleistocene sediments in Dublin Bay, Sci. Proc. Roy. Dub. Soc.,

Series A, Vol. 2, 175-188

Farrell, E. R., and Wall D., 1990 The soils of Dublin, Trans. Instn. Engrs. Ireland, 115, 78-9.

## **GLOSSARY OF TERMS**

As Arsenic Barium Ba

**BTEX** Benzene, Toluene, Ethylbenzene, Xylene

Cd Cadmium Cr Chromium Cu Copper Hg mb

mbgl

Mo

mOD

Ni

**PAH** 

Pb

**PCE** 

pН

Nickel
Polycyclic Aromatic Hydrocarbons
Lead
Perchloroethylene
hydrogen ion concer
Antimony Sb Se Selenium **TCE** Trichloroethylene TOC Total Organic Carbon

**TPH Total Petroleum Hydrocarbons VOC** Volatile Organic Compounds

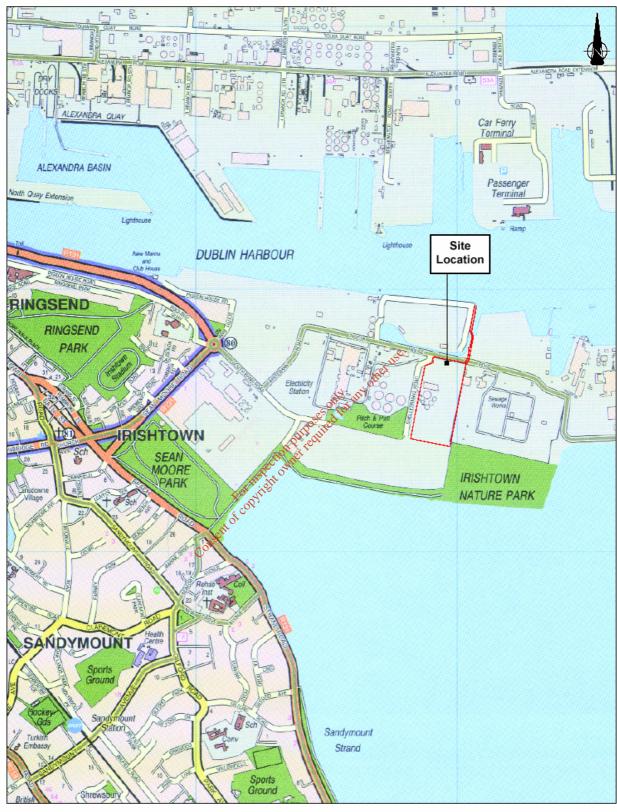
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## **FIGURES**

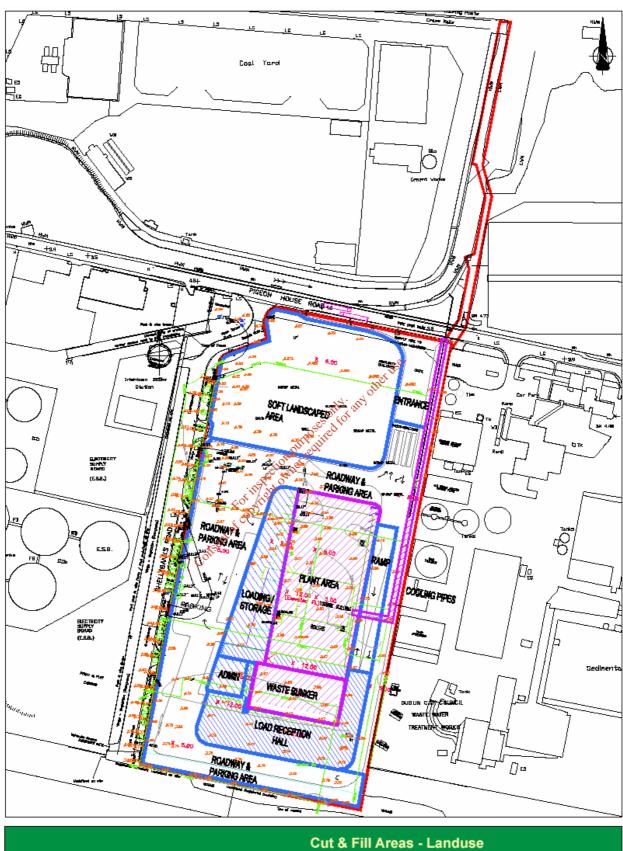


- Figure 1 Site Location Map
- Figure 2 Cut and Fill Areas
- Figure 3 Site Topography
- Figure 4 Landfill History
- Figure 5 Ground Investigation
- Figure 6 Geotechnical Cross Section
- Figure 7 Standard Penetration Test (SPT) Values for Fill
- Figure 8 Standard Penetration for Test (SPT) Values for Gravels
- Figure 9 Standard Penetration Test (SPT) Values for Glacio-Marine Clay / Till

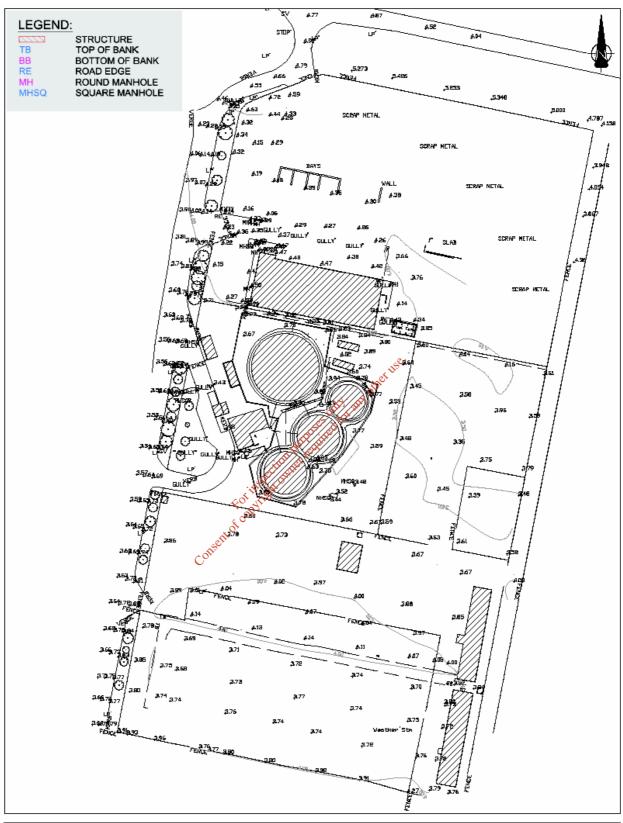




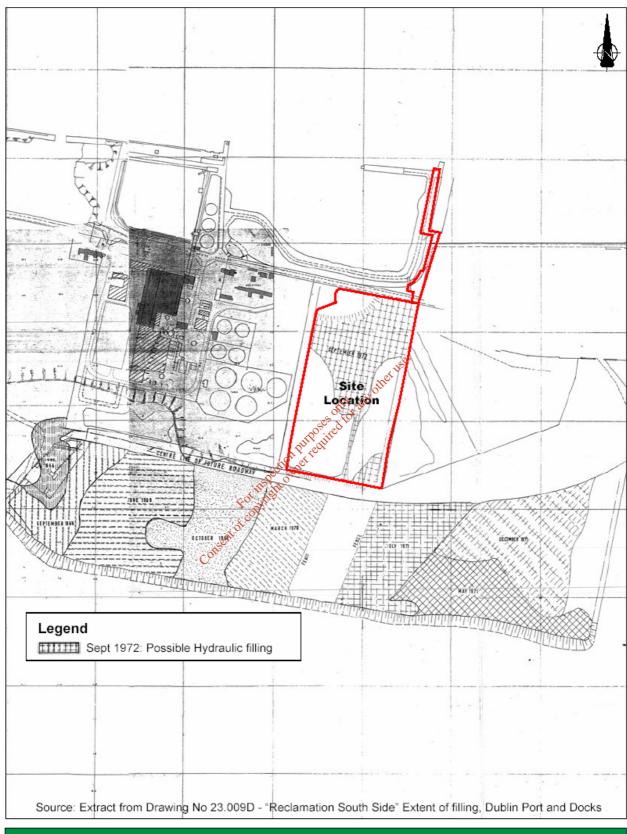
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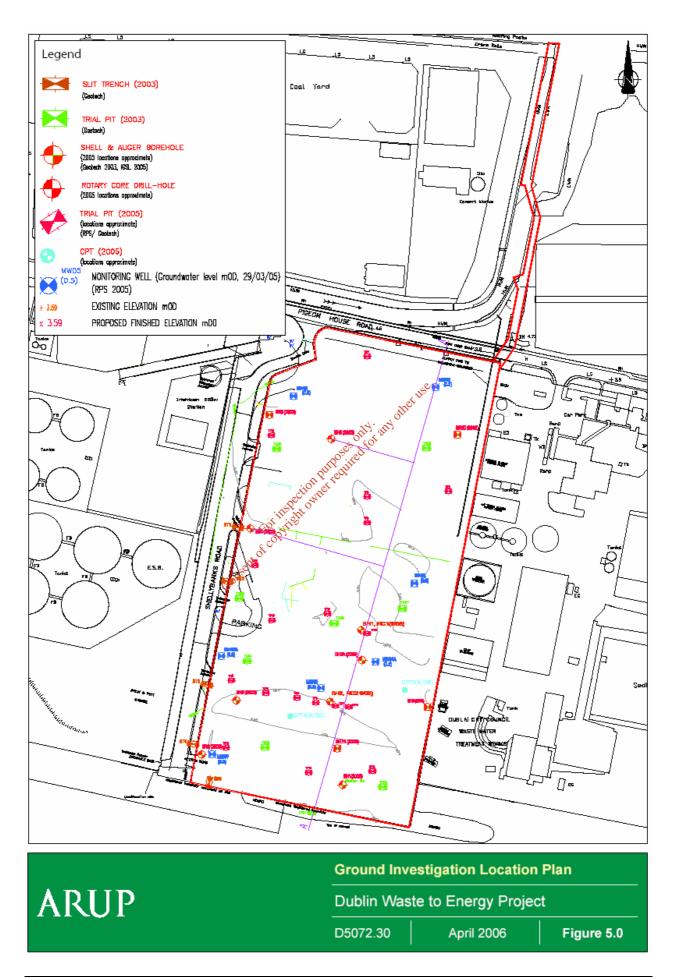
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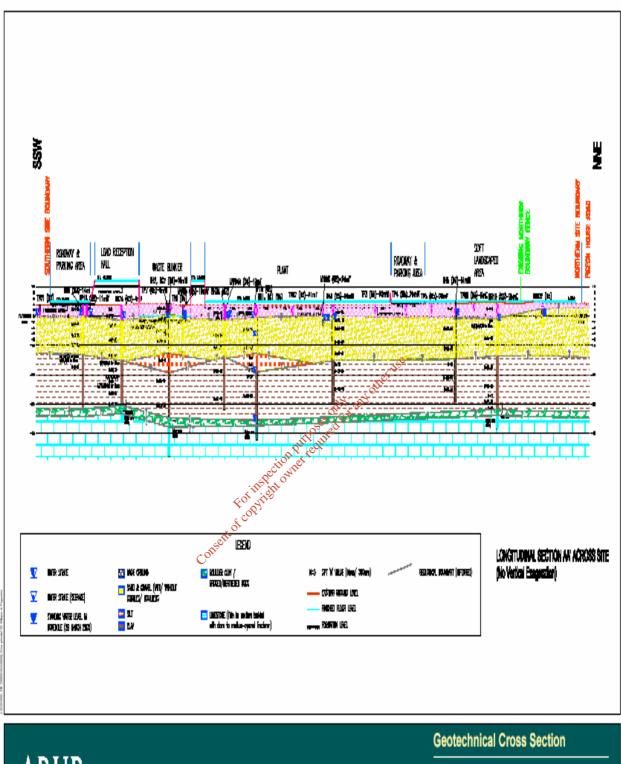


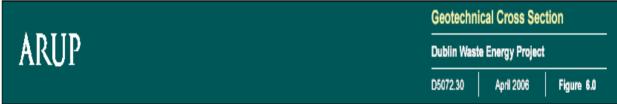


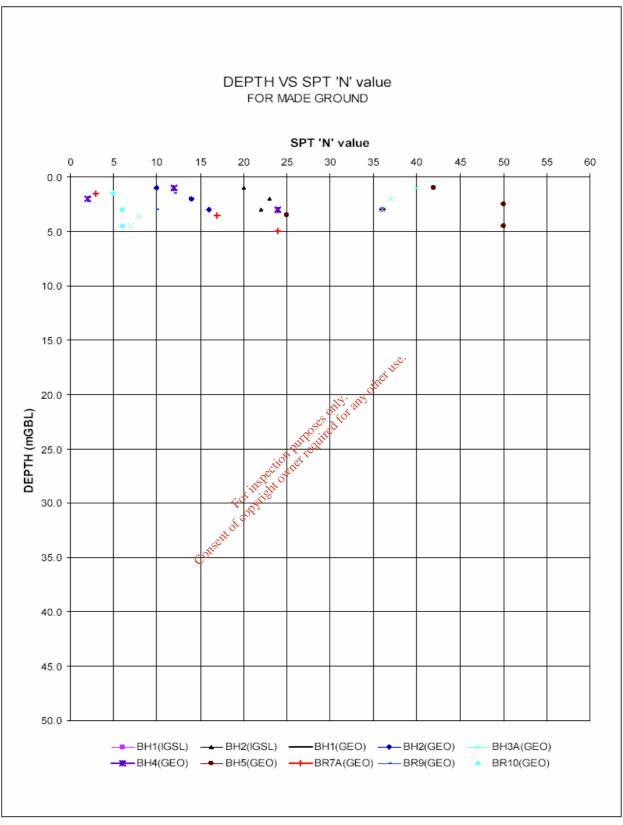


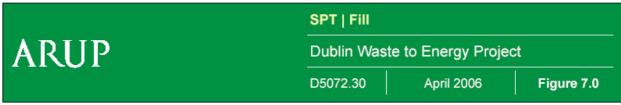
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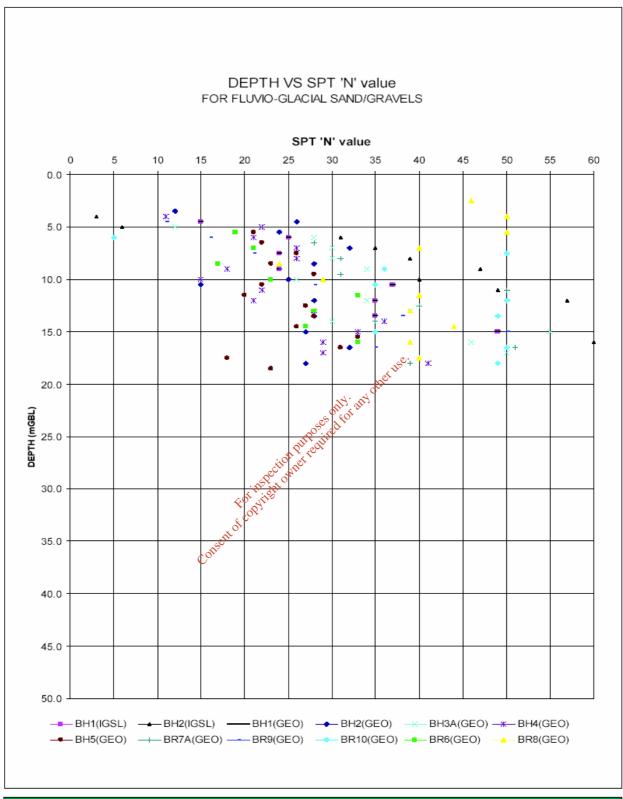


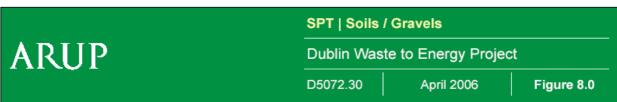


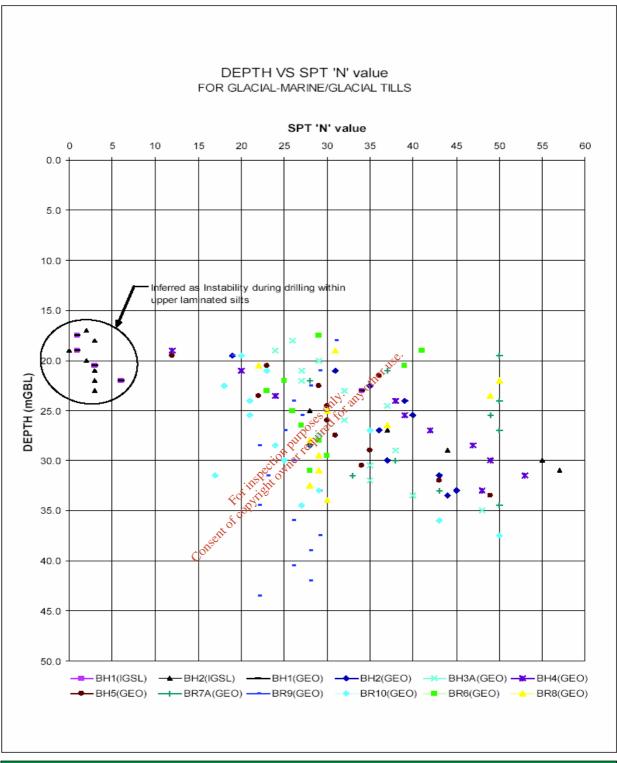


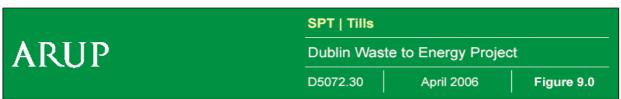










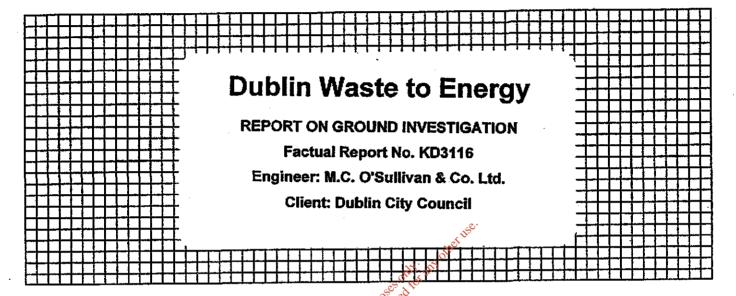


## **Appendix E 2003 GSL Site Investigation Soil Results**

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Our Ref: EFS/034319 Your Ref: 7 November, 2003

Mr M Kelly Geotech Specialists Ltd Hartwell Upper Kill County Kildare Eire



## **TES Bretby**

PO Box 100 Ashby Road Burton-upon-Trent Staffordshire DE15 OXD

Telephone: 01283 554400 Facsimile: 01283 554422

E-mail: enquiries@tes-bretby.co.uk

Dear Mr Kelly

## Soil Sample Analysis - Dublin Waste

Please find attached an amended Table 1 for the samples from the above site with the Elemental Sulphur results that were missing from the original report.

The work was carried out in accordance with Mowlem Environmental Sciences Group Standard Terms and Conditions of Contract.

Please contact me if you require any further information.

Yours sincerely

J Hannah

J Hannah Project Co-ordinator 01283 554403

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## TEST REPORT SOIL SAMPLE ANALYSIS



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## Amended Report TES Report No. EFS/034319

Site: <u>Dublin Waste</u>

Geotech Specialists Ltd Hartwell Upper Kill County Kildare Eire

The 2 samples described in this report were scheduled for analysis by TES Bretby on Friday, 17 October 2003. This is an amended report that replaces the report issued on 31 October 2003. The analysis was completed by Friday, 7 November 2003.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby Laboratories.

The following tables are contained in this report:

Table 1 Main Analysis Results Table of Report Notes (1 Page)

behalf of

Bretby : J How

annah

Project Co-ordinator

Date of Issue: 07/11/03

rked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

Bretby accepts no responsibility for the sampling related to the above results

ES Bretby, P.O. Box 100, Burton-on-trent, DE15 0XD Tel: 01283 554400 Fax: 01283 554422 etby is a division of Mowlem Environmental Sciences Group Registered in England Number 77628

TES Bretby =
Report 034315
Control Page
Sheet 1/1

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## **GEOTECH SPECIALISTS LIMITED**

Hartwell Upper, Kill, Co. Kildare, Ireland Tel: (045) 877201 Fax (045) 877510 Email: geotech.dublin@mesg.co.uk

# **Dublin Waste to Energy**

REPORT ON GROUND INVESTIGATION Factual Report No. KD3116 Engineer: M.C. O'Sullivan & Co. Ltd.

Client: Dublin City Council

ancil

Consent of copyright owner required for any other use.

## Client:

**Dublin City Council** Waste Management Services Dept. 68/70 Marrowbone Lane **Dublin 8** 

## Engineer:

M.C. O'Sullivan & Co. Ltd. **Consulting Engineers** Ashurst **Mount Merrion Avenue** Blackrock Co. Dublin



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4	LABORATORY TESTING 4.1 Geotechnical Testing 4.2 Geoenvironmental Testing	5
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#### 1 INTRODUCTION

In May 2003 Geotech Specialists Limited (GSL) were commissioned by M.C. O'Sullivan & Co. Ltd., (MCOS), on behalf of Dublin City Council (DCC), to carry out a ground investigation at a site in the Ringsend area of Dublin. The investigation was required to obtain geotechnical and geoenvironmental information for the proposed Waste to Energy plant.

The scope of the investigation, which was specified by MCOS, comprised cable percussion and rotary drilled boreholes, excavation of trial pits and slit trenches, and laboratory testing. The investigation was carried out in accordance with the contract specification and relevant standards (see References). The fieldwork was carried out between 14 May and 27 June 2003. This report presents the factual records of the fieldwork and laboratory testing.

#### 2 THE SITE AND GEOLOGY

#### 2.1 The Site

The proposed site is situated to the south of Dublin Harbour and to the west of the of the existing Poolbeg Power Station. The site is at Irish National Grid reference O 196 335, see Site Location Plan in Enclosure F.

The proposed site covers approximately 7 hectares and is generally rectangular in shape with hardstanding surfaces. The site comprises three relatively flat sections including a scrap yard, an area with above ground storage tanks and a car park. The site is bounded by Pigeon House Road to the north, Shellybanks Road and an electrical station to the west and the Ringsend Sewage Treatment Plant to the east. As indicated in the tender documents, the site may have been used as a municipal waste disposal site in the past.

#### 2.2 Published Geology

The published geological map covering the site, GSI Sheet 16 (1995), shows the solid geology in the areas comprises dark grey to black limestone and shale of the Calp Formation (Carboniferous Age)



As reported in the project tender documents (Dublin Waste to Energy, Ground Investigation Contract, October 2002) previous investigations in the vicinity of the site indicate that the area is underlain by <u>made ground</u> overlying a sequence of sands and gravels, soft estuarine clays and silts, laminated clays, glacial till and dense coarse to very coarse granular soils, overlying Lower Carboniferous deposits of limestone.

-orfised.

#### 3 FIELDWORK

#### 3.1 General

The fieldwork was carried out in general accordance with BS 5930 (1999) and Part 9 of BS 1377 (1990). The exploratory hole locations were selected by MCOS as shown on the Exploratory Hole Location Plan in Enclosure F. The locations were set out by taping from local features. The final co-ordinates and reduced levels were surveyed by GSL to Irish National Grid and Ordnance Datum (Malin Head) and are shown on the logs in Enclosure A.

#### 3.2 Exploratory Holes

The exploratory holes are listed in the following table.

#### SUMMARY OF EXPLORATORY HOLES

Туре	Quantity	Maximum Depth (m)	Remarks
Cable Percussion Boring	5	36.50	BH1, 2, 3A, 4 & 5
Rotary Open Hole / Core Drilling	4	49.50	BR6, 7A, 8, 9 & 10
Trial Pits	9	4.40	machine dug, TP1 to TP9
Slit Trenches	5	1.20	machine and hand dug, ST1 to ST5

The exploratory hole records are presented in Enclosure A and should be read in conjunction with the Key included therein. The records provide descriptions, in accordance with BS 5930 (1999), of the materials encountered and details of the samples taken, together with observations made during boring, drilling, pitting and trenching. Slit trench sketches and logs are shown in Enclosure C. Photographs of the trial pits and recovered cores are presented separately.



#### 3.3 Instrumentation and Monitoring

Standpipe piezometers were installed in borings BH1, BH4, BH5, BR6, BR8 and BR9 as shown on the logs in Enclosure A and detailed in Enclosure B. Records of groundwater and gas monitoring carried out by GSL during and after the fieldwork period are also presented in Enclosure B.

#### 3.4 In-Situ Testing

In-situ testing was carried in accordance with BS5930 (1999) and Part 9 of BS1377 (1990) unless otherwise stated. The testing is summarised below and the results are presented on the logs in Enclosure A.

#### SUMMARY OF IN-SITU TESTING

Туре	Quantity	Remarks
Standard Penetration Tests	269	conducted during boring and drilling

Standard Penetration Test (SPT) N-values ranged from less than 10 to greater than 50 (blows per 0.30 m). Tests conducted in made ground where the N-values are greater than approximately 35 is likely due to the presence of cobbles, boulders and obstructions. These values are not regarded as representative of the relative density, consistency or strength of the soil at that depth. The visual description of the consistency or density of the recovered soil samples in these layers is reported on the logs.



#### 4 LABORATORY TESTING

#### 4.1 Geotechnical Testing

On completion of the fieldwork all samples were transported to the Castlemartyr, Co. Cork laboratory of GSL for temporary retention and testing. The laboratory testing was scheduled by MCOS. The geotechnical testing was carried out in accordance with BS 1377 (1990) and ISRM (1981) and ISRM (1985). The testing is summarised below and the results are presented in Enclosure D.

#### SUMMARY OF GEOTECHNICAL LABORATORY TESTING

Туре	Remarks
Moisture Content Determination	20no., conducted on sealed jar (D) samples
Atterberg Limit Determination	18no.
Particle Size Distribution Analysis	32no. including 5no. hydrometer tests
pH Level and Sulphate Content of Soils	28no. otte
Moisture Condition Value (MCV) Tests	12no conducted on bulk (B) samples
California Bearing Ratio (CBR) Tests	no. conducted on bulk (B) samples
Determination of Point Load Index Values	10no., conducted on selected rock core samples
Unconfined Compressive Strength (UCS) Tests	1no., conducted on a selected rock core sample from BR8

#### 4.2 Geoenvironmental Testing

On completion of the fieldwork, samples for geoenvironmental testing were transported to the TES Bretby laboratory in Burton-on-Trent, UK and the ALControl Geochem laboratory in Dublin. The laboratory testing was scheduled by MCOS. The testing is summarised below and the results are presented in Enclosure E.

#### SUMMARY OF GEOTECHNICAL LABORATORY TESTING

Туре	Remarks
ICRCL Full Suite (common contaminants)	6no., conducted on samples from BH2, BH5 & BH8 and TP1, TP4 & TP7.
Total Petroleum Hydrocarbons (by GCFID)	6no., conducted on samples from BH1, BH3A, & BH5 and TP8
Dioxins	2no., conducted on samples from TP2 & TP9



#### REFERENCES

#### **British Standards and Codes of Practice**

BS 1377 : 1990 : Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930: 1999: Code of practice for site investigations. British Standards Institution.

#### Maps

GSI Sheet 16: 1995: "Kildare-Wicklow". 1:100000 geological map (solid). Geological Survey of Ireland.

Ordnance Survey Landranger Series. Sheet 50 : 2001 : Dublin Kildare Meath Wicklow. 1:50000. Ordnance Survey of Ireland.

#### **Publications and Reports**

Dublin Waste to Energy Project, Ground Investigation Contract, October 2002.

ISRM: 1981: Rock Characterisation, Testing and Monitoring - ISRM Suggested Methods (Ed E T Brown). Commission on Testing Methods, International Society for Rock Mechanics, Pergamon Press.

ISRM: 1985: Suggested method for determining point load strength. Commission on Testing Methods, International Society for Rock Mechanics, International Journal of Rock Mechanics, Mining Sciences and Geomechanics Abstracts, Vol 22.

ICRCL 59/83: 1987: Guidance on the assessment and redevelopment of contaminated land, Department of Environment.

Prepared By	Mike Kelley, B.Sc., M.Sc.
Approved for Issue By	Mike Kelley, B.Sc., M.Sc.



# TEST REPORT SOIL SAMPLE ANALYSIS



1257

# TES Report No. EFS/033223

Site: Dublin Waste

Geotech Specialists Ltd Carewswood Castlemartyr County Cork Ireland

The 7 samples described in this report were scheduled for analysis by TES Bretby on Wednesday, 6 August 2003. The analysis was completed by Monday, 18 August 2003.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby, laboratories.

The following tables are contained in this report:

Table 1 Main Analysis Results
Tables of TPH Chromatograms (5 Pages)
Table of Report Notes (1 Page)

On behalf of

TES Bretby : U tours

Project Co-ordinator

Date of Issue: 18/08/03

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results

TES Bretby, P.O. Box 100, Burton-on-trent, DE15 0XD Tel: 01283 554400 Fax: 01283 554422 TES Bretby is a division of Mowlern Environmental Sciences Group Registered in England Number 77628

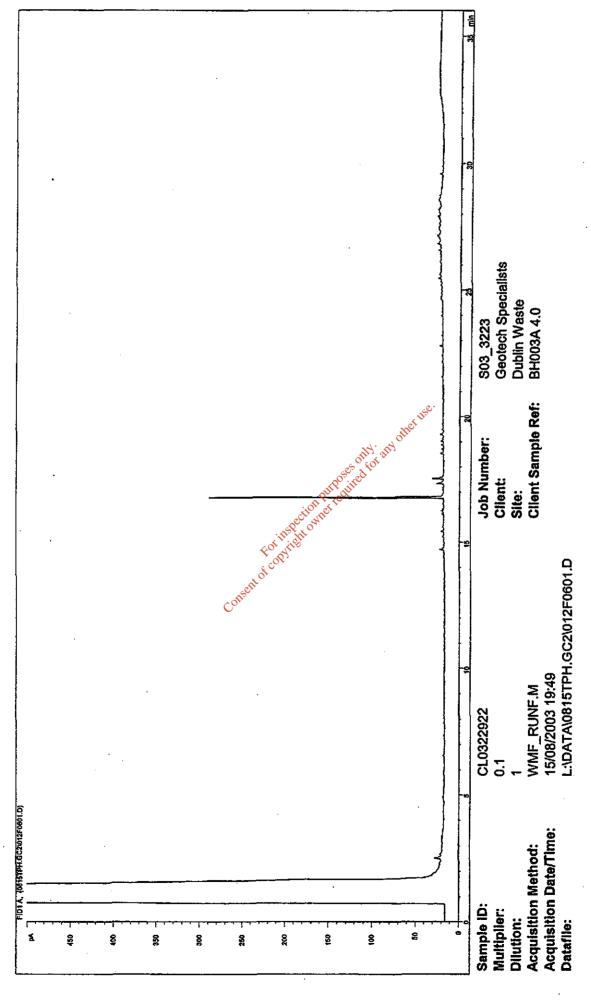
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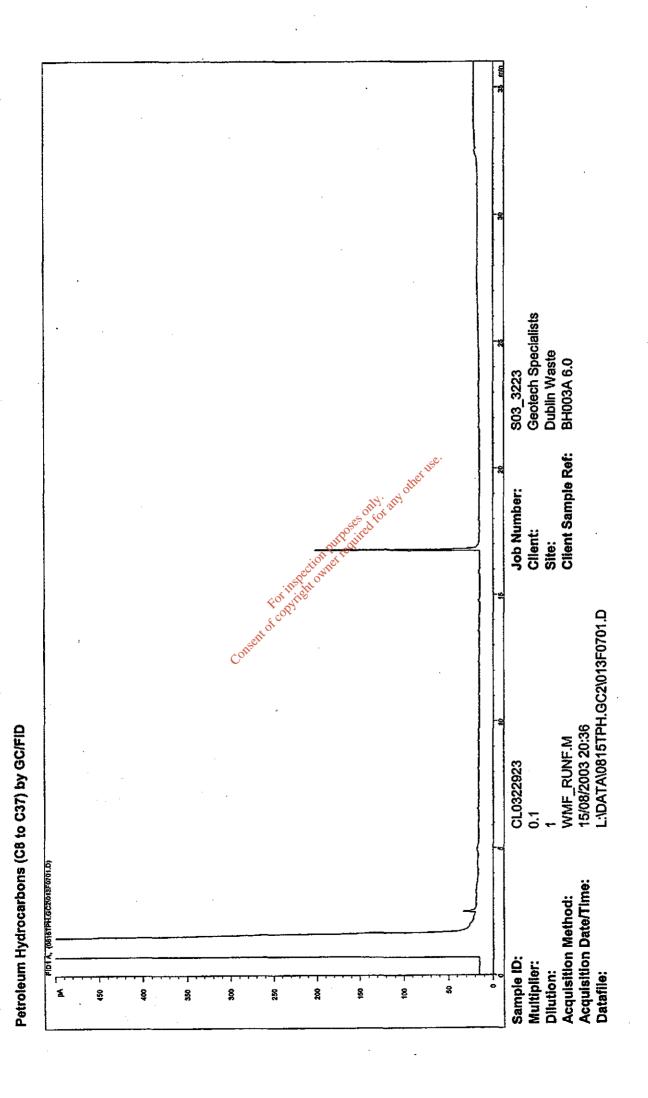
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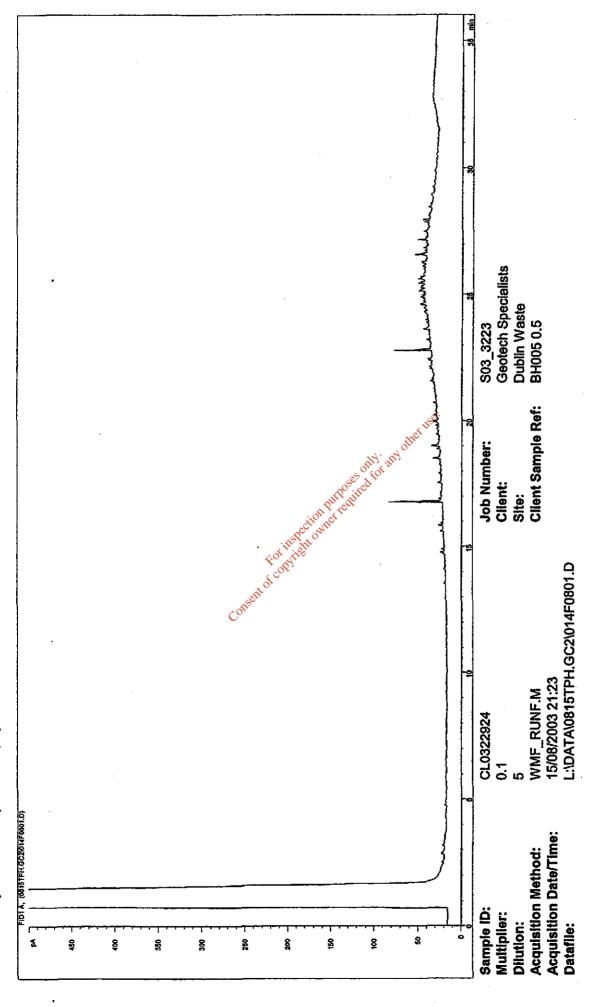
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Petroleum Hydrocarbons (C8 to C37) by GC/FID







S03\_3223 Geotech Specialists Dublin Waste BH005 5.5 Client: Site: Client Sample Ref: Job Number: WMF\_RUNF.M 15/08/2003 22:56 L:\DATA\0815TPH.GC2\016F1001.D CL0322926 0.1 FIDIA, (0015TPH.GCZ0010F1001.D) Acquisition Method: Acquisition Date/Time: Datafile: Sample ID: Multiplier: Dilution: **₹** 1 90 200 . 22 8 250 8 \$ **\$** 8 8

Petroleum Hydrocarbons (C8 to C37) by GC/FID

# Report Notes

Soil/Solid analysis specific:

Results expressed as mg/kg unless stated otherwise S04 analysis not conducted in accordance with BS1377 Water Soluble Sulphate on 2:1 water:soil extract AR denotes analysis conducted on the As Received sample # co-eluted with benzo(b)fluoranthene ## co-eluted with Indeno(123-cd)pyrene BTEX analysis expressed as ug/kg As Received Phenol HPLC results expressed as mg/kg As Received

#### Water analysis specific:

Results expressed as mg/l unless stated otherwise

#### Oil analysis specific:

Results expressed as mg/kg unless stated otherwise S.G. expressed as g/cm²@ 15°C

#### Filter analysis specific:

Results expressed as mg on filter unless stated otherwise

#### VOC analysis specific:

Explanatory notes for data flagging

U = undetected above reporting limit

J = concentration at instrument was below lowest calibration standard

E = concentration at instrument was above top cationation standard

B = compound was detected in method blank

#### Gas (Tedlar bag) analysis specific:

Results expressed as ug/l unless stated otherwise

#### Air (Carbon tube) analysis specifics

Results expressed as ug on tube unless stated otherwise

#### Asbestos analysis specific:

CH denotes Chrysotile

CR denotes Crocidolite

AM denotes Amosite

NADIS denotes No Asbestos Detected in Sample

NBFO denotes No Bulk fibres Observed

T Trace

L Low (2-15%)

M Medium (15-50%)

H High (>50%)

#### General notes:

A this analysis was subcontracted to another laboratory

\$ Within laboratory tolerances

\$\$ unable to analyse due to nature of sample

¥ Results for guidance only, possible interference

& Blank corrected

LS insufficient sample for analysis

Intf Unable to analyse due to interferences

N.D Not determined

N.R Not recorded

N.Det Not detected

Req Analysis Requested, see attached sheets for results

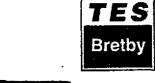
\* denotes this result not UKAS accredited on this sample

> Raised detection limit due to nature of sample

Our Ref : EFS/032527

Your Ref: 9 July 2003

Mr A Garne Geotech Specialists Ltd Carewswood Castlemartyr County Cork Ireland



Geotech Specialists Limited

1 4 JUL 2003

**TES Bretby** 

PO Box 100 Ashby Road Burton-upon-Trent Staffordshire DE15 0XD

Telephone: 01283 554400 Facsimile: 01283 554422

E-mail: enquiries@tes-bretby.co.uk

Dear Mr Garne

#### SOILS ANALYSIS - Dublin Waste

Please find attached analytical results for the samples from the above site.

An invoice for this work will follow under separate cover.

If appropriate, samples covered by this report will be saved until approximately 06/08/03 when they will be discarded. Please call 01283 554403 for an extension of this date.

Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 3 year

The work was carried out in accordance with Mowlem Environmental Sciences Group Standard Terms and Conditions of Contract.

Please contact me if your require any further information.

Yours sincerely

J Hannah

J Hannah
Project Co-ordinator
01283-554403



# TEST REPORT SOIL SAMPLE ANALYSIS



1252

# TES Report No. EFS/032527

Site: Dublin Waste

Geotech Specialists Ltd Carewswood Castlemartyr County Cork Ireland

The 3 samples described in this report were scheduled for analysis by TES Bretby on Wednesday, 25 June 2003. The analysis was completed by Wednesday, 9 July 2003.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby laboratories.

The following tables are contained this report:

Table 1 Main Analysis Results Table of Report Notes (1 Page)

On behalf of
TES Bretby: January
J Hannah Project Co-ordinator

Date of Issue: 09/07/03

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results

TES Bretby, P.O. Box 100, Burton-on-trent, DE15 0XD Tel: 01283 554400 Fax: 01283 554422 TES Bretby is a division of Mowlem Environmental Sciences Group Registered in England Number 77628

= TES Bretby = Report 03252' Control Page Sheet 1/1

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mg/kg	CPMSS	0.5	96/	Nickel (MS)	29	23.8	52.4																			Date Printed	Report Number	Table Number	Page Number
mg/kg	CPMSS	0,10	79S	Mercury (MS)	0.21	69.0	0.49																						
mg/kg	CPMSS	0.5	yes	Lead (MS)	30.6	479.2	822.6										15	j.											
mg/kg	CPMSS	0.5	yes	Copper (MS)	65.3	42.4	189.5				S	) وجو ايم. الأ	000	ioi A.	dily	Oli													
mg/kg	ICPMSS	0.5	yes	Chromium (MS)	20.5	17.5	58.3	OS)	oil o	A Pi	ie Ne	gar															Cacto.	מטומ	
mg/kg	ICPMSS	0.1	798	Cadmium (MS)	0.13	1.26	(S)	yir																lists			Dublin Macta	)     v	
то/ко				Arsenic (MS)	12.10%	13.50	23.2																	Geotech Specialists	пе		2	3	
mg/kg	ICPACIDS	2	YBS		683	8350	7180																	Geoter	Mr A Game				
mg/kg	ELESULP	8	798	Elementa! Sulphur	48	21	9ZV																	ате	٠				
mg/kg				Cyanide (Free)	⊽	⊽	⊽																	Cilent Name	Contact		·		
Units:	Method Codes:	Detection Limits :	UKAS Accredited :	Client Sample Description	TP001 1.2-1.6	TP004 1,2-1,4	TP007 0,7-0.8																	TES Brothy		Burton-on-Trent, Staffordshire, DE15 0XD	Tel +44 (0) 1203 554400	Fax +44 (0) 1283 554422	
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mg/kg	CPBOK	200	2	Boron.	6.0	<u>~</u>	 	S.															Geotech Specialists		me		Dublin		
mg/kg	WSLM4	0.0	yes	Phenol Index	<0.5	\$,05	<0.5						_	-								-	Geote		Mr A Garne				
pH Units	_		V83	pH units	9.5	-	0.6	   															Client Name		tact	•	٠		
ts: mg/kg	SCNC	2	sex : pe	Thiocyanate.	€0.5	<0.5	€,0,5		_	-			_	_			+	1			•			···.	Contact	08			_
Units	Method Codes:		UKAS Accredit	Client Sample Description	TP001 1.2-1.6	TP004 1.2-1.4	TP007 0.7-0.8																	TES Bretby				Fax +44 (0) 1283 654422	
				TES ID Number CL/	0318338	0318337	0318338																7170	C 1		Bretby			

# Report Notes

Soll/Solid analysis specific:

Results expressed as mg/kg unless stated otherwise S04 analysis not conducted in accordance with BS1377 Water Soluble Sulphate on 2:1 water soil extract AR denotes analysis conducted on the As Received sample # co-duted with berzo(b)fluoranthene ## co-duted with Indeno(123-cd)pyrene BTEX analysis expressed as ug/kg As Received Phenol HPLC results expressed as mg/kg As Received

#### Water analysis specific:

Results expressed as mg/l unless stated otherwise

#### Oil analysis specific:

Results expressed as mg/kg unless stated otherwise S.G. expressed as g/cm<sup>3</sup>@ 15°C

#### Filter analysis specific:

Results expressed as mg on filter unless stated otherwise

#### VOC analysis specific:

Explanatory notes for data flagging

U = undetected above reporting limit

J = concentration at instrument was below lowest calibration standard

E = concentration at instrument was above top calibration standard

B = compound was detected in method blank

#### Gas (Tedlar bad) analysis specific:

Results expressed as ug/l unless stated otherwise

#### Air (Carbon tube) analysis specific:

Results expressed as ug on tube unless stated otherwise

#### Asbestos analysis specific:

CH denotes Chrysotile

CR denotes Crocidolite

AM denotes Amosite

NADIS denotes No Asbestos Detected in Sample

NBFO denotes No Bulk fibres Observed

T Trace

L Low (2-15%)

M Medium (15-50%)

H High (>50%)

#### General notes:

A this analysis was subcontracted to another laboratory

\$ Within laboratory tolerances

\$\$ unable to analyse due to nature of sample

¥ Results for guidance only, possible interference

& Blank corrected

LS insufficient sample for analysis

Intf Unable to analyse due to interferences

N.D Not determined

N.R Not recorded

N.Det Not detected

Req Analysis Requested, see attached sheets for results

\* denotes this result not UKAS accredited on this sample

> Raised detection limit due to nature of sample

Our Ref : EFS/034319

Your Ref: 21964 31 October 2003

Mr M Kelley Geotech Specialists Ltd Hartwell Upper Kill County Kildare Eire



#### **TES Bretby**

PO Box 100 Ashby Road Burton-upon-Trent Staffordshire DE15 OXD

Telephone: 01283 554400 Facsimile: 01283 554422

-mail: enquiries@tes-bretby.co.uk

Dear Mr Kelley

#### SOILS ANALYSIS - Dublin Waste

Please find attached analytical results for the samples from the above site.

An invoice for this work will follow under separate cover.

If appropriate, samples covered by this report will be saved until approximately 28/11/03 when they will be discarded. Please call 01283 554403 for an extension of this date. Please be aware that from 1 January 2003 our policy for the retention of paper based laboratory records and analysis reports will be 3 years

The work was carried out in accordance with Mowlem Environmental Sciences Group Standard Terms and Conditions of Contract.

Please contact me if you require any further information.

Yours sincerely

J Elstub

Project Co-ordinator

01283-554403



# TEST REPORT SOIL SAMPLE ANALYSIS



1055

# TES Report No. EFS/034319

Site: Dublin Waste

Geotech Specialists Ltd Hartwell Upper Kill County Kildare Eire

The 2 samples described in this report were scheduled for analysis by TES Bretby on Friday, 17 October 2003. The analysis was completed by Friday, 31 October 2003.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Brethy laboratories.

The following tables are contained in this report:

Table 1 Main Analysis Results
Table of TPH Chromatogram (1 Page)
Table of Report Notes (1 Page)

On behalf of TES Bretby : J Elstub

Project Co-ordinator

Date of Issue: 31/10/03

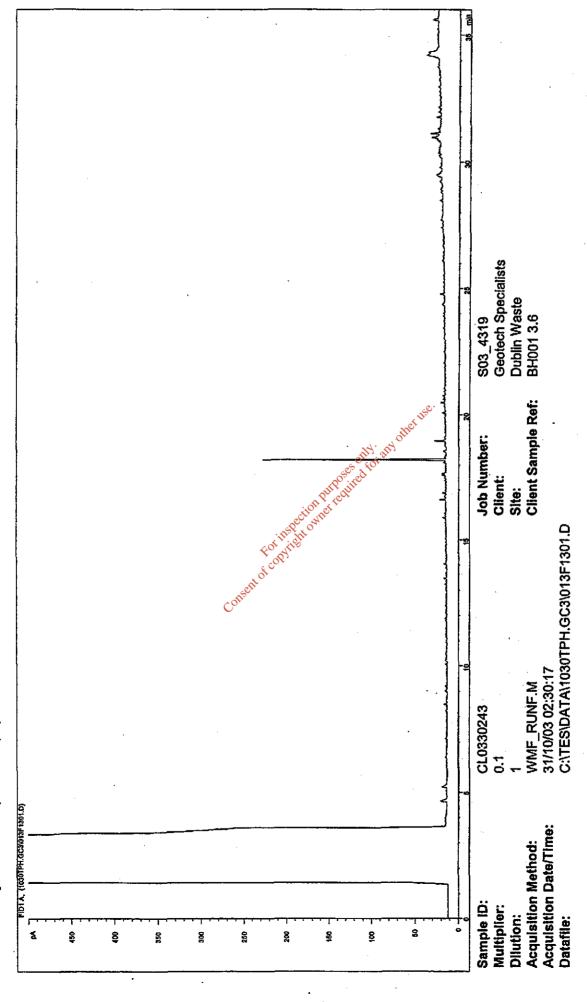
Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results

= TES Bretby Report 0343 Control Pag Sheet 1/

mg/kg	200	ο. Ο	ye8	Thìocyanate.		<0.5					-																-			S		
mg/kg	-	-+	-		-	<0.1		-		+	+			-		+				-		-	+	-	-					UKA	4252	
mg/kg	40000	2	yes			88																		+				<del></del>	October 2003	EFS/034319	-	1 of 2
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mg/kg	0750	-	yes				-		•	E .																	Soils Sample Analysis					
mg/kg	_	3.0	yes	Zinc (MS)		320.9																					oils Sa		ted	umber	mber	mber
mg/kg	+	-}	-	Selenium (MS)		1.10																				'	<i>,</i>		Date Printed	Report Number	Table Number	Page Number
mg/kg	4			Nickel (MS)		24.9																										
mg/kg	+	-	-	Mercury (MS)		0.34													300	159	2											
mg/kg	CAMPS	0.5	yes	Lead (MS)		178.6								رون	95	200	òt.	MY C	Str.													
mg/kg	CLAMBO	0,5	Yes	Copper (MS)		27.5				35	e di	04	Dil	ed	3															400	asie	
mg/kg	2000	0.5	yes	Chromium (MS)		19.2	4	₹ S	or Co	Til.	$\sim$																ists			Dublin Woods	A	
mg/kg	2012	0.1	yes	Cadmium (MS)		0.90	150					-															Geotech Specialists			ָב ב		
mg/kg	CPMSS	9.0	yes	Arsenic (MS)		12.80																					Geotec	Mr M Kelley				
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Bretby	Burbn-on-Trent, Staffordshire, DE15 0x0									Date	Date Printed		31 Octo	31 October 2003		)   
	Tel +44 (0) 1283 654400					Dublin Wasta	neto			Repo	Report Number		됩	EFS/034319	UKAS	\ S
	FBX +44 (0) 1283 554422				3	)	אסומ			Tabk	Table Number			•	1252	~
										Page	Page Number			2 of 2		



# Report Notes

#### Soil/Solid analysis specific:

Results expressed as mg/kg unless stated otherwise S04 analysis not conducted in accordance with BS1377 Water Soluble Sulphate on 2:1 water.soil extract AR denotes analysis conducted on the As Received sample # co-eluted with benzo(b)fluoranthene ## co-eluted with Indeno(123-cd)pyrene BTEX analysis expressed as ug/kg As Received Phenoi HPLC results expressed as mg/kg As Received

#### Water analysis specific:

Results expressed as mg/l unless stated otherwise

#### Oil analysis specific:

Results expressed as mg/kg unless stated otherwise S.G. expressed as g/cm3@ 15°C

#### Filter analysis specific:

Results expressed as mg on-filter unless stated otherwise

#### VOC analysis specific:

Explanatory notes for data flagging U = undetected above reporting limit

J = concentration at instrument was below lowest calibration standard E = concentration at instrument was above top calibration standard

B = compound was detected in method blank

#### Gas (Tedlar bag) analysis specific:

Results expressed as ug/l unless stated otherwise

#### Air (Carbon tube) analysis specific:

Results expressed as ugon tube unless stated otherwise

#### Asbestos analysis specific:

CH denotes Chrysottle CR denotes Crocidolite AM denotes Amosite NADIS denotes No Asbestos Detected in Sample NBFO denotes No Bulk fibres Observed T Trace L Low (2-15%) M Medium (15-50%) H High (>50%)

#### General notes:

A this analysis was subcontracted to another laboratory \$ Within laboratory tolerances \$\$ unable to analyse due to nature of sample ¥ Results for guidance only, possible interference & Blank corrected I.S insufficient sample for analysis Intf Unable to analyse due to interferences **N.D** Not determined N.R Not recorded N.Det Not detected

Req Analysis Requested, see attached sheets for results \* denotes this result not UKAS accredited on this sample P Raised detection limit due to nature of sample



# ALcontrol Laboratories (Dublin)

18a Rosemount Business Park, Ballycoolin, Dublin 11 Ireland

Tel: +353 (0) 1 8829893 Fax: +353 (0) 1 8829895

#### CERTIFICATE OF ANALYSIS

Client:

Geotech Specialists Ltd

Carewswood Castlemartyr Co.Cork

Geotech Specialists Limited 2 1 AUG 2003

Attention:

Ronan Lynam

Date:

15 August, 2003

Our Reference:

03-B02557

Your Reference:

**DUBLIN WASTE KD3116** 

Location:

for analysis on Wednesday, A total of 2 samples was received 30 July 2003. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

Signed

Site Manager

Compiled By

Natalie Duncan

# ALcontrol Laboratories in eland Test Schedule

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			٠	-	-		ALcontrol Reference	03-802557-S0004-A01	03-802557-S0005-A01																			Notes: N		

\* SUBCONTRACTED TO OTHER I ABORATORY / \*\* CANABLES AND COMMENDED TO STATE OF THE ST

✓ Validated

# ALcontrol Laboratories Ireland

Table Of Results

Ref Number: 03-B02557

Date of Receipt: 30/07/03

Client: Geotech Specialists Ltd

Sample Type: SOIL

Client Contact: Ronan Lynam Location:

Consent of convince of the con

Checked By

Natalie Duncan

Printed at 18:32 on 18/08/03

Appendix

Appendix

Consent of copyright owner required to the 
#### **APPENDIX**

- 1. Results are expressed as mg/kg dry weight unless otherwise stated, excluding analyses in (2) below.
- 2. Leach tests, cyanide, phenols by MS, hexavalent chrome, flash point, acid soluble sulphides, TPH by IR and volatiles are performed on wet soil as received, and results are expressed as mg/kg of wet soil or mg/I of Leachate of specified leach test. Ammoniacal nitrogen and total phenols by HPLC are performed on wet sample but are then re-calculated and expressed as mg/kg of dry soil.
- 3. ICP metals results are analysed using a screening program and the data is accurate to within 20%
- 4. The Majority of analyses are run to an accuracy of 10%, but this may be improved upon if legally defensible data is required.
- 5. A sub sample of all samples received will be retained free of charge for two months for soils and one month for waters (sample size permitting), but may then be discarded unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or thereof until the client cancels the request for sample storage.
- 6. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but the turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
- 7. Please note that we take no responsibility for any test performed by subcontractor's (marked with an asterisk).
- 8. Asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD-no fibres present. If asbestos is detected then identification & quantifications is carried out by sub-contractor. If a sample is suspected of containing asbestos then drying & crushing will be suspended on the sample until the asbestos result is known. If asbestos is present then no analysis requiring dry sampling will be undertaken.
- 9. NDP-No determination possible due to insufficient / unsuitable sample.



SCIENTIFIC ANALYSIS LABORATORIES LTD.

Mediock House, New Elm Road, Manchester M3 4JH Telephone: 0161-827 1400

Fax: 0161-827 1414

Job 37310E/Dioxins

# Dioxin and Furan Analysis For

# ALcontrol Geochem Ireland

Rosemount Business Park,

Date of Sample Receipt: 31/07/03

Date(s) of Sample Testing: 31/07/03 - 11/08/03

Date of Issue of Report: 11/08/03



### Scientific Analysis Laboratories Ltd.

## **Certificate of Analysis**

All analytical results contained within have been obtained in accordance with the Laboratory's standard operating procedures contained in SAL SOP #1

Any deviations from these standard operating procedures are described in the following text.

Report written by.....Signature/date.

Report checked by......Signature/date.

Director

### Job 37310E/Dioxins

# Scientific Analysis Laboratories Ltd.

# **Report Checking Form**

CHECK	SIGNED/DATE
CLIENT ID vs LAB ID CHECKED LITTLE TO THE CH	19 1/0
DETECTION LIMITS CHECKED	D 1/1/0
QUALITY CONTROLED DATA CHECKED	D 11/40
SAMPLE TEQS TRANSPOSED TO SUMMARY COR	RECTLY 11/8/03
SAMPLE NARRATIVES CHECKED	( 11/8/a
ID OF TARGET COMPOUNDS	E 161/03
SELECTED ANALYTE CONCNS. CHECKED FROM F	RAW DATA 5 11/6/07
TRACKING FORMS CHECKED	65 11K/v

#### Sample Data Pack, JOB # 37310E

#### **Table of Contents**

Chapter.page ni	ımber
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- 1.5 Summary of Objectives
- 2.5 Sample data and results presentation
- 3.6 Toxic Equivalent Factors
- 4.7 Data Summary
- 5.8 Sample Number 37310E001, Your Reference "03-B02557-50004-AD1 TP9 (0.7-0.9m)".
- 6.13 Sample Number 37310E002, Your Reference "03-B02557-50005-AD1 TP2 (1.0-1.1m)".
- 7.18 Reagent Blank Narrative
- 8.23 Extraction and Clean Up Procedures
- 9.23 Analytical Procedures
- 10.24 (a) GC Conditions for the Analysis
  (b) Acquisition System Used for Window Standard.
- 11.25 Mass Spectrometer Conditions and Instrumentation Used
- 12.25 Compounds Present in the Window Determination Standard.
- 13.26 Raw Data from the Window Determination Standard Including Peak Identifications.
- 14.27 Acquisition Systems Used for Sample Analysis.
- 15.29 Dioxin and Furan Calibration Standards Preparation Certificate.
- 16.30 Initial Calibration Results Table (IC1707)
- 17.34 Continuing Calibration Check, 8th August 2003
- 18.36 Estimation of Method Detection Limits
- 19.37 GC Performance Check
- 20.38 GC Performance Check Data DB5-ms Column, 8th August 2003
- 21.39 Sample Log Sheet
- 22.40 SAL Authorised Signatories Register

#### 1.5 Summary of Objectives

Two soil samples were analysed for the seventeen 2,3,7,8 containing chlorinated dibenzo-p-dioxins and chlorinated dibenzo-furans. The concentrations of total tetra-through heptachlorinated dioxin and furan homologues were also determined.

Please note that the data reported here are based on the samples on a 'dried and ground' basis. Analysis and quantitation was performed at SAL via isotope dilution high resolution gas chromatography/ high resolution mass spectrometry according to SAL SOP #1. Tests covered by this report are within the scope of our UKAS accreditation.

The detection limits for these samples were between 0.2 and 0.4 ng/kg per congener, depending upon the specific sample and congeners involved.

Raw data from calibration and sample analyses are archived indefinitely on magnetic tape.

#### 2.5 Sample data and results presentation

This is a brief explanation of the way in which the results are presented for this sample. The sample data pack commences with a sample narrative, this contains any comments upon the data, or any peculiarities observed in the sample's pathway through the laboratory.

Following this is a data summary sheet, this contains the results obtained for the targeted 2378 containing congeners and the "totals" for other chlorinated dioxin and furan isomers present in the sample.

The next page consists of the recovery information for the isotope labelled standards relative to the <sup>13</sup>C<sub>6</sub>-1,2,3,4-TCDD standard added prior to injection. Any comments thought appropriate will appear in the sample narrative.

Finally the sample tracking sheet is included.

#### "Totals" Determinations

In the case of quantitation of isomers other than the 2378 containing ones the RRFs of the first eluting 2378 isomer of the same degree of chlorination (or homologue group) are used.

Note that the current Toxic Equivalent Factors (TEFs) for the German BGA/UBA, US EPA and European Community/NATO (also known as i-TEF) are listed on the next page and are used to produce a total Dioxin and Furan equivalent amount for all congeners.

#### 3.6 Toxic Equivalent Factors

Dîoxîn 2,3,7,8-Isomer		TEF				TEF		
		BGA/UBA	USEPA	EC				
2,3,7,8-TCDD		1.0	1.0	1.0				
1,2,3,7,8-PeCDD		0.1	0.5	0.5				
1,2,3,4,7,8-HxCDD		0.1	0_1	0.1				
1,2,3,6,7,8-HxCDD		0.1	0.1	0.1				
1,2,3,7,8,9-HxCDD		0.1	0.1	0.1				
1,2,3,4,6,7,8-HpCDD		0.01	0.01	0.01				
OCDD		0.001	0.801	0.001				
Total Dioxin Non-2,3,7,8-Isomer								
Summed TCDD		0.01						
Summed PeCDD		0.01						
Summed HxCDD		0.01	•					
Summed HpCDD		0.001						
Furan 2,3,7,8-Isomer			per of the true of true of true of the true of the true of tru					
2,3,7,8-TCDF		0.3	ses die					
1,2,3,7,8-PeCDF		O 1 OUT	1110-1 110-1	0.1				
2,3,4,7,8-PeCDF		n 1 xion xer re	n s	0.05 0.5				
1,2,3,4,7,8-HxCDF		USA OMIT	n 1	0.5				
1,2,3,6,7,8-HxCDF	. న	O STATE	0.1	0.1				
1,2,3,7,8,9-HXCDF	Cousent of co	50.1	0.1	0.1				
2,3,4,6,7,8-HxCDF	J & C	0.1	0.1	0.1				
1,2,3,4,6,7,8-HpCDF	sent	0.01	0.01	0.01				
1,2,3,4,7,8,9-HpCDF	Cotte	0.01	0.01	0.01				
OCDF		0.001	0.001	0.001				
Total Furan Non-2,3,7,8-Isomer								
Summed TCDF		0.01						
Summed PeCDF		0.01						
Summed HxCDF		0.01						

Please note that the USEPA TEFs now employed correspond exactly with those promulgated by NATO/CCMS and the EC.

0.001

Summed HpCDF

#### 4.7 Data Summary

The EC/NATO/CCMS/i-TE total toxic equivalent amounts for each of the samples are given in the table below. Note that the results are reported in ng/kg for the soil samples.

SAL Reference	Your Reference	Amount ng/kg I-TE
37310E001	03-B02557-50004-AD1 TP9 (0.7-0.9m)	2.2
37310E002	03-B02557-50005-AD1 TP2(1.0-1.1m)	19
37310EBL	Method Blank	<0.5

1,72.2

### 5.8 Sample Narrative, Sample Number 37310E001

Extraction/ Clean up :- No Comments.

Data Acquisition:- No Comments.

Data Analysis: A number of the toxic PCDD/Fs were detected in this sample together with some non-toxic ones.

The internal standard recoveries are acceptable.

#### RESULTS SUMMARY REPORT (Sally Version 6.7)

Job Number

: 37310E

**Sample Number : 37310E001** 

Date Acquired : 08-Aug-03 Operator

Acquired File: A:D0808

Client Id :-

Column

:DB5-ms

PC File

: D. Wood

Instrument : Ultima

: R:\D10X1NV\D0808\sample.005\D0808.DAT File Text : 03-B02557-50004-AD1 TP9 (0.7-0.9m)

Compound Name	Quantity	Toxic Ec	puivalents	
	ng/kg	BGA	USEPA	EC
Dioxins				
2,3,7,8-TCDD	N.D.	_		
1,2,3,7,8-PeCDD	N.D.	_		
1,2,3,6,7,8-HxCDD	1.6	0.16	0.16	0.16
1,2,3,4,7,8-HxCDD	N.D.			
1,2,3,7,8,9-HxCDD	0.72	0.072	0.072	0.072
1,2,3,4,6,7,8-HpCDD	58	0.58	0.58	0.58
OCDD	440	0.44	0.44	0.44
Total non-targeted iso	mers	•		
TCDD	4.9	0.049	0.0	0.0
PeCDD	1.7	0.017	0.0 TUSE	0.0
HxCDD	9.4	0.094	0.0 0.0 0.0 0.0 0.0	0.0
нрсоо	71	0.071	1114. 3040	0.0
Total Dioxins TEQ		0.017 0.094 0.071 1.5 HOWEN TO THE PROPERTY OF	1.3	1.3
Furans	· · · · · · · · · · · · · · · · · · ·	Spection reference		
2,3,7,8-TCDF	0.76	ight 0.076	0.076	0.076
1,2,3,7,8-PeCDF	0.82	0.082	0.041	0.041
2,3,4,7,8-PeCDF	0.64	0.064	0.32	0.32
1,2,3,4,7,8-HxCDF	1.1set	0.11	0.11	0.11
1,2,3,6,7,8-HxCDF	0.73	0.073	0.073	0.073
2,3,4,6,7,8-HxCDF	0.75	0.075	0.075	0.075
1,2,3,7,8,9-HxCDF	N.D.			
1,2,3,4,6,7,8-HpCDF	16	0.16	0.16	0.16
1,2,3,4,7,8,9-HpCDF	0.94	0.0094	0.0094	0.0094
OCDF	45	0.045	0.045	0.045
Total non-targeted iso	ners			
TCDF	2.6	0.026	0.0	0.0
PeCDF	3.7	0.037	0.0	0.0
HxCDF	12	0.12	0.0	0.0
HpCDF	27	0.027	0.0	0.0
Total Furans TEQ		0.90	0.91	0.91
Grand Total TEQ		2.4	2.2	2.2

#### TARGETING REPORT (Sally Version 6.7)

Job Number

: 37310E

Sample Number: 37310E001 Client Id:-

Date Acquired : 08-Aug-03

Acquired File : A:D0808

Operator : D. Wood

Instrument : Ultima

Column :DB5-ms

PC File

: R:\DIOXINV\D0808\sample.005\D0808.DAT File Text : 03-802557-50004-AD1 TP4 (0.7-0.9m)

Compound Name	M1	M2	м	1/M2		Retentio	on Time	Area	RRF	Amount
			thry	acti	Ok	theory	found			
Dioxins										
13C 1,2,3,4-TCDD	326	328	0.78	0.83	Y	00:30:06	00:29:37	111369	1.00	300.0
13C 2,3,7,8-TCDD	332	334	0.78	0.80	Y	00:30:38	00:30:09	25508	1.00	69.0
13C 1,2,3,7,8-PeCDD	368	370	1.55	1.56	Y	00:35:52	00:35:26	25205	0.94	
13C 1,2,3,6,7,8-HxCDD	402	404	1.24	1.19	Y	00:40:20	00:40:01	17345	0.63	74.0
1,2,3,6,7,8-HxCDD	390	392	1.24	1.31	γ	00:40:21	00:40:01	288	1.03	1.6
1,2,3,7,8,9-HxCDD	390	392	1.24	1.28	Y	00:40:44	00:40:26	114	0.91	0.7
13C 1,2,3,4,6,7,8-HpCDD	436	. 438	1.05	1.08	Y	00:44:34	00:44:10	12982	0.56	63.0
1,2,3,4,6,7,8-HpCDD	424	426	1.05	1.03	Y	00:44:35	00:44:11	7007	0.93	57.8
13C OCDD	470	472	0.89	0.87	Y	00:49:16	00:48:50	6939	0.33	56.3
OCDD	458	460	0.89	0.91	Y	00:49:17	00:48:52	31458	1.03	439.5
Furans		•				DD-30-04				
470 4 6 7 4 000					, oth	Je,				
13C 1,2,3,4-TCDD	326	328	0.78	0.83	$\mathfrak{D}_{i}$	00.30.00	00:29:37	111369	1.00	300.0
13C 2,3,7,8-TCDF	316	318	0.78	~ W 20>	Y	00:29:56	00:29:26	35363	1.36	70.1
2,3,7,8-TCDF	304	306	0.78	0.75	Y	00:29:57	00:29:27	283	1.06	0.8
13C 1,2,3,7,8-PeCDF	352	354		1.52	Y	00:34:27	00:34:00	31982	1.19	72.7
1,2,3,7,8-PeCDF	340	342	0.51 1.24	1.53	Y	00:34:28	00:33:58	249	0.95	8.0
2,3,4,7,8-PeCDF	340	342	₹.55	1.60	Y	00:35:34	00:35:08	188	0.92	0.6
13C 1,2,3,4,7,8-HxCDF	384	386 ilig	<b>8.51</b>	0.50	Y	00:39:12	00:38:48	24763	0.84	79.3
1,2,3,4,7,8-HxCDF	374	210.00,	1.24	1.35	Y	00:39:12	00:38:48	283	1.07	1.1
1,2,3,6,7,8-HxCDF	374	7.0		1.26	Y	00:39:21	00:38:59	204	1.13	0.7
2,3,4,6,7,8-HxCDF	374	<b>376</b>	1.24	1.29	Y	00:40:04	00:39:44	170	0.91	8.0
13C 1,2,3,4,6,7,8-HpCDF	418		0.46	0.42	Y	00:43:06	00:42:45	10222	0.57	47.9
1,2,3,4,6,7,8-HpCDF	408	410	1.05	1.00.	Y	00:43:07	00:42:46	2029	1.27	15.7
1,2,3,4,7,8,9-HpCDF	408	410	1.05	1.00	Y	00:45:28	00:45:02	79	0.73	0.9
130 0000	470	472	0.89	0.87	Y	00:49:16	00:48:50	6939	0.33	56.3
OCDF	442	444	0.89	0.90	Y	00:49:42	00:49:15	2926	0.93	45.4

#### **RECOVERY REPORT** (Sally Version 6.7)

Job Number : 37310E Sample Number : 37310E001 Client 1d :-

Date Acquired : 08-Aug-03 Acquired File : A:D0808

Operator : D. Wood Instrument : Ultima Column :DB5-ms

PC File : R:\DIOXINV\D0808\sample.005\D0808.DAT File Text : 03-B02557-50004-AD1 TP9 (0.7-0.9m)

Compound Name	Recovery %	Standard Addition / ng
Dioxins		
13C 1,2,3,4-TCDD		
13C 2,3,7,8-TCDD	69	1.00
13C 1,2,3,7,8-PeCDD	72	1.00
13C 1,2,3,6,7,8-HxCDD	74	1.00
13С 1,2,3,4,6,7,8-нрсоо	63	1.00
13C OCDD	56	1.00
Furans		
13C 1,2,3,4-TCDD		
13C 2,3,7,8-TCDF	70	1.00
13C 1,2,3,7,8-PeCDF	73	1.00
13C 1,2,3,4,7,8-HxCDF	79	1.00 1.00 the the 1.00 the
13с 1,2,3,4,6,7,8-нрсоғ	48	1-00 500
13C OCDD	79 48 56  For inspection for only right of	100 C
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# SAL Sample Tracking Form: Issue 6

#### PLEASE INITIAL AND DATE ALL ENTRIES

Job Number_	37310	Sample Num	ber <u>001</u>	Analysis	<u> PCOPIF</u>		
***********	*****************************	***********	Sample Extra	ction	)		***********
Weight/Volum	ne Extracted	10.00	<u>s</u>	<del></del>		DS-08-03	RSU
PCCD/F Inter	nal Standard id/Lo	t #/VolumeEl	DF957/32461-8:	3/ 46	عبد	05·08·03	PSU
PCB Internal	Standard id/Lot #/	Volume					
Extraction Me	thod/Solvent/Volu	me SOXHU	et tou	œν€	300ml	08.08.03	PSU
Extraction Sta	rt <u>16:00</u>	08.08.03	ROU End	Ø9÷∞		೧೯६०९	POU
Additional Co	mments			*****			
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			Extract Clean	-up			
Clean-up 1	COMBINATIO	N COLUM	الم	inst ilse.		06.08.03	PSV
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Method	SALLY (DIO	x NV)				10/08/0	STAN
	-						
Additional Con	nments						
CAT OTTO							·

#### 6.13 Sample Narrative, Sample Number 37310E002

Extraction/ Clean up :- No Comments.

Data Acquisition:- No Comments.

Data Analysis: - All bar one of the toxic PCDD/Fs were detected in this sample together with some non-toxic ones.

The internal standard recoveries are acceptable.

#### RESULTS SUMMARY REPORT (Sally Version 6.7)

Job Number

: 37310E

Sample Number: 37310E002

Client Id :-

:DB5-ms

Column

Operator

Date Acquired : 08-Aug-03 : D. Wood

Acquired File : A:D0808

Instrument : Ultima

: R:\DIGXINV\D0808\sample.006\D0808.DAT

PC File File Text

: 03-802557-50005-AD1 TP2(1.0-1.1m)

Sample Employed: 10.0 g

Compound Name	Quantity	Toxic			
	ng/kg	BGA	USEPA	EC	
Dioxins					
2,3,7,8-TCDD	N.D.				
1,2,3,7,8-PeCDD	1.3	0.13	0.64	0.64	
1,2,3,6,7,8-HxCDD	13	1.3	1.3	1.3	
1,2,3,4,7,8-HxCDD	3.3	0.33	0.33	0.33	
1,2,3,7,8,9-HxCDD	5.3	0.53	0.53	0.53	
1,2,3,4,6,7,8-HpCDD	380	3.8	3.8	3.8	
OCDD	3600	3.6	3.6	3.6	
Total non-targeted iso	mers				
TCDD	23	0.23	0.0	0.0	
PeCDD	28	0.28	0.0	, 15° 0.0	
HXCOD	1 <b>9</b> 0	1.9	0.0	71 <sup>c1</sup> 0.0	
HpCDD	450	0.45	Onio any	0.0	
Total Dioxins TEQ		13	IIPOSES OF FOR	10	
Furans	-	Dection of	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	<del></del>	
2,3,7,8-TCDF	5.9	ON 0:591	0.59	0.59	
1,2,3,7,8-PeCDF	17	1.3 0.66	0.86	0.86	
2,3,4,7,8-PeCDF	6.9	్0.69	3.5	3.5	
1,2,3,4,7,8-HxCDF	13 ngen	1.3	1.3	1.3	
1,2,3,6,7,8-HxCDF	6.6 COV	0.66	0.66	0.66	
2,3,4,6,7,8-HXCDF	7-6	0.76	0.76	0.76	
1,2,3,7,8,9-Hxcor	N.D.				
1,2,3,4,6,7,8-HpCDF	89	0.89	0.89	0.89	
1,2,3,4,7,8,9-HpCDF	16	0.16	0.16	0.16	
OCDF	330	0.33	0.33	0.33	
Total non-targeted ison	ners				
TCDF	58	0.58	0.0	0.0	
PeCDF	53	0.53	0.0	0.0	
HXCDF	110	1.1	0.0	0.0	
HpCDF	13	0.013	0.0	0.0	
Total Furans TEQ		9.2	9.0	9.0	
Grand Total TEQ		22	19	19	

Report 37310E/Dioxins Page 14 of 40

#### TARGETING REPORT (Sally Version 6.7)

Job Number

: 37310E

Sample Number : 37310E002

Client Id :-

Date Acquired : 08-Aug-03

Acquired File : A:D0808

Operator PC File

: D. Wood

Instrument : Ultima

Column

File Text

: R:\DIOXINV\D0808\sample.006\D0808.DAT

: 03-B02557-50005-AD1 TP2 (1.0-1.1m)

Compound Name	M1	M2	M'	1/H2		Retentio	xn Time	Area	RRF	Amount
			thry	acti	0k	theory	found			
Dioxins										
13C 1,2,3,4-TCDD	326	328	0.78	0.86	Y	00:30:06	00:29:43	35168	1.00	300.0
13C 2,3,7,8-TCDD	332	334	0.78	0.83	Y	00:30:38	00:30:12	8670	1.00	74.3
13C 1,2,3,7,8-PeCDD	368	370	1.55	1.57	Y	00:35:52	90:35:30	8016	0.94	72.9
1,2,3,7,8-PeCDD	356	358	1.55	1.40	Y	00:35:53	00:35:31	90	0.88	1.3
13C 1,2,3,6,7,8-HxCDD	402	404	1.24	1.28	Y	00:40:20	00:40:04	4289	0.63	58.0
1,2,3,6,7,8-HxCDD	390	392	1.24	1.23	Y	00:40:21	00:40:05	586	1.03	13.2
1,2,3,4,7,8-HxCDD	<b>39</b> 0	392	1.24	1.39	Y	00:40:13	00:39:58	124	0.88	3.3
1,2,3,7,8,9-HxCDD	390	392	1.24	1.29	Y	00:40:44	00:40:30	206	0.91	5.3
13C 1,2,3,4,6,7,8-HpCDD	436	438	1.05	1.10	Y	00:44:34	00:44:14	2551	0.56	39.2
1,2,3,4,6,7,8-HpCDD	424	426	1.05	1.04	Y	00:44:35	90:44:15	8988	0.93	377.3
13C OCDD	470	472	0.89	0.85	Y g	00:49:16	00:48:54	1092	0.33	28.1
OCDD	458	460	0.89	0.91	YUSC	00:49:17	00:48:55	40980	1.03	3636.6
_				· so	ine,					
Furans		426 472 460 328 318 306 354 354 343 343 343 343	ड on	ot any						
13C 1,2,3,4-TCDD	326	328	. 78°	0.86	Y	00:30:06	00:29:43	35168	1,00	300.0
13C 2,3,7,8-TCDF	316	318	QUI 0.078	0.69	Ý	00:29:56	00:29:32	12655	1.36	79.5
2,3,7,8-TCDF	304	306 JUN	Ø 0.78	0.67	Y	00:29:57	00:29:33	791	1.06	5.9
13C 1,2,3,7,8-PeCDF	352	306 dion 354 Perion 354 Perion 342 Perion	1.55	1.44	Y	00:34:27	00:34:04	11402	1.19	82.1
1,2,3,7,8-PeCDF	340	342,1971	1.55	1.51	Y	00:34:28	00:34:02	1851	0.95	17.2
2,3,4,7,8-PeCDF	340	342	1.55	1.58	Y	00:35:34	00:35:12	725	0.92	6.9
13C 1,2,3,4,7,8-HxCDF	20/	X 300	0.51	0.55	Y	00:39:12	00:38:52	6859	0.84	69.6
1,2,3,4,7,8-HxCDF	374 Sent	376	1.24	1.28	Y	00:39:12	00:38:53	920	1.07	12.5
1,2,3,6,7,8-HxCDF	324	376	1.24		Y	00:39:21	00:39:03	509	1.13	6.6
2,3,4,6,7,8-HxCDF	374	376	1.24		Y	00:40:04	00:39:48	475	0.91	7.6
13C 1,2,3,4,6,7,8-HpCDF	418	420	0.46	0.45	Y	00:43:06	00:42:50	2328	0.57	34.5
1,2,3,4,6,7,8-HpCDF	408	410	1.05	1.03	Y	00:43:07	00:42:51	2636	1.27	89.4
1,2,3,4,7,8,9-HpCDF	408	410	1.05	1.08	Y	00:45:28	00:45:06	267	0.73	15.8
130 0000	470	472	0.89	0.85	Y	00:49:16	00:48:54	1092	0.33	28.1
OCDF	442	444	0.89	0.87	Y	00:49:42	00:49:20	3378	0.93	333.1

### **RECOVERY REPORT** (Sally Version 6.7)

Job Number : 37310E Sample Number : 37310E002 Client Id :Date Acquired : 08-Aug-03 Acquired File : A:D0808

Operator : D. Wood Instrument : Ultima Column :DB5-ms

PC File : R:\DIOXINV\D0808\sample.006\D0808.DAT File Text : 03-B02557-50005-AD1 TP2 (1.0-1.1m)

Compound Name	Recovery %	Standard Addition / ng
Dioxins		
13C 1,2,3,4-TCDD		
13C 2,3,7,8-TCDD	74	1.00
13C 1,2,3,7,8-PeCDD	73	1.00
13C 1,2,3,6,7,8-HxCDD	58	1.00
13C 1,2,3,4,6,7,8-HpCDD	39	1.00
13C OCDD	28	1.00
Furans		
13C 1,2,3,4-TCDD		
13C 2,3,7,8-TCDF	79	1_00
13C 1,2,3,7,8-PeCDF	82	1.00
13C 1,2,3,4,7,8-HxCDF	70 .	1.00
13C 1,2,3,4,6,7,8-HpCDF	35	1.00 💥
13C OCDD	28	1.00
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# SAL Sample Tracking Form: Issue 6

### PLEASE INITIAL AND DATE ALL ENTRIES

Job Number_	37310	Sample Number	002	Analysis	PCOOLE		<del></del>
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Weight/Volum	e Extracted	و00:00				<b>८</b> € <b>८</b> ₽ <b>८</b> ७	POU
PCCD/F Inter	nal Standard id/I	ot #/VolumeEDF9	57/32461-83	3 <u>/46</u>	<u>zul</u>	02.08.03	PON
PCB Internal S	Standard id/Lot#	#/Volume				OS-08-03	Asu
Extraction Me	thod/Solvent/Vol	ume_SOXHLET	TOW	ENE	300ml	Q2-08-03	POU
	nt 16:00	r				Cp.08-03	POA
Additional Co	mments		-				
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Additional Co	mments						
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SAL STF v.6	-	Report 37310F	/Dioxine P	200 17 of 40		Issued 15	/11/02

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#### 7.18 Reagent Blank Narrative

Extraction/ Clean up :- No Comments.

Data Acquisition:- No Comments.

Data Analysis: This reagent blank contains a limited number of the target congeners. It is reported as <0.5 ng/kg I-TEQ in the data summary.

The internal standard recoveries are acceptable.

#### RESULTS SUMMARY REPORT (Sally Version 6.7)

Job Number

: 37310E

Sample Number: 37310EBL

Date Acquired Operator : 08-Aug-03

Acquired File : A:D0808 Instrument : Ultima Client id :-

:DB5-ms

Column

PC File

: D. Wood Instrument : Ultima : R:\DIOXINV\D0808\sample.004\D0808.DAT

File Text

: Method Blank

Sample Employed: 10.0 g

Compound Name Toxic Equivalents Quantity ng/kg USEPA EC Dioxins 2,3,7,8-1CDD N.D. 1,2,3,7,8-PeCDD N.D. 1,2,3,6,7,8-HxCDD 0.16 0.016 0.016 0.016 1,2,3,4,7,8-HxCDD N.D. 1,2,3,7,8,9-HxCOD N.D. 1,2,3,4,6,7,8-HpCDD 1.6 0.016 0.016 0.016 OCDD 4.2 0.0042 0.0042 0.0042 Total non-targeted isomers TCDD N.D. 0.0 PeCDD 1.2 0.012 0.0 HxCDD 0,300 0.56 0.0056 0.0 **HpCDD** N.D. 0.054 Total Dioxins TEQ 0.036 0.036 A.D. Fortigle duned

N.D. Jord of Copyright Owner

N.D. N.D. Furans 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HXCDF 2,3,4,6,7,8-HxCDF N.D. 1,2,3,7,8,9-HxCDF N.D. 0.013 1,2,3,4,6,7,8-HpCDF 1.3 0.013 0.013 1,2,3,4,7,8,9-HpCDF N.D. OCDF 1.9 0.0019 0.0019 0.0019 Total non-targeted isomers TCDF 1.6 0.016 0.0 0.8 PeCDF 0.0062 0.62 0.0 0.0 HXCDF 2.5 0.025 0.0 0.0 **HpCDF** N.D. 0.062 0.015 Total Furans TEQ 0.015 Grand Total TEQ 0.12 0.051 0.051

#### TARGETING REPORT (Sally Version 6.7)

Job Number

: 37310E

Sample Number : 37310EBL

Client Id :-

:085-ms

Column

Date Acquired : 08-Aug-03

Acquired File : A:D0808

Operator

: D. Wood

: Ultima Instrument

PC File

: R:\DIOXINV\D0808\sample.004\D0808.DAT

File Text

: Method Blank

Compound Name	M1	M2	М	1/M2		Retentio	on Time	Area	RRF	Amount
			thry	actl	Ok	theory	found			
Dioxins										
13C 1,2,3,4-TCDD	326	328	0.78	0.85	Y	00:30:06	00:29:34	148320	1.00	300.0
13C 2,3,7,8-TCDD	332	334	0.78	0.84	Y	00:30:38	00:30:04	34908	1.00	70.9
13C 1,2,3,7,8-PeCDD	368	370	1.55	1.50	Y	00:35:52	00:35:23	34363	0.94	74.1
13C 1,2,3,6,7,8-HxCDD	402	404	1.24	1.21	Y	00:40:20	00:39:51	24700	0.63	79.2
1,2,3,6,7,8-HxCDD	390	392	1.24	1.07	Y	00:40:21	00:39:52	40	1.03	0.2
13C 1,2,3,4,6,7,8-HpCDD	436	438	1.05	1.11	Y	00:44:34	00:44:04	17824	0.56	65.0
1,2,3,4,6,7,8-нрСОО	424	426	1.05	1.11	Y	00:44:35	00:44:06	270	0.93	1.6
13c OCDD	470	472	0.89	0.88	Y	00:49:16	00:48:40	11071	0.33	67.4
OCDD	458	460	0.89	0.80	Y	00:49:17	00:48:43	479	1.03	4.2
Furans						00:30:06				
13C 1,2,3,4-TCDD	326	328	0.78	0.85	6 <b>3</b> .	00:30:06	00:29:34	148320	1.00	300.0
13C 2,3,7,8-TCDF	316	318	0.78	0.58	ŇΥ	00:29:56	00:29:23	49340	1.36	73.5
13C 1,2,3,7,8-PeCDF	352	354	1.55	$s^{o} \Delta^{*}$	v	00:34:27	00:33:57	31591	1.19	53.9
13C 1,2,3,4,7,8-HxCDF	384	386	1.55 0.50 0.46	<b>3.51</b>	Y	00:39:12	00:38:42	34139	0.84	82.1
13C 1,2,3,4,6,7,8-HpCDF	418	420	(A)	0.45	Y	00:43:06	00:42:37	22390	0.57	78.8
1,2,3,4,6,7,8-HpCDF	408	410 472 444 FO ON	20° 15.05	0.90	Y	00:43:07	00:42:38	359	1.27	1.3
13C OCDD	470	472	₩D.89	88.0	Y	00:49:16	00:48:40	11071	0.33	67.4
OCDF	442	444 4000	0.89	0.89	Y	00:49:42	00:49:05	199	0.93	1.9

### **RECOVERY REPORT** (Sally Version 6.7)

Job Number : 37310E Sample Number : 37310EBL Client Id :-

Date Acquired : 08-Aug-03 Acquired File : A:D0808

Operator : D. Wood Instrument : Ultima Column :DB5-ms

PC File : R:\DIOX1NV\D0808\sample.004\D0808.DAT

File Text : Method Blank Sample Employed : 10.0 g

Compound Name	Recovery %	Standard Addition / ng
Dioxins		
13C 1,2,3,4-TCDD		
13C 2,3,7,8-TCDD	71	1.00
13C 1,2,3,7,8-PeCDD	74	1.00
13C 1,2,3,6,7,8-HxCDD	79	1.00
13C 1,2,3,4,6,7,8-HpCDD	65	1.00
13C OCDD	67	1.00
Furans		
13C 1,2,3,4-TCDD		
13C 2,3,7,8-TCDF	73	1.00
13C 1,2,3,7,8-PeCDF	54	1.00
13C 1,2,3,4,7,8-HxCDF	82	1.00 1.00 1.000 <sup>E</sup>
13C 1,2,3,4,6,7,8-HpCDF	79	1.0000
13C OCDD	67	1800 all 1800
	82 79 67 67 Consent of copyright own	ooses of for
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	antor	•
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# SAL Sample Tracking Form: Issue 6

#### PLEASE INITIAL AND DATE ALL ENTRIES

Job Number 37309 310 336 419 273	Sample Numb	er BLK	Analysis <u>f</u>	tople + p	CS (MHO15)	
apratia		Sample Extracti	on	45044004 \$ P\$\$ PO PARA DO PARA	4 444444	***********
Weight/Volume Extracted	THIMBLE			•	०५-०४-०३	PSU
PCCD/F Internal Standard id/Lot #/	VolumeED	F957/32461-83/ <u></u>	46	3,1	05.08.03	Ръч
PCB Internal Standard id/Lot #/Vol	ume PCBC	H012 0707	103/A	20,1	OS-08-03	PBU
Extraction Method/Solvent/Volume_	SOXHLE	T DOM: He	cane	ecomi	OS: 08:03	POM
Extraction Start 16:00	5.08.03	RSH End_	09:00		06-08-03	Pan
Additional Comments						
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			<u> </u>			
~!!#!!A********************************	*********		**********	94956 <b>6656</b> 6446 <del>4</del> 4545456	************	6 <del>51</del> ezzteszaekes:
		Extract Clean-uj	p 🔬.			
Clean-up 1COMBINATION	o Cocom	(N)	otherus		Op.Og.O3	PSU
Clean-up 2 FLORISIL Co	OWMN	in esony	Kany	<u> </u>	OF-08-03	PSU
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Additional Comments		SSECTION TEXT		······································		
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Instrument OLTIMA	_Analyte	People	Injection	19584	08 B B	- QX
Instrument	_Analyte		Injection	L		
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Method SALLY (DIOXIN)					10 कि	NO.
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			· ————			
Additional Comments						
SAL STF v.6	Report 3731	0E/Dioxins Pag	ge 22 of 40		Issued 15/	/11/02

### 8.23 Extraction and Clean Up Procedures

Each sample was processed in accordance with the procedures defined in SAL SOP #1. In summary an accurately weighed 10g aliquot of the 'dried and ground' soil sample was placed into a Soxhlet thimble that was then spiked with labelled internal standards. The samples were extracted with 300 mls of toluene for in excess of sixteen hours.

A method blank was prepared in the same way.

Following extraction, the toluene was reduced to incipient dryness in vacuo, prior to reconstitution in ca 5 ml hexane and purification by elution through a column combining sulphuric acid impregnated silica, potassium hydroxide impregnated silica and anhydrous sodium sulphate. The entire eluate from this column was further purified via activated Florisil column chromatography and then concentrated to near-dryness prior to GC/MS analysis.

Immediately prior to analysis by GC/MS nonane spiked with recovery standard  $^{13}$ C<sub>6</sub>-1,2,3,4-TCDD and nonane were added to the samples and the blank (see the sample tracking form for the respective amounts). An aliquot of this solution was then injected onto the GC/MS system.

#### 9.23 Analytical Procedures

The analytical methods may be summarised as follows,

4

Stable isotopically labelled internal standards are added at known concentration to the samples prior to extraction and clean up.

A standard solution containing the known first and last eluting isomers of the tetra, penta, hexa and hepta furans is injected onto the GC/MS system with ions monitored for all the homologues. This allows the setting up of appropriate acquisition windows for the more specific multi-group data acquisition for the sample analysis. The resulting elution windows are incorporated into the multi group acquisition tables.

Following this, another standard solution containing the 2378 TCDD native compound and the known close eluting isomers is injected. This permits the ability of the column to identify 2378-TCDD to be evaluated.

Two masses each are monitored for each native and isotopically labelled congener, this allows the isotope ratio to be checked with the theoretical value as additional confirmation of the compound's identity. Note that although the mass spectrometer is operated at 10,000 resolving power there are still other compounds which may survive the clean up and may be close enough in mass to yield a response in the dioxin or furan channels. To aid in identification of these interferences two other QA masses are monitored, firstly the molecular ion species for polychlorinated diphenyl ethers which yield fragments in their mass spectra of exactly the same mass as the furans, if a response is observed in this channel coincident with the furan masses then the peaks are discarded if appropriate. Secondly, as part of the system's performance checks, a "lock mass" from perfluorokerosene (present in the batch inlet throughout the entire GC run) is monitored and scanned to compensate for any mass drift during the run. Use is made of this feature to monitor the lock mass before it has been used to correct for drift. This trace would, if no large components were present, appear as a continuous line, however, if a large (many nanograms/micrograms) peak elutes from the GC column the ion source sensitivity is suppressed and a negative going "peak" will be seen. If such a peak coelutes with possible interferences they may also be discarded, (see each sample's narrative).

Standards of both the isotopically labelled and native 2378 containing congeners of interest are injected sequentially, starting with the least concentrated. The composition of these are given later. The resulting target results and relative response factors are given.

All 2378 containing native congeners are quantitated by isotope dilution methods relative to their carbon-13 labelled internal standards. For quantitation of the "totals" of all non-2378 containing congeners, the relative response factor is assumed to be the same as for the first eluting native 2378 congener of the same homologue group. For example, non-2,3,7,8-chlorinated PeCDFs are quantified using the RRF derived for 1,2,3,7,8-PeCDF.

As a check upon the efficiency of the extraction/clean up, <sup>13</sup>C<sub>6</sub>-1,2,3,4-TCDD was added to the samples immediately prior to injection onto the GC/MS system. This is also used to help evaluate the method detection limit in the case where no peak is detected for one of the targeted analytes. A recovery table is printed in each sample's report.

A nonane blank is injected prior to sample analysis. This blank must contain no target isomers above noise before the analysis of samples can continue.

The sample log sheet for the job is given at the end of the report.

### 10.24 (a) GC Conditions for the Analysis, Acquisition System Used for Window Standard.

Column 60m J&W DB5-ms, 0.25u film thickness, 0.25mm i.d., head pressure 30 p.s.i.

Program 140° C for 4 minutes, then 15 C°/min to 220° C, then 1.5 C°/min to 240° C, hold for 2 minutes, then 4 C°/min to 310° C, which is held for 10 minutes.

Injection Conditions Temperature 300 °C, Splittess mode, valve time 2 minutes.

#### (b) GC/MS Acquisition System, Window Standard

Group Time, 0:01:0 to 0:50:0

Masses Monitored

Component	Mass	Sample Time(ms)	Delay Time(ms)
TCDF	305.8987	40	10
PeCDF	339.8597	40	10
HxCDF	373.8208	40	10
HpCDF	407.7818	40	10

This test is performed at 1000 resolving power (10% valley definition).

#### 11.25 Mass Spectrometer Conditions and Instrumentation Used

The operating parameters for the mass spectrometer used during sample analysis are listed below.

Resolving Power

10,000 (10% valley definition).

Source Conditions

Electron Energy 30 eV. Trap Current 700 µA.

Source Temperature 250 °C.

**Interface Temperatures** 

280 °C.

**Detector Conditions** 

Amplifier Range 10<sup>-6</sup> Amps Full Scale. Amplifier Response Time 0.01 ms.

Multiplier Voltage 320 volts.

GC/MS system VG Autospec Ultima Mass Spectrometer equipped with HP 5890A Gas Chromatograph. Data system is a VG OPUS. Samples were injected with an HP7673B autosampler.

#### 12.25 Compounds Present in the Window Determination Standard.

	First eluting isomer	Last eluting isomer
Tetra Furan	1368	1289
Penta Furan	13468	12389
Hexa Furan	123468	123489
Hepta Furan	1234678	1234789

Only one isomer exists for the octachiorinated furan and so no standard is necessary to define the acquisition window.

Please note that 1,2,8,9-TCDF elutes after 1,3,4,6,8-PeCDF on the DB-5ms column. On the basis of operator experience, it has been decided that the acquisition windows be set to permit measurement of 1,3,4,6,8-PeCDF, which is far more prevalent in samples than 1,2,8,9-TCDF. The data reported here for "total non-targeted TCDFs" therefore, omits 1,2,8,9-TCDF.

#### Compounds in Column Performance Standard

The following TCDD isomers:

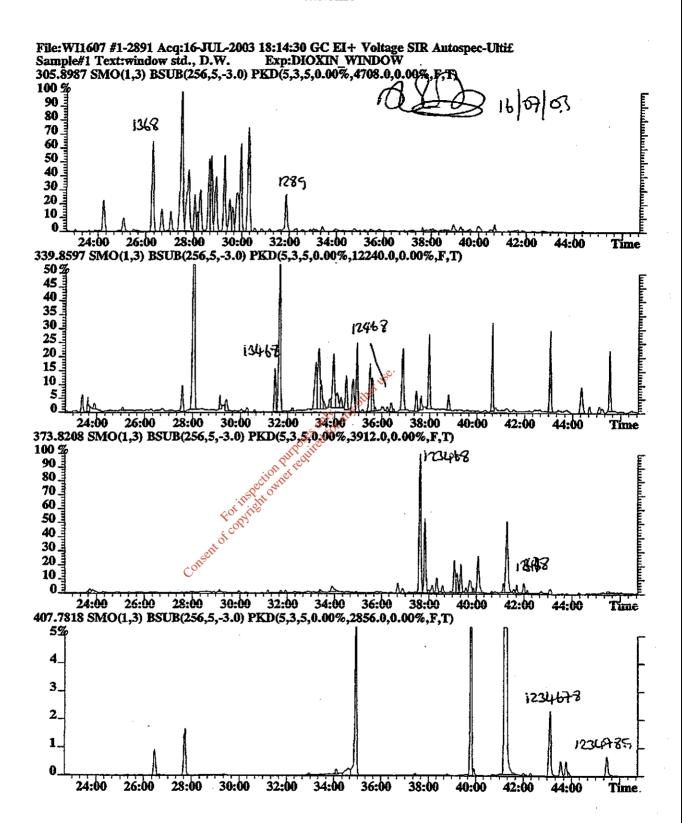
1478, 1234, 1237/1238, 2378, 1278, 1267

Note: The DB5-ms column chosen achieves satisfactory resolution of 2378 TCDF from its close eluting isomers.

EPA protocols require that the separation between 1237/1238 and 2378 TCDD be better than 25% valley, clearly easily achieved on the DB5-ms column used.

Please note that the DB5-ms column employed does not effect satisfactory resolution of 2,3,4,7,8-PeCDF and 1,2,3,7,8,9-HxCDF from their close-eluting isomers. The amount reported for these isomers are therefore the *maximum possible*. The amount of the 2,3,4,7,8-PeCDF may be over reported by as much as 25%, based upon the analysis of five extracts chosen at random that were then confirmed on a polar column.

# 13.26 Raw Data from the Window Determination Standard, Including Peak Identifications.



#### 14.27 Acquisition Systems Used for Sample Analysis.

### Group 1

Component	Mass	Sample Time(ms)	Delay Time(ms)
PFK	292.9825	10	5 Lock Mass Check
PFK	292.9825	50	10 Lock Mass
TCDF	303.9015	100	10
TCDF	305.8987	100	10
<sup>13</sup> C TCDF	315.9419	30	10
<sup>13</sup> C TCDF	317.9389	30	10
TCDD	319.8965	100	10
TCDD	321.8936	100	10
<sup>13</sup> C6 1234 TCDD	325.9166	30	10 Recovery Std.
<sup>13</sup> C6 1234 TCDD	327.9137	30	10 Recovery Std.
<sup>13</sup> C 2378 TCDD	331.9368	30	10 .
<sup>13</sup> C 2378 TCDD	333.9339	30	10
CDPE	375.8364	30	50 Furan Interference

### Group 2

Component	Mass	Sample Time(ms)	Delay Time(m	s)
PeCDF	339.8597	100 differ 16	10	
PeCDF	341.8567	100 🔬 🚕 💞	10	
<sup>13</sup> C PeCDF	351.9000	300 kg and	10	•
<sup>13</sup> C PeCDF	353.8970	300 d for an	10	
PeCDD	355.8546	<sup>310</sup> 100	10	
PeCDD	357.8516	30° 51° 100	10	
PFK	366.9792	100 100 100 100 100 100 100 100 100 100		Lock Mass Check
PFK	366.9792	in the 50	10	Lock Mass
<sup>13</sup> C PeCDD	367.8949	10 <sup>11</sup> 30	10	
<sup>13</sup> C PeCDD	369.8919 🔊	30	10	•
CDPE	409.7974	30		Furan Interference
	Cons			•
~ ~				

### **Group 3**

HxCDF       373.8208       100       10         HxCDF       375.8358       100       10 <sup>13</sup> C HxCDF       383.8639       30       10 <sup>13</sup> C HxCDF       385.8610       30       10         HxCDD       389.8157       100       10         HxCDD       391.8127       100       10         PFK       392.9760       10       5       Lock Mass Check         PFK       392.9760       50       10       Lock Mass <sup>13</sup> C HxCDD       401.8559       30       10 <sup>13</sup> C HxCDD       403.8529       30       10	Component	Mass	Sample Time(ms)	Delay Time(ms	3)
CDPE 445.7555 30 Furan Interference	HxCDF  13C HxCDF  13C HxCDF  HxCDD  HxCDD  PFK  PFK  13C HxCDD  13C HxCDD	375.8358 383.8639 385.8610 389.8157 391.8127 392.9760 392.9760 401.8559 403.8529	100 30 30 100 100 10 50 30	10 10 10 10 10 5 10 10	Lock Mass

### Group 4

Component	Mass	Sample Time(ms)	Delay Time(ma	s)
HpCDF HpCDF  HpCDF  13C HpCDF HpCDD HpCDD HpCDD PFK PFK PFK  13C HpCDD  13C HpCDD CDPE	407.7818 409.7789 417.8253 419.8220 423.7766 425.7737 430.9729 430.9729 435.8169 437.8140 479.7165	100 100 30 30 100 100 10 50 30 30	10 10 10	Lock Mass Check Lock Mass

# Group 5

Component	Mass	Sample Time(ms)	Delay Time	(ms)
OCDF PFK PFK OCDF  13C OCDF OCDD OCDD 13C OCDD 13C OCDD 13C OCDD CDPE	441.7428 442.9728 442.9728 443.7399 453.7830 455.7800 457.7377 459.7348 469.7835 471.7750 513.6775	100 10 50 100 30 30 100 100 100 100 100 100 100	10 5 10 10 10 10 10 10 10 10 10 50	Lock Mass Check Lock Mass

#### 15.29 Dioxin and Furan Calibration Standards Preparation Certificate.

#### Dioxin/Furan Calibration Standards Preparation Certificate

This certifies that a set of five dioxin/furan calibration standards were prepared in accordance with SAL SOP 2, issue 3.

The batch numbers of the stock dioxin and furan reference standards used in the preparation of the calibrations standards were:

<sup>13</sup>C<sub>6</sub>-1,2,3,4-TCDD (080299)

Mixed labelled/native standards CS1-CS5 (EDF-4947), batch numbers 34752-77A, 33384-42B, 35005-04, 3384-42D and 34752-77E respectively.

All the above standards are traceable to certified reference standards purchased from Cambridge Isotope Laboratories.

Signature

Name

**Position** 

Standards prepared by

3

P.Harrington

Dioxin Analyst

Date of Preparation: - CS2: 26/11/01, CS3: 28/06/02, CS1,4,5: 14/08/02.

Standard Codes: - CS1/140802, CS2/261101, CS3/280602, CS4/140802, CS5/140802

Please note that these standards contain <sup>13</sup>C<sub>12</sub>-OCDF and are suitable for use in method EN1948 analysis (SAL SOPIc).

The continuing calibration solution, CS3, is in constant use and is exhausted regularly. This standard is prepared on an as needed basis, the current standard being CS3/280602.

\*\*\*\*\*\*\*\* ?. 170503 PSI

# 16.30 Initial Calibration Results Table (IC1707)

CALIBRATION RESULTS (Sally Version 6.7)

File Number	Date (d:m:ye		File Name				
1 2 3 4 5	17-Jul- 17-Jul- 17-Jul- 17-Jul- 17-Jul-	03 R:\D 03 R:\D 03 R:\D	IOXINV\IC1 IOXINV\IC1 IOXINV\IC1 IOXINV\IC1 IOXINV\IC1	707\sample 707\sample 707\sample	.003\1C170 .002\1C170 .004\1C170	7.DAT 7.DAT 7.DAT	
File	1	2	3	4	5	Average	%s.d.
13C 1,2	,3,4-TCDI	0			Retenti	ion Time Sta	andard
Amount	y Standa 91.0						
RF	1.00	91.0	91.0	91.0	91.0		
RRF		1.00	1.00	1.00	1.00	1.00	
KKF	1.00	1.00	1.00	1.00	1.00	1.00	0
13C 2,3 Interna	,7,8-TCDD					•	jet ise.
Amount	91.0	91.0	91.0	91.0	91.B	1. A Old	>
RF	0.847	0.718	0.784	0.848	0.920	00.00	
RRF	0.847	0.718	0.784	0.848	91.0 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920	0.949	0.00
2,3,7,8	-TCDD				ion Prie	<i>^</i>	
Analyte					Dectr Wile		
Amount	0.5	9-1	1.8	36.0	182.0		
RF	0.005	0.103	0.023	0.42	2.16	0.553	
RRF	1.04	1.03	1.14	1.19 cor	1.08	1.10	6
130 1,2,	3,7,8-Pe	CDD	_	Onser			
Internal				<i>,</i>			
Amount	91.0	91.0	91.0	91.0	91.0		
RF	0.649	0.574	0.653	0.712	0.800	0.00	
RRF	0.649	0.574	0.653	0.712	0.800	0.690	0.00
1,2,3,7, Analyte	8-PeCDD						
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.020	0.435	0.090	1.84	8.84	2.25	
RRF	0.808	0.872	0.903	0.922	0.884	0.878	5
130 1,2,	3,4,7,8-F 3,6,7,8-F Standar	ixCDD			Retentio	n Time Star	ndard
Amount	91.0		04.0	04 -			
RF	0.458	91.0	91.0	91.0	91.0		•
RRF	0.458	0.412	0.456	0.501	0.582	0.00	
1317.1	0.436	0.412	0.456	0.501	0.582	0.505	0.00

1,2,3,6,	.7,8-HxC	DD					
Analyte							
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.024	0.541	0.099	2.08	10.8	2.70	
RRF	0.971	1.08	0.987	1.04	1.08	1.03	5
1,2,3,4,	7,8-HxC	DD .					
Analyte							
Amount	2.3	45.4	9.1	182.0	910.0		
· RF	0.021	0.411	0.099	1.82	8.50	2.17	
RRF	0.845	0.824	0.986	0.911	0.850	0.883	7
1,2,3,7, Analyte	8,9-KxCI	00					
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.021	0.455	0.093	1.91	9.10	2.32	
RRF	0.849	0.913	0.929	0.955	0.910	0.911	4
13C 1,2,		,8-HpCDD-R 8-HpCDD			Retenti	on Time St	andard
Internal		· -					
Amount	91.0	91.0	91.0	91.0	91.0		
RF	0.323	0.272	0.307	0.336	0.401	0.80	
RRF	0.323	0.272	0.307	0.336	0.401	0.394	0.00
1,2,3,4, Analyte	6,7,8-Hf	oCDD				of Other Use	
Amount	2.3	45.4	9.1	182.0	910.0,4	of other	
RF	0.022	0.465	0.093		9.32010	2.37	
RRF	0.899	0.932	0.927	0.978	0.932	0.934	3
				20272	9.320 Por October 19 Por 19 Po		
13C OCDD				actio	inet		
Internal				· 15Pino	1.		
Amount	182.0	182.0	182.0	VOL195681	182.0		
RF	0.394	0.349	0.375	90,403	0.504	0.00	
RRF	0.197	0.175	0.187	§~0.201	0.252	0.234	0.00
OCDD			Collegui				
Analyte							
Amount	4.5	91.0	18.0	360.0	1820.0		
RF	0.024	0.499	0.103	2.12	10.6	2.68	
RRF	0.980	0.999	1.04	1.07	1.06	1.03	4
130 1,2,	3,4-TCD0	)-R			Retentio	n Time Sta	andard
130 1,2,	•						
Recovery							
	<del>9</del> 1.0	91.0	91.0	91.0	91.0		
RF	1.00	1.00	1.00	1.00	1.00	1.00	
RRF	1.00	1.00	1.00	1.00	1.00	1.00	0
130 2,3,							
Internal							
	91.0	91.0	91.0	91.0	91.0		
RF	1.07	0.904	1.03	1.07	1.15	0.00	
RRF	1.07	0.904	1.03	1.07	1.15	1.05	0.00

227	0_T00E						
2,3,7,8 Analyte							
Amount	0.5	9.1	1.8	7/ 0	400.0		
RF	0.005	0.102	0.022	36.0 0.448	182.0 2.09	0.534	
RRF	1.00	1.02	1.09	1.13	1.05	1.06	5
						1100	_
13C 1,2	2,3,7,8-pe	eCDF					
Interna	al Standa	erd					
Amount	91,0	91.0	91.0	91.0	91.0		
RF	0.750	0.673	0.849	0.890	0.934	0.00	
RRF	0.750	0.673	0.849	0.890	0.934	0.941	0.00
1,2,3,7	7,8-PeCDF						
Analyte	•						
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.024	0.480	0.094	1.83	9.38	2.36	
RRF	0.973	0.962	0.938	0.914	0.938	0.945	2
2.3.4.7	,8-PeCDF						
Analyte							
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.023	0.467	0.090	1.80	9.12	2.30	
RRF	0.930	0.936	0.897	0.900	0.912	0.915	2
170 4 0	7 ( 7 0						
	,3,4,7,8-				Retentio	on Time Sta	andard
Interna	,3,4,7,8- l Standa					on Time Sta	ex 112
Amount	91.0	91.0	91.0	91.0	91.0	off of the state o	
RF	0.539	0.468	0.557	0.580	91.0	ould, and	
RRF	0.539	0.468	0.557	0.580	0.000	- 400 C	
	7.527	0.400	0.551	0.360	91.0 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668 0.668	100.619	0.00
1,2,3,4	,7,8-HxCD	F			ion of teel		
Analyte					oecti with		
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.027	0.520	0.112	2.19	10.4	2.64	
RRF	1.07	1.04	1.12	1.89	1.04	1.07	3
				sent			
	,7,8-HxCDI	F	C	nsent			
Analyte							
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.026	0.566	0.118	2.31	11.1	2.81	
RRF	1.05	1.13	1.18	1.15	1.11	1.13	4
2,3,4,6 Analyte	,7,8-HxCD1	•					
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.021	0.474	0.092	1.90	8.87	2.27	
RRF	0.858	0.950	0.923	0.950	0.887	0.914	4
1.2.3.7	,8,9-HxCDF	:					
Analyte	, -   c (1898)						
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.015	0.336	0.066	1.31	6.59	1.66	
RRF	0.603	0.673	0.660	0.654	0.659	0.650	4
		V.013	0.000	V.U.74	0.037	0.000	4

	3,4,6,7,8 3,4,6,7,8 Standar	-HpCDF			Retentio	n Time Sta	andard
Amount	91.0	91.0	91.0	91.0	91.0		
RF	0.322	0.300	0.343	0.345	0.411	0.00	
RRF	0.322	0.300	0.343	0.345	0.411	0.405	0.00
1,2,3,4,	6,7,8-нрС	DF			•		
Analyte							
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.032	0.615	0.128	2.62	12.4	3.16	
RRF	1.27	1.23	1.28	1.31	1.24	1.27	2
1,2,3,4, Analyte	7,8,9-ярс	DF					
Amount	2.3	45.4	9.1	182.0	910.0		
RF	0.018	0.368	0.070	1.46	7.46	1.87	
RRF	0.723	0.737	0.704	0.728	0.746	0.728	2
13C OCDD							
Internal	Standar	d					
Amount	182.0	182.0	182.0	182.0	182.0		
RF	0.394	0.349	0.375	0.403	0.504	0.00	
RRF	0.197	0.175	0.187	0.201	0.252	0.234	0.00
OCDF Analyte						aner use	
Amount	4.5	91.0	18.0	360.0	1820.0 🚕	MOIL	
RF	0.021	0.462	0.098	1.83	9.49 011	2.38	
RRF	0.856	0.925	0.988	0.924	0.9490	0.928	5
			Consent	for its petito	0.504 0.252 1820.0 9.49 of the 0.649 delta		
							,

# 17.34 Continuing Calibration Check, 8th August 2003

Standard 'CS3/170503' is injected onto the 60m DB5-ms column prior to sample analysis. The relative response factors are determined for all analytes and must not have changed by more than 25% from the initial values for analysis to proceed.

The differences are reported in the table below and are acceptable.

Compound Name	Mean RRF	%SD	RRFcc	Жelta
2,3,7,8-TCDD	1.10	6	1.13	-3
1,2,3,7,8-PeCDD	0.878	5	0.870	1
1,2,3,6,7,8-HxCDD	1.03	5	1.10	-6
1,2,3,4,7,8-HxCDD	0.883	7	0.847	4
1,2,3,7,8,9-HxCDD	0.911	4	1.06	-16
1,2,3,4,6,7,8-HpCDD	0.934	3	0.974	-4
OCDD	1.03	4	1.03	0
2,3,7,8-TCDF	1.06	5	1.06	0
1,2,3,7,8-PeCDF	0.945	2	1.03	-9
2,3,4,7,8-PeCDF	0.915	2	1.07	-17
1,2,3,4,7,8-HxCDF	1.07	3	1.04	3
1,2,3,6,7,8-HxCDF	1.13	4	1.24	-10
2,3,4,6,7,8-HxCDF	0.914	4	1.00	-10
1,2,3,7,8,9-HxCDF	0.650	4	0.744	-14 (15 <sup>©</sup>
1,2,3,4,6,7,8-HpCDF	1.27	2	1.31	-3 other
1,2,3,4,7,8,9-HpCDF	0.728	2	0.800	1901
OCDF	0.928	5	1.06 🚕 🤇	<b>c</b> 04
·	0.728 0.928	or itspectif	or purpositive	3 -10 -10 -14 -3 offer use.

#### TARGETING REPORT (Sally Version 6.7)

Date Acquired : 08-Aug-03

Acquired File: A:D0808

Operator

: D. Wood

Instrument : Ultima

Column

:DB5-ms

PC File

: R:\DIOXINV\DO808\sample.001\D0808.DAT

Compound Name	<b>N1</b>	M2	M	1/H2		Retentio	on Time	Area
			thry	actl	Ok	theory	found	
Dioxins						•	•	
13C 1,2,3,4-TCDD	326	328	0.78	0.84	Y	00:30:06	00:29:30	227274
13C 2,3,7,8-TCDD	332	334	0.78	0.83	Y	00:30:38	00:30:01	165886
2,3,7,8-TCDD	320	322	0.78	0.77	Y	00:30:39	00:30:03	18743
13C 1,2,3,7,8-PeCDD	368	370	1.55	1.58	Y	00:35:52	00:35:19	162041
1,2,3,7,8-PeCDD	356	358	1.55	1.56	Y	00:35:53	00:35:21	70308
13C 1,2,3,6,7,8-HxCDD	402	484	1.24	1.21	Y	00:40:20	00:39:49	119228
1,2,3,6,7,8-HXCDD	390	392	1.24	1.28	Y	00:40:21	00:39:50	65284
1,2,3,4,7,8-HxCDD	390	392	1.24	1.27	Y	00:40:13	00:39:42	50393
1,2,3,7,8,9-HxCDD	390	392	1.24	1.27	Y:	00:40:44	00:40:12	62893
13C 1,2,3,4,6,7,8-HpCDD	436	438	1.05	1.05	Y	00:44:34	00:44:02	87537
1,2,3,4,6,7,8-HpCDD	424.	426	1.05	1.02	Y	00:44:35	00:44:03	42555
130 0000	470	472	0.89	0.86	Y	00:49:16	00:48:38	115785
OCDD	458	460	0.89	0.84	Y	00:49:17	00:48:39	59486
Furans			0.78 0.78 0.78	ć	nei Jise	) <b>*</b>		
				من مع	N.			
13C 1,2,3,4-TCDD	326	328	0.78	200.84	Y	00:30:06	00:29:30	227274
13C 2,3,7,8-TCDF	316	318	Q5.780	0.68	Y	00:29:56	00:29:19	226840
2,3,7,8-TCDF	304	306	NO 038	0.74	Y	00:29:57	00:29:20	23969
13C 1,2,3,7,8-PeCDF	352	306 354 chort 342 periodi 342 periodi	o√1.55	1.46	Y	00:34:27	00:33:53	182700 .
1,2,3,7,8-PeCDF	340	342 200 0 W	1.55	1.54	Υ	00:34:28	00:33:55	94232
2,3,4,7,8-PeCDF	340	342 juli	1.55	1.59	Y	00:35:34	00:35:01	97661
13C 1,2,3,4,7,8-HxCDF	384	, <del>2</del> 86,	0.51	0.53	Y	00:39:12	00:38:39	146104
1,2,3,4,7,8-HxCDF	374	<b>₹376</b>	1.24	1.22	Y	00:39:12	00:38:40	75858
1,2,3,6,7,8-HxCDF	374	376	1.24	1.23	Y	00:39:21	00:38:50	90434
2,3,4,6,7,8-HxCDF	3740ms	376	1.24	1.19	Y	00:40:04	00:39:33	73153
1,2,3,7,8,9~HxCDF	374	376	1.24	1.21	Y	00:41:15	00:40:44	54197
13C 1,2,3,4,6,7,8-HpCDF	418	420	0.46	0.44	Y	00:43:06	00:42:35	99240
1,2,3,4,6,7,8-HpCDF	408	410	1.05	1.01	Y	00:43:07	00:42:36	64700
1,2,3,4,7,8,9-HpCDF	408	410	1.05	1.00	Y	00:45:28	00:44:53	39628
13C OCDD	470	472	0.89	0.86	Y	00:49:16	00:48:38	115785
OCDF	442	444	0.89	0.90	Y	00:49:42	00:49:03	61476

#### 18.36 Estimation of Method Detection Limits

The 'CS3' continuing calibration standard responses for the day when this sample was run (using standard CS3/170503) were used to estimate the method detection limits for the targeted analytes. The criteria is a minimum S/N of 2.5:1 for both isotope peaks.

Analyte	Std Amount(pg)	S/N	Detection Limit(pg)
Dioxins			
2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	10 50 50 50 50 50 50	500:1 2000:1 2000:1 2000:1 2000:1 1500:1 2000:1	0.05 0.05 0.05 0.05 0.05 0.08 0.1
Furans			
2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	10 50 50 50 50 50 50 50 50 50 100	500:1 2000:1 2000:1 2000:1 2000:1 2000:1 1000:1 2000:1 2000:1	0.05 0.05 0.05 0.05 0.05 0.05 0.1 0.05 0.1

Note that these detection limits are given in pg injected, so the sample detection limits are obtained by using the following equation. The proportion of the sample injected may be determined from the sample tracking form included with each sample report.

Analyte detection limit = Injection detection limit (above)

(portion of sample injected) x (amount sample)

In the case of poor recoveries of the internal standards this amount should be further increased by multiplying by 100/(recovery %).

The detection limits for these samples, where ca 1/30th was injected and recoveries were ca 70% were between 0.2 and 0.4 ng/kg per congener in the soil samples, depending upon the specific sample.

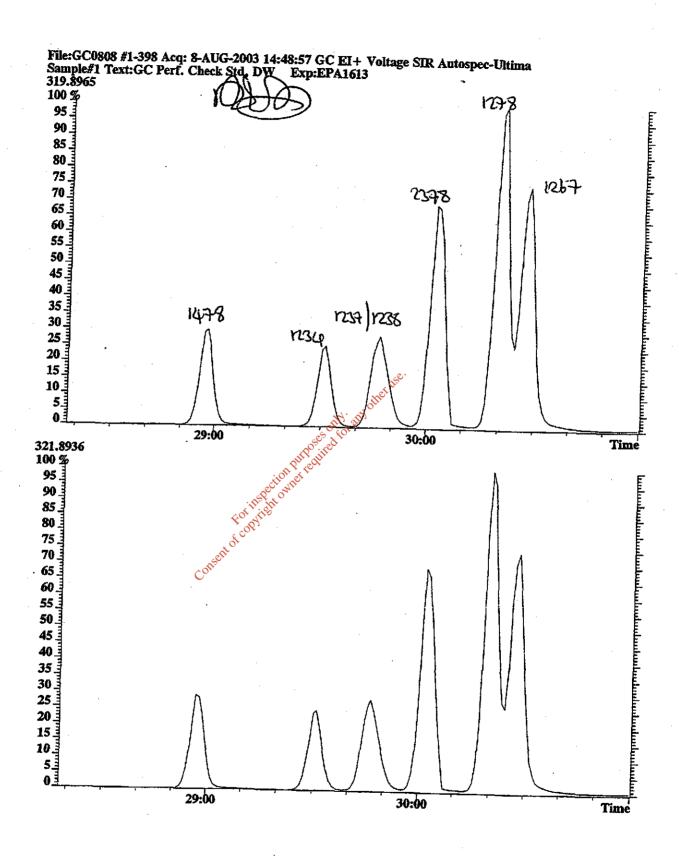
#### 19.37 GC Performance Check

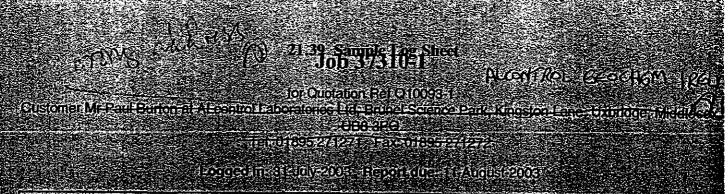
The ability of the GC column used to resolve the known close eluting isomers of the Tetra Dioxins was tested prior to analysis. A performance check standard containing the following isomers is injected. The TCDD traces are given on the following pages.

TCDD isomers contained in the GC Performance Check Standard in elution order.

1,4,7,8 1,2,3,4 1,2,3,7/1,2,3,8 2,3,7,8 1,2,7,8 1,2,6,7

The criterion for acceptance of this test is that the 2,3,7,8 TCDD must be separated by a valley of at least 25% from its nearest neighbours.





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# 22.40 SAL Authorised Signatories Register

SAL AUTHORISED SIGNATORIES SPECIMEN SIGNATURES CURRENT AS OF 14-APR-2003, ISSUE: 32 MASTER COPY

Name	Signature	Initials	•
Sarah Bannister	Krtanisa	SB	
Saber Chaudlary	4	5·C	
Bill Cohen	Lifete	mac:	
Lindsay Collins	Lift	,X	
Steve Contan	M	2	١
Will Crossley	V.Comby	WE:	
Sebastian Dohl	Som	50.	
Chris Field	C - 155/-	<u>G</u>	
Jane Fletcher	duline	12	
Jane Fox	Southern	- <del>SF</del>	
Subbash Gadher	23-	48	
Philip George	Play	RG	
Paul Harrington	787	net .	
Izin Haslock	Elafak	161	
lan Hayes	14	13 <sup>(2)</sup>	
Vancera Highan	Diffo:	the Cal	
Eifion Hollywell	E Helly A	EH!	
Pam Knott	A 0 00	<b>27</b> 1¢	

SAL Authorised Signatories Specimen Schoolsten (14/04/2003)

Marter Copy Page 1 of 2

Name N	Signature	Initials
Himanshu ad	as	re.
Holes Mason	(News	<b>(8</b> 04)
Mile Marwell	N. W. SALLAN	MM
Vic Parr	des	Œ.
Thi Phem	- sole	3.P.
Jane Pilot	Stut	37.
Metrey Prak	meth	WS
Los Quibell	لله صل	Lei
Suzanne Quick	S Quick	SQ
Gary Quiek	لمنتاسن	Ģœ
Clifford Rodger	ally	CF
Charlottz Riley	€.શાલા	CR
Graham Small	de fran	OSZ.
Robert Smith	Rhia	Re.
Nicola Summers	لانا حب.	NJS
Keith Thompson	kilhanjaan	kT
Leanne Taylor	Waylor	LT
Peter Verrechia	P. Shapeshin	PV
David Wood	all	Œ

SAL Anthoxinol Signatories Specimen Signatures (14/04/2003)

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# **Appendix F 2005 RPS Site Investigation Soil Results**

### A2. RPS (2005)

#### **Results Tables For Soil**

Table 1: pH, Asbestos and Soll Moisture Content results for soil (taken during well drilling)

	Date		Mar-05	
Sample	Depth (mbgl)	рН	Natural Moisure Content (%)	Asbestos Screening
Method Detection Limit / Units		pH units	0.01	n/a
MW01	1m	8.61	16.5	None detected
MW01	4m	-		None detected
MW01	5m	7.7	46.5	None detected
MW01	6m	-	<u> </u>	None detected
MW01	7m	8	11.3	None detected
MW02	1m	6.94	20.7 يي.	None detected
MW02	5m	7.64	16,121	None detected
MW02	7m	7.82	114. att 18	None detected
MW03	1m	8.04	11.3	None detected
MW03	2m	- philed		None detected
MW03	3m	Decigo When	20.2	None detected
MW03	4m	39.7	35.4	None detected
MW03	5m	8.16	44.8	None detected
MW03	6m ent	-	•	None detected
MW03	7mCon	-	<u>-</u>	None detected
MW04A	1m	7.94	16.7	None detected
MW04A	5m	8.4	28	None detected
MW04A	7m	8.44	15.7	None detected
MW05	1m	8.15	5.7	None detected
MW05	2m	8.73	11	None detected
MW05	5m	8.51	18.3	None detected
MW05	10m	8.51	7.8	None detected
MW06A	1m	8.19	14.1	None detected
MW06A	4m	9.05	53.2	None detected
MW06A	7.3m	8.63	10.3	None detected
MW07	1m	7.9	12.3	None detected
MW07	4m	8.12	38.3	None detected
MW07	6m	7.89	20.8	None detected

Notes:

<sup>&#</sup>x27;- Below Detection Limits

Table 2: pH, Asbestos and Soil Moisture Content results for soil (taken during trial pitting)

	Date		Mar-05	
Sample	Depth (mbgl)	рН	Phenois Total Monohydric	Ammonical Nitrogen
Method Detection Limit / Units		napH units	< 0.01 mg/kg	<0.3 mg/kg
TP1	0.5	7.64	0.02	٥
TP1	3.5	7.67	-	0
TP2	0.3	7.37	-	٥
TP2	3.0	7.8	-	٥
TP3	0.5	7.65	-	0
TP3	3.2	7.95	0.01	٥
TP4	0.5	7.67		٥
TP4	2.0	7.69	0.02	<b>⋄</b>
TP4	3.0	7.74		<b>.</b>
TP5	0.5	7.63	0.04 the	<b>◊</b>
TP5	3.0	7.83	all ary ar	<b>◊</b>
TP6	0.5	7.78	es of foi	<b>◊</b>
TP6	2.4	8.8	ijie 0.4	<b>◊</b>
TP7	0.5	8.05	0.05	<b>◊</b>
TP7	3.0	Der .86 VIII	-	٥
TP8	0.5	11 og .73	-	<b>◊</b>
TP8	3.1	8.59	0.03	<b>◊</b>
TP9	0.5	7.91	-	<b>♦</b>
TP9	2.050	7.85	_	<b>*</b>
TP10	0.5	7.9	0.01	<b>◊</b>
TP10	2.0	8.17	-	<b>♦</b>
TP11	0.5	8.06	0.12	<b>◊</b>
TP11	3.3	8.1	-	<b>◊</b>
TP12	0.5	8.11	-	<b>◊</b>
TP12	3.2	7.62	-	<b>o</b>
TP13	0.5	8.15	<b>-</b>	<b>◊</b>
TP13	3.5	6.74	0.01	<b>◊</b>
TP14	0.5	6.58	-	٥
TP14	3.0	6.32	-	٥
TP15	0.5	6.75	-	٥
TP15	3.0	6.29	-	<b>&gt;</b>
TP16	0.5	6.92	0.01	0.9
TP16	3.0	9.89	-	1.5
TP17	0.5	8.64	0.01	<b>*</b>
TP18	0.5	8.66	_	<b>&gt;</b>
TP18	3.0	7.65	-	<b>◊</b>

<sup>♦</sup> Parameter not

analysed '- Below Detection Limits

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p/m-Xylene	-	æ		$\int$	23		1	<u>ş</u>	1	-	.65	=	8	+	=	9	2	\$ P	*
Bromoform	-	,						†	,	1	3	•	1	+	+	+	1	1	+
Stynene	-			·	,		•	+	,	1	*	+	†	+	+	,	1	1	1
1,1,2,2-Tetrachioroethane	-			·	•			1	+	1	†	+	+	+	╁	+	+	1	1
о-Хубата	-	Ţ					_	\$	1	9	•	w	†	2	<u></u>		5		_
1,2,3-Trichloropropane	-		١	·				1		1	·	+	+	+	+	-	1	1	1
<u>Bopmpy/bergene</u>	-	,	·		•			1	1	†	†	†	†	2	+	+	1	1	1
Bromobenzene	-						1	†	†	†	1	†	+	$\dagger$	+	+	+	+	+
2-Chlorololuene	-	1			]		1	1	-	1	Ţ	1	1	+	+	+	}	<u> </u>  -	+
Propylbenzene	-							+		1	Ţ	1	+	+	-	+		<u> </u>	1
4-Chicabblume	-	.  ;					1	Ť	+	1	1	†	+	+	+	<del> </del>	<u> </u>	+	1
1,2,4-Trimethythenzene	-   	2		1				1	1	1	1	†	+	+		<u> </u>	<u> </u>	<u> </u>	<u> </u>
4-i sopropytoruene			,					T		t	Ī	Ť	l			L	-	-	1
1.3.5-Trimethylbenzene	-		,		<u>.</u>			1	1	†	†	+	+	+	-	+	}	+	1
1.2-Dichlorobenzene	-	1		1				+	+	†	†	†	†	†	+	+	-	1	+
1.4-Dichlorobenzene	-			1			1			Ţ	Ī	1		+	+	+	+		1
aec-carylbenzene	-							Ť		T	I	t	t	+	-		}	<u> </u>	1
ant-Butybenzene	-	·			,			Ť	1	†		1	1	+	+	+	+		1
1.3-Dichignobenzene	-						1	T	†	1	Ť	†	†	†	+	+	}	1	-
n-Butylbenzene		1	1				1	Ť	1	1				†	-			+	+
1.2-Обито-3-споиоргорате	-		,	1						<u>†</u>				ţ,	<del> </del>	۱.			Ϊ,
Later Inches Constitution	-			1			,		,	Ţ.	ŀ			38		ļ.		ŀ	ľ
12.3-Trichlombenzene	-	,	Ŀ	L	,				,			,					<u> </u>	ŀ	_
Hexachlorobutadiene	-			Ŀ	-		,							•			-	-	-
Below Detection Limits																			

	۱						l	F	ľ	ľ	Ì	ľ	I	ľ	ľ	Ī	l
Compound	ş	Ā	Ē	Ē	è	È	Ē	ğ	Ž	ě	į	Ě	Ě	Ĕ	Ã	į	į
Depth (bgl) (m)	0.5	2.0	0.5	3.3	0.5	3.2	Н	Н	0.5	0.6	90	3.0	0.5	25	972	35	3.0
Dicherodifluoromethane		•			-		•			-	-	,	•	•		,	
Chloromethane		·	·		-		,	+	ŀ	1		-		·	·		,
Vitryl chloride	1	1	-	·	7	1	1	+	·	1	1	1				7	
Вгомотнейние	-	1	1	•	1		+	1	1	,	,	1	1			7	
Chloroethane		1		,	1		+	+	Ť						1	1	
Trichiorathuramengne	·	1	1	1	1		+	1	1	,	1	+			1	1	1
Parallary 1,2-Ukrikiyere		1			1.			<del> </del>	†.	Ϊ,	,	†	1		1	1	1
Carbon disulphide		,			١.	ļ.											
1.1-Dichiprosthene				,	,			١.	,								١
1,1-Dichlore-thane		١.										,					١.
tert-butyl methyl ather	,				,				,			,			,		
cis-1,2-Dichloroethene	·	,			,	-	,	-	-						ı		
Bromochiommethane	•			,	,			-	•	,					·		,
Chloroform							H	,	•	1							
2,2-Dichloropropane				,	ŕ			•			,		,				
1,2-Dichlorosthane				Ģ	,	•	-	-	·	·			,	,	•	-	
1,1,1-Trichlorcethane		·		V,				-	1	٦	,					1	١,
1,1-Dichloropropene	-	·	1	ZŠ.		-	-	•	1		ij	•	-	-	1	,	4
Benzene			·	1	Ø	-	+	+	·	-	'	1	1	1	Ī		
Carbontetrachloride	·	1	1	1	٥	ξÓ	+	†	†	1	•	1		-	1	1	-
Discommentane	-	1		1	ġ,	,	•	†	1	1	1	1	1	ı	-	1	,
1,2-Dichloropropane	•	·			,	57	1	,	•		1		1		-	1	,
Bromodiohioromethane	1	·	·	1	1	\$	3	1	†	1	1	1	•			7	
Trichloroethene	1	-	1		4	3	9	1		1	1	1	1	,	-	1	-
cfs-1,3-Dichloroptopene	•	-		,	1			+	+	1			,	,	,	Ţ	-
trans-1,3-Dichloropropene	-	•			1	1	8	4		,		1	1			Ţ	
1,1,2-1 nchombernane	1			1	. ;	۱,	1	\$	.	1	1	+		1	1	1	٠.
1 9. Cichiomorphano		7	?		1	ļ	1		٤	,	1		,			1	
Discomposition								, III	Ĝ				1.			,	١.
1,2-Dibromoethane		١,			,				9		,		,				,
Tetrachloroethene		25	22	١,	€3		22	æ	Ģ	P29	12		R	9	8	ā	25
1,1,1,2-Tetrachlorgelhane			•				'	•	,	1	'	'	,	-	•		
Chloroberzene	1	•			-	-	•	1	,	Š	- 1	1	-	,	·	1	
Ethylbenzene	72	~	2	1	7	†	22	+	1	đ	- [	†	28	5	1	,	,
p/m-Xytene	25	۰	<b>₹</b>	Ī	9	ī	zs.	†	22	7	2	1	<u>s</u>	S	6	5	-
Bromotom	-		,					+	,	1				·	-	Ī	
Styrene	1	·	ŀ		1	-	+	+	†	1	, C	†	1	T		1	1
1,1,2,6-1 BUSKIRS UBURING	.   ;						,	1	9			t	,			Ţ,	
4 9 % Trichiomorphisms	3						3		3 .				,				2 .
Processing					,				١.								
Bromobenzene						١,		-							,	Ţ.	١.
2-Chlorotoluene				,			١,	-	•	·					·	-	,
Propyloenzense	1	j	·		1	1	'	•	·	-	·	-	-	·	·	7	
4-Chkrobávene	1	·	-	]	-	,	†	†	,	1		1	1	1	T	1	1
1,2,4-Trimethylbenzene		J				·	1	†	1	1	,		Ī			Ī	
4-isopropytonene	į				1	,										Ţ	
1.2.Dichlombenzene					[		†		1	1		1		1	١.	Ţ.	١.
1.4-Dichloroberzene	,	ŀ	[					ŀ	ŀ	Γ.	,	Ĺ	[			[	١.
sec-Butylbengene	,	,					·		,		,		,	-		·	,
fart-Butylberzane			,				1	+	-	·	-		1			7	
1,3-Dichlorobenzene					1		†	†	1	1		,	1			1	1
n-Butylbenzene				,	1		t	1	1	1						Ī	
1.2 Olbromo-3-chloropropane			,				+	1	1	1		1				1	
1,2,4-Inchiorocenzene Nachthalene	1	[	I	Ţ,		Ţ.	Ţ.	1			1		Γ	T		Γ	
1,2,3-Trichlorobenzene			·						[.		-				ŀ	$\left[ \cdot \right]$	
Hexachlorobutediene	·	ŀ				,	H	-	-					ŀ			ŀ
- Below Detection Limits																	

Table 5: PAH Results for soil (taken during well drilling)

Sample												PAHS										
	Date											Mar-05	2									
	Method Detection Limit	MW01	MW01	MW01 MW01 MW02	MW02	MW02 N	MW02	MW03 N	MW03 h	MW03 M	MW03 M	MW04 MI	MW04 M	MW04	MW05 MW	MW05 MW	MW05 MM	MW06 MW	MW06 MW06	06 MW07	7 MW07	7 MW07
	Depth (mbgl)	1m	5m	m/	Į,	E S	<b>7</b> B	Ę	3m	4m	Sm.	3m	5m 7	7m 1	1m 5	5m 10	10m 1	1m 4r	4m 7.3m	E -	£	Eg
Naphthalene	<1ug/kg	301	1021	,	,	90	42	461	126	94	278		<u> </u>	- 1	117	_		169	H	351	357	٠
Acenaphthylene	<1ug/kg	51	392		,	-	-	11	53	41	35	-	-	-	.	-	- 21	H	-   -	243	289	-
Acenaphthene	<1ug/kg	378	2012	,	-	-	-	517	40	43	49	-	•	-	38 1	10	- 71		-	339	754	-
Fluorene	<1ug/kg	344	2277	-	-		•	624	48	63	64	•			39 1	10	9 -		-	424	718	-
Phenanthrene	<1ug/kg	3139	12509	•	•		•	3175	573	_	343	•		. 3	Н	73	- 42	427 4;	42	2819	7357	34
Anthracene	<1ug/kg	1531	3134	,	•		Ç	672	119	98	100	•	•	•	63 1	14	- 8	1 68	10	882	1757	13
Fluoranthene	<1ug/kg	3693	25444	-	•	•	Ò	4569	930	629	456		-	-   4	488 4	44	5	H	35 -	3575	11476	3 44
Pyrene	<1ug/kg	3607	69287		•	-	٠.	3043	891	909	425		-	- 4	436 3	36	. 4	488 3	30	3078	3 10325	34
Benz(a)anthracene	<1ug/kg	1848	11253	•	•			238Z	415	420	431	-	-	- 3	340	.   -	- 38	380		2237	2567	899
Chrysene	<1ug/kg	1847	9642		•	-	-	2097	<del>5</del> 50.	377	512	-	<u> </u>	- 3	356	-	- 33	337		1982	2 6147	51
Benzo(b)+Benzo(k)f Iuoranthene		1804	10794	•		,	1	2214	ASP ANT	282	168	•	•	- 2	253	•	- 27	275		1629	9 6163	67
Benzo(a)pyrene	<1ug/kg	1023	1629	-	•	-	-	1252	248 1	1578 A	•		-	- 11	141	_	- 16	191		951	3100	36
ideno(1,2,3-cd)pyren	<1ug/kg	308	2011		,	-	-	447	108	W 78			-	-	20	_	9 -	62		432	1375	157
benzo(a,h)anthracer		168	1466	-	-	•		265	54	33%	Se	•	-	_	30	_		. 37	-	792	865	122
Benzo(ghi)perylene	<1ug/kg	364	2441	•	•	•		509	130	62 14	9.0	•	-	-	62	_	- 7	. 9/	-	505	1576	145
Total EPA 16	<1ug/kg	20406	20406 120556	-	-	90	42	23310	4882	3286   2	2869 7			- 2	2800 18	186	- 32	3200 11	- 117	19711	1 57828	3 760
Shaded area:											i ali	А									ofernous 18	
Results not available												oth										
- Below Detection Limits												Jige.	· · ·									

PAHs	Mar-05	TH9	05 24 05 30 05 31 05 20 05 20 05 33 05 32 05 35 05 30 05 30 05 05 05	2284 4789 4031 190 2448 3181 544 666 1741 536 12036 186 310 1094 416 219 1534 158 841 217 278 445 299 141	202 479 109 51 69 84 36 178 88 26 680 13 52 259 40 14 47 28 719 26 83 218 54 10	417   3116   391   74   155   201   304   210   103   40   348   21   580   351   222   50   261   51   633   105   164   542   114   90	788 2510 903 82 510 487 305 220 129 50 1566 21 549 286 178 59 457 48 623 94 156 468 79 87	5638 19936 6579 652 4535 3616 1788 1804 1007 644 8928 276 5610 1846 1766 507 3856 441 7077 806 1411 5040 835 600	797 4567 688 193 688 564 350 486 184 84 744 40 1480 433 339 89 619 81 2028 156 294 1402 181 89	4453 28632 2863 1288 1513 1884 1760 2230 402 602 1670 197 10046 624 2799 331 2841 567 15834 1332 1843 15668 866 640	3829 21432 2623 1070 1416 1569 1506 2002 507 479 1677 151 7397 482 2338 280 2422 503 13500 1029 1396	1866 10211 2330 612 1138 1061 999 1112 326 352 1433 114 5196 1954 1777 279 1806 400 8650 886 1008 8003 343 386	2164 11711 2231 706 1504 1432 1116 1463 406 513 2353 155 5270 3292 2053 320 2161 438 9301 1288 1782 9386 583 468	1344   10883   1856   818   606   873   1349   1381   149   445   1171   140   6312   3442   1836   200   1977   596   12830   1517   1422   10892   433   416	630   4096   995   279   399   376   470   642   147   281   390   59   2706   1798   612   67   563   202   4851   422   588   3194   219	1462 10464 1623 593 574 710 910 1225 197 268 868 99 4642 4403 1632 151 1223 276 10811 738 981 8449	930 857 828 389 522 532 532 642 662 1183 411 783 77 3102 11 1442 113 912 383 7072 967 1288 6250 314	231 7 2876 581 162 391 283 280 391 123 183 711 40 1579 <8 766 55 594 194 3377 579 703 2596 156 482	897 74/2 1081 432 778 808 648 877 288 530 1227 88 3111 <10 1527 134 1078 494 7245 857 1669 5926 487	28862 147383 30673 7771 17456 17552 12897 15891 5899 5424 386543 1630 57742 20286 18743 2868 22171 4864 1E-05 10869 14755 90591 6138 6072	\$		The Bection purposes only any other use only of the first
		TPS	0.5	288 391	108 21	230 61	170 55	2105 845	436 130	3928 908	3872 799	2141 697	2545 863	3730 947	1105 322	2591 571	1779 390	787 213	2117 558	27930 7783			-
		TP4 TP4 TP4	2.0	98 98	135	<140 763 169	⊢	1483 8361 1737	88	13740	12108	8747	828 7390 1779	738   8922   1709	<250 3591 738	415 6240 1517	4003	28	4010	78793			- - -
		2 TP3 TP3	0.5	۰	250	t	H	4032	1863	10651	9465	8048	8 5548 9401	7 7775 7852	2 2307 3783	5 5560 7227	⊢	258	389	63504 104665			1 - -
		TP2	┢╌	١.,	⊢	178 73	L	2408 519	+	٠	+	⊢	1168 306	883 297	377 132	752 186	╀	⊢	730 142	┺			-
		1	t	۰	┿	т	_	368	_	+	+	Н	Н	335	⊢	⊢	+	┪	Н	t.	-		-
		Ē	╀	₽	٠	t	⊢	⊢	╄	╀	_	┺	⊢	1640	629	╙	╄	┺	852	-	+		-
	Date	Method Detection Limit	Depth (mbgl)	<1uc/kg	<1uo/kg	<1ug/kg	<1ug/kg	t	T	t	T	<1ug/kg	<1ug/kg	T		<1uo/kg		<1uo/lo	<1ug/kg	T	T		1
Sample		_		Nachthalena	Acenaphthylene	Acensphthene	Fluorene	Phenanthrane	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzolkifluoranthene	Benzola)pyrene	Indeno(1.2,3-cd)pyrene	Dibenzola.h)anthracen	Benzo(ghi)perylene	Total EPA 15		- Below Detection Limits	Results (Charles & Market & Ma

1													Sample	Sample Number												
Compound		WO 1	W01 MV	MW01 MW01 MW01 MW02 I	VO1 MW	VOZ MWOZ	OZ MWOZ	2 WW02	2 MW03	MWG3	MW03	MW03 N	MWO3	MW04A M	MW04A N	MW04A	MW05 N	MW05 M	MW05 M	MW05 MW	MWOGA MV	MW06A MV	MW06A MV	WW07 MY	MW07 M	MW07
Depth (bgl) (m)	mg/kg	1m	4m 5	5m 7r	7m   1r	Im 5m	ח7   ה	Вт	μl	2п	Зm	4m	5m	-u	Sm	Jm.	μĻ	2m	5m 1	10m 1	1m	4m 7.	7.3m 1	E 4	4m 6	em
Arsenic Low Level	0.5	15		16	1	10 -	'	'	11	,	13	17	14	22	14	7	11	10	10		_	20	- 1	14.0 25	23.0	,
Cadmium Low Level	0.5	1			•	-   -	-	•	3	•	1	1	-	-	,	-		2			_		- 1	0	4.0	,
Chromium	1	35	-	18 1	10 3:	33 10	01   10	1	17		26	27	13	21	6	6	15	16	12	9	12	8	9 2	25.0 46	49.0	8.0
Copper	1	35	•	85 6	9	60 5	2	1	36	_	74	46	18	89	8	5	23	30	21	6 2	22	35	8	38.0 181	0	9.0
Pead	-	963	- 1	105 6	6 3	38 7	5	•	156	,	259	193	В	902	2545	111	B	265	æ	13 6	60	46	5 15	58.0 71	716.0	7.0
Mercury Low Level	0.3	-				-	•	-	•	•	,		•		,	'	١	-	,	,	,	-		- 2	2.0	,
Nickel	١	43	-	32 1	12 4	47 14	11	-	59	•	30	112	72	35	=	6	8	28	43	8	16	33	B 22	25.0 16	162.0 1	11.0
Selenium Low Level	0.5	_		_	_	_	_	•	١		,	•	•	•	-	-	2	1	•	4	-	-	,	-	,	
Zinc	1	258	-   1	134 3	30 7	74 30	29	-	317	·	167	128	22	408	42	R	112	399	47	23	122	59	24 24	240.0 193	1929.0	32.0
Water Soluble Boron	1	2	-		-	2 4		ď	-		_	2			-		-	9	6	-	-	-	<u>"</u>	3.0	5.0	2

- Below Detection Limits Shaded area: Results unavailable

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					-	ŀ	ŀ						Ī		I		ŀ	1	1	3	-		-	ŀ			-	-		-	}				İ	7
Compound	Defection Limit /						_											-				_														
	SQL C	된	TP1	TP2	TP2	TP3	윤	1₽4	1P4	₹ <u>₽</u>	TPS	TPS	TP6	TP6	TP7	797	178 8		-E	TF9	TP10 T	TP10 TF	TP11 TP	TP11 TP	TP12 TP12	12 TP13	13 TP13	13 TP14	4 TP14	14 TP15	5 TP16	5 TP16	TP16	TP17	TP18	F18
Depth (bgl) (m)	Бу/бш	0.5	9'E	0.3	3.0	6.0	3.2	9,0	2.0	3.0	9.0	3.0	9.0	2.4	0.5	3.0	0.5	3.1	0.5	2.0	0.5	2.0 0	0.5 3.	3.3 0.	0.5 3.2	2 0.5	5.8	5 0.5	3.0	0.5	3.0	0.5	3.0	0.5	0.5	30
Arsenic Law Level	0.5	11	12	17	1	13	11	8	88	18	97	12	6	12	8	6	19	18	12	55	4	6	4 1	17 9	9 26	8 9	10	11	10	31	8	23	8	8	40	5
Cadmium Low Level	0.5	-	-	1	2	-	2	٠,	2	-	7	2	-	2		1	-	-	-	-		2	_	-	2 .	Ĥ	2	_	2	2	2	-	-		2	
Chromium	-	103	52	96	17	56	52	18	17	13	28	24	12	39	13	16	14	14	17	23	8	16	6 1	18	39	9 16	5 20	19	16	3 40	4	36	28	31	15	11
Copper	*-	178	9	133	83	49	179	57	101	49	906	125	45	8/	28	37	30	30	63	72	, 4	40	17 4	41 1	18 88	B 52	2 48	36	51	82	31	87	×	22	46	8
Lead	-	447	228	·	925	246	155	180	1377	140	516	133	70	180	85	181	44	4	197	306	25   1	144	28	17 11	115 40	0 118	Se   8	127	7 410	558	88	273	116	230	43	351
Mercury Low Level	0.3	1-1	٠		•	-	-	,	·	•		,	•		-	•	,	,	,		-	_		_	-	-	Ļ	_	_	_	_	, ! 	-			١.
Nickel	-	47	62	47	23	32	30	22	30	18	8	41	18	86	22	21	23	19	27	34	16	36	10 3	34	29 433	24	40	19	36	51	27	23	88	16	Ж	13
Selenium Low Level	0.5		·	Ī	ŀ	-		١.	•	· .		,	·	ŀ		,	•			-		_	2	2	-	•	_	_	2	2		•	•	,	,	,
Zinc	-	555	191	283	215	217	177	218	205	264	1708	487	147	162	87	209	81	107	170	206	76 1	107	37 4	49	73	3 150	0 115	5 139	9 163	3 767	142	86	124	157	106	82

mpound ple Depth -C12)	Method Detection Limit			-				-				-				-			-					
tte l	LIMIT							_								_								
epth		-	MW01		MW02		MW03	p		MW04A				MW05			£	MWOGA				MAYO7		
	, 13/KB	1ш 1 5	5m 7m	, mr	£5	J.	#	mg.	ᄪ	Ę	LL S	7ш	_		- Pu	10m	13	H	7.3m 1r	1m Zm	E	#	Ę	퉏
MTBE	t	-	L	L	L	Ŀ		-	48	-	-	L	12	110		_	-	<u> </u>	<u> </u>	7	ļ.	,		
	5	-			ŀ			-		H		_	-	Ξ.	Н	_	<u> </u>	L	<u>.</u>	- 1 -	Ļ	1 - 1	<u> </u>	
Banzene	10	•		ļ. L			ļ.							-	_		<u>_</u>	L.	-	- 1 -	-	•	-	
Toluene	2	<del> </del>	,						23	ļ-	-  -		12	-	ŀ	-	ļ.	-		7	Ŀ			
Ethyl benzene	9-	,		,		ŀ		-	-	ļ- ,	١.	-			L.	<b>L</b>		,	Ľ	•	·	-	ŀ	
m & n Xulana	Ę				Į.					,				ŀ	-  -	-  -	ŀ	ļ ,	Ľ	ľ	ļ	-	ŀ	
o Vylano	Ę	1	.	-				<u></u>		ŀ		-	ļ ,	ļ.	ļ.	-	-		<u> </u>	ľ	ŀ	ŀ		
Alimbatice CA-CR	2 5	╁	. .					1					,	ļ			1.	-	,	╀			ŀ	
Aliabatics ATROS	2 0	+	ļ	-				†	×				-	ļ		<del> </del>	ļ.	-	'	\ \ \ \ \ \	1		ļ.	Ţ.
Aliobatics 208-010	2 9	╢.	ļ.		[		1	-	+		+		ļ.	8	ļ.	<del> </del>	ļ	<del> </del>	<u>'</u>	ľ	ŀ		ŀ	
Aliobatics >C10-C12	9		,			ŀ			ļ.	ļ.	  -	ŀ		41	-		<u> </u>  -	<del> </del>	Ľ		٠	ŀ		
Aliohatics >C12-C16	10	3581	1101 283	1054018	293	564345	132.19	1035	3073	11002	696	H	L	┞	H	H	L	┞	r	5089 882	2   5157	36193	51063	9 <u>8</u>
Aliohalics >C16-C21	Γ	14708 2093	393 835	✝	L	33501394	174233	1392	15218	9009	115	128	7069	3614	284	2224 3	34167	788	1282 578	_	788	290444	34157	88
Aliohatics >C21-C35	l	5305 14		T	L	8923521	63832	2058	45847	55283	1507	L		H	L	H	L	Ľ	r	73597 11023		S31398 84791	34791	1912
Total Allichatics C&C35	l	73594 4815		1	3485	42989280	251384	4485	248	75290	2191	ŀ	L	H	L	┝	170011	H	8388 136	136504 13289		1258035 170011	7007	2851
Arometics C6-C7	l			Т	L	,		ļ.	<b>S</b>			H	L	H	┞	┝	╀	┞		·	ŀ		۱.	
Arometics >C7-C8	0		,	ļ.				,	23	-	ļ.		12				,			- 14		ŀ	,	,
Aromatics >EC8-EC10	2	<del> </del>	-  -	ļ.  -	ļ. _			-	ļ-	S S		-	-	45	L	-	  -	<u> </u>	<u> </u>	·  -	·	ļ.		,
Arometics >EC10-EC12	10		,	┝	,						- ~	H				Н	Ц	H			Н	Н	•	
Aromatics >EC12-EC16	10	1381 4	471 189	Н	166	4414	2864	888	1131	10232	00 ×	Н	2047	4	201	Н	Ц	128 [ <	<100 29	2979 125	-	4231	<b>60163</b>	471
Aromatics >EC16-EC21	Γ	3886	852 283	166791	761	205826	18126	11215	3638	2	1. TO					Н	Ц	_			Н	66854	252183	858
Aromatics > EC21-EC35		20683 1024	Ш	Н	381	1175215	114751	162968	42627		20160	367 4	40024	5415		245 4	443330	36B <			388	399379 4	443330	883
Total Aromatics C6-C35	П	26060 2147	Ц	1150547	1308	1385454	135541	174871	47419	59541	X 100	387	23900	7748		+	Ц	+	131 504	50410 1153	_	470464 755878	55878	1992
TPH (Aliphatics and Aromatics C5-C35)	10	99654 6762	1788	3 21051062	4793	44374714	386925	179356	111583	134831	2478/14	OK Q	1212 2	9838		6572 8	925687	9888	5183 1866	186914 14452	988	1728499 925687	125687	4843
- Balow Datecton Limits											<b>0</b> <sup>+</sup>	ingost reditied	Medited for any other use.	net use.					i.	:				

Compound	Method Detection Limit		-																
Campia Pacit	odjon	ě	Ę "	2 5	2 2	2 2	2	<u> </u>	7 174	# 0 H	1 PS	30 1	92	+	TP7 TP7	7 TP8	<u>۽</u>	2 5	E <
	2			3	3	;	1	200	Š	╀	+	₽	+	8	╀	╄	4	1	1
MTBE	0	ŀ	ŀ	[.				1	ļ.	ŀ	ļ.	l.	1	  - 	ľ	Ι.	ŀ	ŀ	ŀ
Benzane	5		ŀ	[	ŀ	ŀ	ļ,	ŀ	ŀ	ļ.		ļ.	+	ŀ	ŀ	ļ.	ŀ	ŀ	ŀ
Toluena	9	ŀ		Γ.	ŀ	ŀ	,	,	ļ.	,	<del> </del>	<del> </del>		Į,		ŀ	ŀ		ŀ
Ethyl benzene	10				ŀ	ŀ				,		,	-	Ĺ			ŀ	ŀ	ŀ
m & a Xviene	0	ŀ	ŀ			ŀ	ŀ	ŀ	ļ.	ļ ,	<u> </u>	<u> </u>	$\vdash$	ŀ	Ľ	Ľ	ŀ	ŀ	ŀ
o Xviene	٩			ŀ	ŀ	,		ŀ	ŀ	ŀ	-	-	-	ľ,	Ľ	Ŀ	ŀ	ŀ	ŀ
Aliphatics C5-C8	10				,	,	,	·				ŀ	Ľ	Ŀ	Ľ	Ŀ	•	٠	ŀ
Aliphatics > C8-C8	10	,	,			ŀ		ľ	ŀ	ŀ	ļ.	H	$\vdash$	┞	L	L	Ŀ	Ŀ	ŀ
Allphatics >C8-C10	9	ŀ	,	,	,	ŀ		133	022	,	١.	۱	ľ	747	<u> </u>  -	ŀ	ľ	ŀ	ŀ
Allphatics >C10-C12	10	ŀ		,	,					-			ľ	187	Ľ	ŀ	•	•	٠
Aliphatics >C12-C16	100	4173	834	8854	1780	58	5799	2921	2	900	386	371 2	250 36	3994 6997	97 105	5 13916	31265	4848	1116
Aliphatics >C16-C21	100	107332	974	5966	3464	483	13947	5026		249 1	1478 4	Н	155 80		364	4 7782	_	₽-	4100
Aliphatics >C21-C35	190	1340230 3233		337727	32047	1157	38621	26231 1005265		548	15888 6	829	Н	32796 9027	27 310	-	30575 233676	39971	9908
Total Aliphatics C5-C35	9	1451 735	504		37291	889	_	34311 1014461	014461	797 18	18344 12	1477 7	747 45	45158 20420	20 789	-	52283 336190	08265	13276
Aramatios C6-C7	10					ŀ	ŀ	,	٠	·	ı		H	ľ.	Ľ	ŀ	ŀ	ľ	
Aromatics >C7-C8	₽		ŀ		Ň	,		ŀ	ŀ		ŀ	-		ŀ	Ľ	Ŀ	Ŀ	Ŀ	Ŀ
Anomatics >EC8-EC10	10	·			Ó	Ý		198	331	۰	H	H	12	231	Ц	$\perp$	Ŀ	_	·
Annatics >EC10-EC12	10		-		•		-4		,	Н	Н	Н	_	282	Ľ		•		- [
Aromatics >EC12-EC16	100	213	•	8179	175	5	8811		833	Н	Н	Н		7647 113	11346 <100	X) 9036		_	388
Aromatics >EC16-EC21	100	581	•	17416	177	8737	40347		7719		_	Н		36582 14827	227 185	5 16618	B 41565		
Aromatics >EC21-EC36	100	37754	284	216291	1060	88868	B9888 200070 22388		48913					205397 32390			33 173399		
Total Aromatics C6-C35	100	38548	28	242888	1412	09866	39360 259\$/18 T	1757	27796	477 40	43606 1	1112 4	496 25U	250142 58363	383 6460	30 75617	7 238011	1 11345	3280+
TPH (Aliphatics and Aromatics C5-C35)	흔	1480263	5325	590506	38703	#	38703 ##### 317585 8555871072257	COS C	072257	1274 6	61950 2	2589 1	1243 296	296300 78783		7228 1279	127900 572201	70635	46180
Company Compan								T. C.	Tobes of Herital of the Control of t	ces off air,	14. 44 off								
											,	21 115°.							

							-		_	-	-			_	_	-	_	Γ
Compound	Method Detection Limit	TP10	TP40	TP11	Ž	1012			- EP43	TP14	77	TP15	TP15	7.016	176	71917	974	8191
Sample Depth	us/kg		202	90	+-							90	0.0	9		50		2
GRO (C4-C12)	9	ŀ	,		,			ŀ		,				212	,		ŀ	
MTBE	2	ŀ		ŀ	,				,		,		,		•		ŀ	٠,
Benzene	10		Γ.		ŀ	ŀ	ŀ	ŀ	١.			ŀ		ŀ	ŀ	ŀ	ŀ	
Toluene	10	ŀ	ŀ	ŀ		ŀ	ŀ	ŀ		ŀ	ŀ	ŀ		16	,		ŀ	
Ethyl benzene	10	ŀ				ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ļ	ŀ	ŀ	
m & o Xviene	9				ŀ		ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ī	ļ	ŀ	l	ŀ
o Xylene	우				·	,				ŀ	,							ŀ
Aliphalics CS-CS	9	ŀ		ŀ		,	ŀ	ŀ	ŀ		ŀ	ŀ	ŀ	ŀ				
Aliphatics >C8-C8	9	ŀ	١,				1	١.	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ŀ	ļ	,
Aliphatics >C8-C10	9	ŀ	,															
Alibhatics >C10-C12	₽				ŀ	ŀ	ļ-,	<u> </u>	ļ-		,	ŀ	,	ŀ	ŀ	ŀ	ŀ	ŀ
Aliphatics >C12-C16	90,	8003	297	101720	385	253	124990	88	581	<del>(</del> 8	9	3000	143	SOP	332	2637	523	950
Aliphatics >C16-C21	100	3624	318	12056B	Ş	197	515683	488	1605	923	339	D966	0012	6/1	208	16025	899	235
Aliphatics >C21-C35	8	36866	191	252700	ā	487	112286	1200	2305	ŧ	5.	20872	336	ξŝ	22	37398	137	24
Total Aliphatics C5-C35	100	48522	708	474988	1243	-	1622874	₩	148	222	<u>6</u>	33832	ŝ	25	1263	36260	1328	1177
Ammatics C6-C7	10		9		,	T		۰	ļ.	Ī.	ŀ		ŀ	ļ.		,		Ţ,
Aromatics >C? C8	9	ŀ	P	×	ŀ	١.	ŀ	ļ,	Ī		ŀ			<u>-</u>	١,		ŀ	ŀ
Aromatics > ECB-EC10	10			d	ŕ	ŀ		ļ		,	ŀ	,		121	ŀ	ŀ	ŀ	
Aromatics > EC10-EC12		•	١.	1	Ç	ŀ	ŀ	ŀ	ŀ	ļ	ŀ			,	,		ŀ	,
Anmatics > EC12-EC16	8	2631		20466	<b>5</b>	1636	88	342	8	9	163	2217	101	Γ	z	ŝ	T	ŀ
Aromatics > EC16-EC21	100	5547	496	1156DB	Q Q	9843	88	363	252	7184	190	15103	302	377	8866	112	ŝ	<del>4</del>
Aromatics > EC21-EC35	ā	36.761	476	262237	128	65830	808	25364	252	14906	3.	149163	9366	1868	66608	424	291	180
Total Aromatics C6-C35	L	44942	972	397311		108	_	25069	Н	36130	17.4	166483	8678	24.57	190	87	333	×
TPH (Aliphatics and Aromatics C5-C35)	100	83464	1779	872299	1372	78059	Jezifes 27240	27240	2695	31407	183	200915	10166	3580	12(06	43408	1650	1467
- Below Detection Limits		]	]	]	1	1	and see out of any other use.	ulgoses only any our	ses affort	यात्र, आंत्र	atherit	nse.	]	1	]	1	1	1

Table 11: Microbacterial Results for Soils

	Method	Sample	Sample Number
Compound	Detection Limit /		•
	Units	TP16	TP16
Depth (bgl) (m)		0.5m	Эm
Faecal Coliforms	cfu/100ml	0	0
Salmonella	n/a	Positive	Positive Negative

										S	Sample Number											
Сотроин	Method Detection Limit / Units																					
		MWD	MWD1	MWO1	MW02	MW02	MW02	MW03	MW03	MW03	MW03 N	MW03 M	MW04A MV	MW04A M	MW04A MW05	705 MW05	105 MW05	OS MWOS	MW06A	A MW/07	MW07	MW07
Depth (bgl) (m)	mg/kg	Ę,	Sm	7m	1m	5m	7m	-FL	2m	3m	4m	5m	1m	Em	7m 1m	7 2m	m 5m	n 10m	ξ	1m	4m	-Bm
Resorcinol	0.01					·	•		,			,	,		_					$\cdot$	,	,
Catachol	10.01				-	•	•	•	,				-		•			Ţ		- ]	•	,
Pheno	10.0				_	•	9.0	•		,	1	-	,	_	•				•	•	0.05	-
Total Cresols	0.01		,		_		-	-	'	-		,	-	-	- 0.03	. 50	_	-	٠	-	0.04	-
Total Xylenoks	10.0				-	•	-		-	-	-	-	-	_	_			-		4.57	_	,
Napthol	0.01	•		,	-									-		_	-	-			٠	_
2,3,5 -Trimethyi Phenal	0.01	•		,			•		-	,	-	-		_		•		_				
2-Isopropyl Phenol	0.01			-	•		•		•		•	,	-	-				_	٠	-		
Total Phenois	0.01		•		-		9.0		,				,	,	- 0.03	60		-	•	4.58	0.09	

- Below Detaction Limits



# **Appendix G 2005 RPS Site Investigation Groundwater Results**

#### **Results Tables For Groundwater**

Table 1: pH, Temperature, Dissolved Oxygen Results for all wells

Sample         Conductivity (at Method Detection Limit Method Detection Limit Mw01         Conductivity (at Dissolved Detection Limit Mw02         Conductivity (at Dissolved Detection Limit Mw02         Conductivity (at Dissolved Detection Limit Detection Limit Mw02         Ana-05         Co.014         Co.014         Co.014         PH units           MW01         Mar-05         Mar-					
Date And Hamble And Angle And Angle And Angle And Angle		Ç	Conductivity (at 25 deg C) Ms/cm	Dissolved Oxygen (mg/l)	Н
Mar-05       April 2,330       8.6         Mar-05       2,430       7.5         Mar-05       3,250       5.7         Mar-05       4,180 Ma, 6.1       6.1         Mar-05       22.500       7.5         Mar-05       5.600       4.3         Mar-05       33.900       7.2         Mar-05       34.600       8.8         Mar-05       10.00       6.6         Mar-05       19.420       6.5		Date of Date of United States	l i	<0.1	pH units
Mar-05         2,430         7.5           Mar-05         3,260         5.7           Mar-05         4,180 %         6.1           Mar-05         22.500         7.5           Mar-05         5.600         4.3           Mar-05         33.900         7.2           Mar-05         34.600         8.8           Mar-05         10.00         6.6           Mar-05         19.420         6.5		Mar-05	•	8.6	8.25
Mar-05       3.260       5.7         Mar-05       4.180 %       6.1         Mar-05       22.500       7.5         Mar-05       5.600       4.3         Mar-05       33.900       7.2         Mar-05       34.600       8.8         Mar-05       10.00       6.6         Mar-05       19.420       6.5	MW02	Mar-05	006 20 116	7.5	7.67
Mar-05       3.260       5.7         Mar-05       4.180 %       6.1         Mar-05       22.500       7.5         Mar-05       5.600       4.3         Mar-05       33.900       7.2         Mar-05       34.600       8.8         Mar-05       10.00       6.6         Mar-05       19.420       6.5	MW03	Mar-05	2,430	8.8	7.84
Mar-05       4.180 %       6.1       6.1         Mar-05       22.500 %       7.5       7.5         Mar-05       33.900       7.2       7.2         Mar-05       34.600       8.8       8.8         Mar-05       10.00       6.6       6.5	MW04A	Mar-05	3.260	5.7	7.60
Mar-05       22.500       4.3         Mar-05       5.600       4.3         Mar-05       33.900       7.2         Mar-05       34.600       8.8         Mar-05       10.00       6.6         Mar-05       19.420       6.5	MW5	Mar-05	4.180 Hay	6.1	76.7
Mar-05         5.600         4.3           Mar-05         33.900         7.2           Mar-05         34.600         8.8           Mar-05         10.00         6.6           Mar-05         19.420         6.5	MW06A	Mar-05	22.500 <sup>ve</sup>	7.5	7.71
Mar-05         33.900         7.2           Mar-05         34.600         8.8           Mar-05         10.00         6.6           Mar-05         19.420         6.5	MW07	Mar-05	2.600	4.3	7.70
Mar-05         34.600         8.8           Mar-05         10.00         6.6           Mar-05         19.420         6.5	BR6	Mar-05	33.900	7.2	8.01
Mar-05 10.00 6.6 Mar-05 19.420 6.5	BR8	Mar-05	34.600	8.8	8.04
Mar-05 19.420 6.5	BH1	Mar-05	10.00	6.6	7.80
	BH4	Mar-05	19.420	6.5	8.23

Table 2: VOC Results for Shallow Groundwater Wells

thane ethane ethane ethane ethane ethane ethane eethane eethana eethan					. s	Sample Number			
e	Compound	Method Detection Limit / Units	MW01	WW02	EOMW	MW04A	MW5	MW06A	20AW
	Date	l/Bn	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05
	Dichlorodifluoromethane	1	•	ţ	-	•	-	1	,
	Chloromethane	1	•	-	•	•	•	•	•
	Vinyl chloride	1	1	-	_	-	-	•	ı
	Bromomethane	1	•	•	-	•	-	•	•
The standard of the standard o	Chloroethane	1		-	_	•	1	-	-
	Trichlorofluoromethane	1	Onsei	ı	•	•	-	-	-
	trans-1,2-Dichloroethene	1			-	•	-	•	-
	Dichloromethane	-		inst	-		-	-	1
	Carbon disulphide	•		oction by		-	-	-	-
	1,1-Dichloroethene	1		Purc		-	-	•	•
	1,1-Dichloroethane	1	•		حى	•	-	-	1
	tert-butyl methyl ether	1		-	aly.	-	-	1	•
	cis-1,2-Dichloroethene	1	•	•	anyo	_	-	<b>'</b>	1
	Bromochloromethane	1	-	-	ther w	-	-	•	•
	Chloroform	1	,	•		•	-	٠	•
ane 1	2,2-Dichloropropane	-	•	•	•	1	1	-	-
ane 1	1,2-Dichloroethane	1	•	r	•	1	=	•	•
de 1 de	1,1,1-Trichloroethane	<b>-</b> :	,	ı	•	•	ı	'	•
de	1,1-Dichloropropene	1	•	•	1	•	1	'	•
de 1	Benzene	1		•	1	1	•	•	•
	Carbontetrachloride	1	•	•	•	1	ı	•	1
	Dibromomethane	1	•	•	1	•	ī	'	٠

Table 2: VOC Results for Shallow Groundwater Wells

und         Method Detection         MNV01         MNV02         MNV03         MNV04A         MNV5           ethane         1					S	Sample Number			
Ug/l Mar-05 Mar-05 Mar-05 Mar-05 Mar-05   Mar-	Compound	Method Detection Limit / Units	MW01	MW02	MW03	MW04A	SWIN	MW06A	MW07
	Date	l/gn	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05
	Bromodichloromethane	1	٠	•	•	-	ı	-	ŧ
	Trichloroethene	1	•	-	•	-	1	•	
	cis-1,3-Dichloropropene	1	-	-	_		•	_	,
	trans-1,3-Dichloropropene	1	-	-	•	-	ī	•	•
propane         1         Name         -	1,1,2-Trichloroethane	1		-	•	-	•	•	•
propane         1         - Property	Toluene	1	OTISE	-	•	•	•	1	•
oromethane         1         - Marking         - Condition         - Cond	1,3-Dichloropropane	1	. of)	<b>₽</b>	•	-	ı	,	,
sethane         1         -         Interest         -         -         Interest         -	Dibromochloromethane	1		inst Vi		_	T	•	
ethene         1         -         Parath Parath 1         -	1,2-Dibromoethane	1		o the o	•	-	•	-	•
achloroethane         1         -         Applian         -         -         Applian         - <td>Tetrachloroethene</td> <td>1</td> <td></td> <td>i Pur</td> <td></td> <td>-</td> <td>1</td> <td>ı</td> <td></td>	Tetrachloroethene	1		i Pur		-	1	ı	
ene         1         -         Apple         -         Apple         -         Apple         -	1,1,1,2-Tetrachloroethane	1		Editi	S	ŧ		•	
ne         1         -	Chlorobenzene	1	•		afor	-		-	1
1         -	Ethylbenzene	1	•		4	-	ī.	•	•
1         -	p/m-Xylene	1	-	1	ther	t	J	•	,
opane         1         - <td>Bromoform</td> <td>1</td> <td></td> <td>,</td> <td></td> <td>t</td> <td></td> <td>•</td> <td>•</td>	Bromoform	1		,		t		•	•
opane         1         - <td>Styrene</td> <td>1</td> <td>•</td> <td>•</td> <td>•</td> <td>1</td> <td>t</td> <td></td> <td>•</td>	Styrene	1	•	•	•	1	t		•
opane 1	1,1,2,2-Tetrachloroethane	1	•	-	1	1	1	,	1
opane 1	o-Xylene	1	,	,	•		1	•	•
	1,2,3-Trichloropropane	1	•	•	•	ı	t	-	
1 1	Isopropylbenzene	1	•	•	1	ı	ŀ	•	•
	Bromobenzene	1	•	ı	•		•	•	•
	2-Chlorotoluene	1	1	•	I	1	•	•	ı

Table 2: VOC Results for Shallow Groundwater Wells

				S	Sample Number	<b>!</b>		
Compound	Method Detection Limit / Units	MW01	MW02	MW03	MW04A	MW5	MW06A	MW07
Date	l/Bn	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05
Propylbenzene	1	-	•	-	•	<b>-</b>	•	•
4-Chlorotoluene	1	•	-	-	1	-	-	•
1,2,4-Trimethylbenzene	1	•	_	-	1	-	-	
4-Isopropyltoluene	1	-	•		_	1	•	•
1,3,5-Trimethylbenzene	1		•	1	-	-	•	•
1,2-Dichlorobenzene	1	Ones	•	-	•	-	•	•
1,4-Dichlorobenzene	1	8	$\Delta \mathbf{Q}$	1	-	•	-	
sec-Butylbenzene	1		inst	_	-	-	-	•
tert-Butylbenzene	1	•	otion hto	1	•	-	•	,
1,3-Dichlorobenzene	1	•	Dur i	•	-	1		ı
n-Butylbenzene	1	•	Chire	S.	-	•	-	
1,2-Dibromo-3-chloropropane	1	•	-		-	1	_	
1,2,4-Trichlorobenzene	1	-	-	anyo		•	•	•
Naphthalene	1	-	•	herv	•	•	•	•
1,2,3-Trichlorobenzene	1	•	1	မ် •	•	1		
Hexachlorobutadiene	1		1	٠	-	1	-	
- Below Detection Limits								

Table 3: VOC Results for Deep Groundwater Wells

Compound	Method Detection Limit / Units	BR6	BR8	BH1	BH4
Date	l/bn	Mar-05	Mar-05	Mar-05	Mar-05
Dichlorodifluoromethane	1	-	-	•	
Chloromethane	1	•	-	-	
Vinyl chloride	1	-	1	-	•
Bromomethane	4	•	-	-	1
Chloroethane	1	Ł	-	-	
Trichlorofluoromethane	Onse	1	-	-	
trans-1,2-Dichloroethene	x of	-	-	-	1
Dichloromethane	option in the contract of the	1	-	-	-
Carbon disulphide	1 de la constantina della cons	•	-	-	•
1,1-Dichloroethene	The state of the s	0	-	-	-
1,1-Dichloroethane	1	OSES OSLIT	•	-	ı
tert-butyl methyl ether	1	only.	-	-	1
cis-1,2-Dichloroethene	1	अग्रि	•	•	
Bromochloromethane	1	ille.	- ~	-	1
Chloroform	1	•	se.	-	•
2,2-Dichloropropane	1	,	ı	•	٠
1,2-Dichloroethane	1	,	•	٠	ı
1,1,1-Trichloroethane	1	•	,		,
1,1-Dichloropropene	1	•		£	,
Benzene	1	ı	,•	1	1
Carbontetrachloride	1	1	,	•	•
Dibromomethane	_	ı	1	1	•

Table 3: VOC Results for Deep Groundwater Wells

Compound	Method Detection Limit / Units	BR6	BR8	BH1	ВН4
Date	l/6n	Mar-05	Mar-05	Mar-05	Mar-05
1,2-Dichloropropane	1	-		ı	,
Bromodichloromethane	1	-	•	1	_
Trichloroethene	1	-			-
cis-1,3-Dichloropropene	1			-	-
trans-1,3-Dichloropropene	1	_	-	-	•
1,1,2-Trichloroethane	Onser	-	_	-	•
Toluene		•	1	3	-
1,3-Dichloropropane	JUS!	-	•	•	-
Dibromochloromethane	it of the late	-	•	1	-
1,2-Dibromoethane	ner	DILLO	•		-
Tetrachloroethene	1	JSES O	-		•
1,1,1,2-Tetrachloroethane	1	dfor	-	•	•
Chlorobenzene	-	any o	-	ı	•
Ethylbenzene	1	de -	, , ,	-	-
p/m-Xylene	1	ı	٠. و٠.	•	1
Bromoform	+	l l	-	-	1
Styrene	1		1		•
1,1,2,2-Tetrachloroethane	1	1	,	1	ı
o-Xylene	-	•	•	-	ı
1,2,3-Trichloropropane	1	•	,	•	ı
Isopropylbenzene	1	1	•	-	ı
Bromobenzene	_	ı	•	ŀ	ı

Table 3: VOC Results for Deep Groundwater Wells

Compound	Method Detection Limit / Units	BR6	BR8	8H1	BH4
Date	l/ɓn	Mar-05	Mar-05	Mar-05	Mar-05
2-Chlorotoluene	1	-	1	-	-
Propylbenzene	1	•	-	-	-
4-Chlorotoluene	1	_	-	-	-
1,2,4-Trimethylbenzene	1	-	•	-	•
4-IsopropyItoluene	-	•	•	• ::	-
1,3,5-Trimethylbenzene	Olise	-	-	•	-
1,2-Dichlorobenzene	T of	-	•	-	ŀ
1,4-Dichlorobenzene	rins Opti	-	-	-	-
sec-Butylbenzene	ection -	-	Ī	-	•
tert-Butylbenzene	ATTEN	Out	•	-	-
1,3-Dichlorobenzene	1	oses edit	1	-	-
n-Butylbenzene	1	odfor	1	•	•
1,2-Dibromo-3-chloropropane	1	any	•	_	1
1,2,4-Trichlorobenzene	-	ine	٠	_	
Naphthalene	-	-	- ė	-	a
1,2,3-Trichlorobenzene	1	-	ı	1	ı
Hexachlorobutadiene	1	-	ı	ı	1
- Below Detection Limits					:
Shaded: Results unavailable		***			

Table 4: TPH Results for Shallow Groundwater Wells

				Sar	Sample Number	ber		
Compound	Method Detection Limit	MW01	MW02	MW03	MW04A	MW5	MW06A	MW07
Sample Date	l/Bn	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05	Mar-05
GRO (C4-C12)	10	14	1	4		4	,	1
MTBE (Methyl Tertiary Butyl Ether)	10			•		ı		
Benzene	10	•	•	-	-		,	
Toluene	10	•	•	•	-	-	•	-
Ethyl benzene	10	-	•	•	-	-	-	
m & p Xylene	10	•	-	•	•	-	•	•
o Xylene	10	,	-	-	-	=	•	,
Aliphatics C5-C6	රු 10	-	-	-	-	_	•	-
Aliphatics >C6-C8	<sup>76</sup> 9,10	•	-	-	-	-	-	-
Aliphatics >C8-C10	8	-	•	-	•	_	•	-
Aliphatics >C10-C12	10% 16	-	-	•	•	•	•	
Aliphatics >C12-C16	10 By 200	-	29	•	-	-	-	-
Aliphatics >C16-C21	10 00 0		211	12			15	14
Aliphatics >C21-C35	10 10	, July	18	1	-	-	1	-
Total Aliphatics C5-C35	10	05. 05.	258	12	•	-	15	14
Aromatics C6-C7	10	par di	-	-	b	-		_
Aromatics >C7-C8	10	y. s		-	•	-	1	•
Aromatics >EC8-EC10	10	14 12	11		-	-	1	-
Aromatics >EC10-EC12	10	-	det		4	-	-	-
Aromatics >EC12-EC16	10	-	1150	ı	•	-	•	
Aromatics >EC16-EC21	10	-		1	•	-	-	-
Aromatics >EC21-EC35	10	k	•	•	1	•	-	-
Total Aromatics C6-C35	10	14	11	-	•	-	•	-
TPH (Aliphatics and Aromatics C5-C35)	10	14	269	12	٠	•	15	14

'- Below Detection Limits

Table 5: TPH Results for Deep Groundwater Wells

Compound Sample Date	Method Detection Limit				
Sample Date		BR6	BR8	BH1	ВН4
(2,0,000)	l/Bn	Mar-05	Mar-05	Mar-05	Mar-05
(オン-もつ) ひとり	10	ı	147	•	
MTBE (Methyl Tertiary Butyl Ether)	10	,	11		-
Benzene	10	-		-	-
Toluene	10	•	-	•	-
Ethyl benzene	10	-	-	t	-
m & p Xylene	10	•	•	•	ı
o Xylene	10	•	-	4	-
Aliphatics C5-C6	10	•		•	-
Aliphatics > C6-C8	10	•	•	ı	•
Aliphatics >C8-C10	32°Cc. 10	•	54	-	-
Aliphatics >C10-C12	04, 69, 10	•	•	1	•
Aliphatics >C12-C16	10 10 10 10 10 10 10 10 10 10 10 10 10 1		ī	1	•
Aliphatics >C16-C21	90 0kg	•	11		•
Aliphatics >C21-C35	10% 901	-	-	-	-
Total Aliphatics C5-C35	10 %.	•	65	•	1
Aromatics C6-C7	10 %	•	1	1	ı
Aromatics >C7-C8	10 10	•		•	•
Aromatics >EC8-EC10	10	-	82	1	,
Aromatics >EC10-EC12	10	•	•	•	,
Aromatics >EC12-EC16	10	•	•	1	•
Aromatics >EC16-EC21	10	1	1	•	
Aromatics >EC21-EC35	10	•	•	-	,
Total Aromatics C6-C35	10		82	£	•
TPH (Aliphatics and Aromatics C5-C35)	10	•	147	1	•

Table 6: Heavy Metals Results for Shallow Groundwater Wells

Sample								
	Date				Mar-05			
	Method Detection Limit	MW01	MW02	MW03	MW04A	MW5	MW06A	MW07
Arsenic Dissolved (ICP-MS)	//8n ↓>	7	2	10	2	80	19	9
Boron Dissolved (ICP-MS)	<10 ug/l	626	913	197	1619	723	1673	1206
Cadmium Dissolved (ICP-MS)	<0.4 ug/l	0.4	•	•	0.7		•	•
Chromium Dissolved (ICP-MS)	/l/gn l>	9	10		5	ဌာ	5	7
Copper Dissolved (ICP-MS)	1/bn L>	6	4	4	3	1	4	2
Lead Dissolved (ICP-MS)	1/gn 1>	2	•	•	18	•	•	2
Nickel Dissolved (ICP-MS)	<1 ug/l 😪	15	16	19	33	6	12	31
Selenium Dissolved (ICP-MS)	ا/gn 1>	13	2		2	7	40	7
Zinc Dissolved (ICP-MS)	<u> </u>	87	94	43	72	77	49	49
Mercury Dissolved (CVAA)	<0.05 ug/l	-	r	-	•	1	-	r
							ı	

- Below Detection Limits

Pection Purposes only any other use

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Table 7: Heavy Metals results for Deep Groundwater Wells

Sample	Date		Ē.	Mar-05	
	Method Detection Limit (ug/I)	BR6	888	BH1	BH4
Arsenic Dissolved (ICP-MS)	<١	16	53	9	۷,
Boron Dissolved (ICP-MS)	<10	2495	3130	0.81	1.44
Cadmium Dissolved (ICP-MS)	<0.4	0.7	4.2	-	-
Chromium Dissolved (ICP-MS)	<1	Ž	11	18	7
Copper Dissolved (ICP-MS)	<1	4	9	1	-
Lead Dissolved (ICP-MS)	<1	1	0.2	1	,
Nickel Dissolved (ICP-MS)	୍ଦ <1	18	18	10	11
Selenium Dissolved (ICP-MS)	78g <1	62	82	11	25
Zinc Dissolved (ICP-MS)	√ <sub>0</sub> , △, <3	79	200	126	49
Mercury Dissolved (CVAA)	%, %, 0.05	-		1	

- Below Detection Limits

Specific purposes only any other use sight owner required for any other use

Table 8: PAH Results for Shallow Groundwater Wells

Sample					PAHs			
	Date				Mar-05			
	Method Detection Limit (ng/I)	MW01	MW02	MW03	MW04A	MW5	MW06A	MW07
Naphthalene	10	-	-	558	•	-	-	•
Acenaphthylene	10	-	•	42	-	,	•	
Acenaphthene	10	1	•	17		,	•	
Fluorene	10	•	,	47	•		-	٠
Phenanthrene	10	ı	•	66			,	•
Anthracene	10	•	•	14	•	•	•	1
Fluoranthene	10	1	-	61	•	•	•	•
Pyrene	10	•	-	52	1		•	,
Benz(a)anthracene	10	-	-	•	1	-	•	-
Chrysene	10 گ	-	•			•	•	•
Benzo(b)fluoranthene	10	-	•		•	•	•	•
Benzo(k)fluoranthene	10 % ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	•	•	-	•	•	•	•
Benzo(a)pyrene	10 29.8		•		1	•	•	,
Indeno(1,2,3-cd)pyrene	10	80°	•	•		•	•	•
Dibenzo(a,h)anthracene	10	io	,	•	•	•	-	•
Benzo(ghi)perylene	10	Pur	-	 	•	•	-	•
Total EPA 16	10	S COL	- 80°	890	•		•	

- Below Detection Limits

other us

Table 9: PAH Results for Deep Groundwater Wells

Sample			7d	PAHs	
	Date		Ma	Mar-05	
	Method Detection Limit (ng/I)	BR6	BR8	BH1	BH4
Naphthalene	10	-	1	982	•
Acenaphthylene	10	-	-	549	•
Acenaphthene	10	-	•	2885	
Fluorene	10	-	-	1200	
Phenanthrene	10	-		4001	•
Anthracene	10	•	•	2495	•
Fluoranthene	10	-	-	2999	•
Pyrene	01 <sup>©</sup>	-		5751	
Benz(a)anthracene	10	=	-	1927	•
Chrysene	Ø1 %	-	(	2824	•
Benzo(b)fluoranthene	7.00k	-	•	1500	,
Benzo(k)fluoranthene	%, <sup>22</sup> 01	-	1	500	•
Benzo(a)pyrene	10 W 01	-	•	674	
Indeno(1,2,3-cd)pyrene	पि वित्र १०	-		427	•
Dibenzo(a,h)anthracene	10 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	-	ı	242	•
Benzo(ghi)perylene	of the of the other of the othe	-	•	473	•
Total EPA 16	10 Ot	-		32411	

- Below Detection Limits

Sample Date Method Detection Limit MW01 MW02 MW03 MW04A MW05 MW05 MW05 MW06A MW06A BR6 BR6	Phenols
BH1	- 80.00
BH4	itic A C

- Below Detection Limits

Durdoses only, any other use

#### **Appendix H Borehole and Trial Pit Logs**



	Drilled by Mi Logged by PC Checked by Mi	End	Equipment, Method Dando 175 cable tool Hand dug inspection in Cable percussive bori Installed 50mm dia, st	drill rig at to 1.20m ng to 36,50m	rks		Depth from to 0.00m 13.50m 13.50m 36.50m	Diameter 250mm 200mm	Casing Depth 13.50m 36,50m	Ground Level Coordinates National Grid	E:	3.64 mOO 319923.03 233437.37
	Samples	and Tests	<del>}</del>	<del></del>		Strata				1		
ı	Depth	Type & No	Records	Date Casing	Time Water		Description			Depth, Level	Legend	Backet
	0.00-0.50 - - - 0.50-1.00	B1 B2			;	Soft brown to black sand and sandy GRAVEL FILL cobbles and fragments of concrete, wood and plast subangular to subrounde (MADE GROUND)	i. with subangular f brick, tic. Gravel is			(Thickness)		
ŀ	1.00-1.50	83				restet /	•	•	1.00-2.50 m		KXXI	NI
	2.00-2.50	SPT C	N=48 (4,45,10.14,18)	1.20	dny				Occasional Judder-sized concrete fragment	(4.00)		
	3.00-3.45 3.00-3.50 3.00	SPTC 85 W9	N≈16 (2,3/3,4,4,5)	3.00	dry							
	3.50 3.60-4.05 3,60-4.00	D6 SPTS B7	N=11 (1,2/2,3,2,4)	3.60	фy		ngo.		1		$\bigotimes$	
	- 4.00-4.45 4.00-4.50	SPT C B8	N=23 (3,4/4,5,6,8)	4.00	dry	Medium dense to dense of with shell fragments and of subrounded cobbles. San	rey sandy GRAVE	L 54	OU-4.50 m	4.00 -0.37	XXX	
	4.50	W48				medium, gravel is subang	ular to rounded		clods 7		0 0	
	5,00-5,45 5,00-5,50	SPT C B 10	N=41 (6,9/9,10,11,11)	5.00 20/05/200 5.00	3.00 3 3.00	fine to coarse (ESTUARI	-			ľ		
	6.00-6.45 6.00-6.50	SPT C B11	N=33 (4,646,8,8,8,11)	6.00	FOT 1	ight.			111111111111111111111111111111111111111		0.000	
	- 7.00-7.45 7.00-7.50	SPT C B 12	N=35 (4,4/7,8,10,10)	7.00	3,00							
	- 8.00-8.45 8.00-8.50	SPT C B 13	Megrin (V., 1987) (1993)	\$190 	3.00							
	9.00-9.45 9.00-9.50	SPT C B 14	N=46 (6,5/9,11,12,14)	9.00	3.00					0	0 0 0 0	
F	Dant	Type E No.	Danauda	Date	Time	Stratum continued r	next sheet			و		oH°
ľ	(m)	ost strike behav	Records iour fter 20 minutes. Stron	Casing Depth se	Water	Depth Related Remarks From to (m)				7.60 - 7.80 30 i	e Tools mins Chisel mins Chisel mins Chisel	
ie in	bbreviations see k	tion of symbols and bey sheet. All depth: ratum thickness give (c) MESC MBH (281),	s and reduced en in brackets	Project Project No Carried ou		Oublin Waste to Energy (D3116 Oublin City Council					H1 t 1 of 4	



Drilled by MC Logged by PC Checked by Mr	20/05/2003 End	ì	ls and Rema	rks		Depth from to Diameter 0.00m 13.50m 250mm 13.50m 36.50m 200mm	Casing Depth 13.50m 36.50m	Ground Level Coordinates National Grid	E 31	.64 mOD 19923.03 13437.37
Samples	and Test	<u> </u>			Strata			<b>]</b>		
Depth	Type & No		Date	Time		Description		Depth, Level		Backfill
10.00-10.29 10.00-10.50	SPT C 8 15	50 (6,11/25,25 for 65mm)	Casing 10,00	Water 3,00		grey sandy GRAVEL occasional od is fine to sular to munded	<u>`</u>	(Thickness)		
11.00-11.45 11.00-11.50	SPT C B 16	N=42 (7,7/8,8,14,12)	11.00 22/05/200 11.00	3.00 3 3.00					0000	
12.00-12.45 - 12.00-12.50	SPT C B 17	H=17 (1,24,4,4,5)	12.00	3.20					0.00	\$ <b>7</b>
13.00-13.45 13.00-13.50	SPT C B 18	N=28 (4,4/6,6,7,9)	13.00	3.20			11111111		0.00	
14.00-14.45 14.00-14.50	SPT C B 19	N=27 (5.5/6,7,6,5)	14.60	3.20	For inspection purposes only	Tany offer use.	14.00 m —		0 0 0	
15.00-15.45 - 15.00-15.50	SPT C B 20	N=32 (4,4/5,5,9,11)	15.00	3.20	Special Purposes of Co	<b>Y</b>				
16.00-16.45 16.00-16.50	SPT C 8 21	N≃35 (5,5/5,8,10,12)	15.00	3.20 Oliseli	For the little		***************************************	0	000	
17.00-17.10 17.10-17.53 17.10-17.60	0.22 SPT S B 23	60 (3,8/10,14,11 for 55mm)	17.10		Stiff to very stiff dark grey b slightly sandy CLAY with ra lenses. (ESTUARINE DEP	re fine cand	1	7.00 -13.36		
18.00-18.44 - 18.00-18.50	SPT S B 24	55 (5,9/9,13,12 for 60mm)	18.00 23/05/2003 18.00	3.20			***************************************	- - - - -		
19.50-19.95 19.50-19.95	SPT S D 25	N=30 (4,4/5,7,9,9)	19.50	3.20	Stratum continued ne	ext sheet	Trees to the		1	
Depth	Type & No	Records	Date T Casing W	ime fater			· <del>-</del>		<del>-     </del>	
(m)	st strike behavi	lour ter 20 minutes, Strong	Depth seal	led (m)	Depth Related Remarks From to (m)		[ D	hiselling lepths (m) Time 0.80 -10.95 45 m 2.80 -12.90 30 m 3.70 -13.95 45 m	Tools us ins Chisel ins Chisel ins Chisel	sed
Notes: For explanationabreviations see leg- levels in metres. Stratin depth column.  Scale 1:50	y sheet. All depths ium thickness give	en in brackets	Project Project No. Carried out (	K	ublin Waste to Energy 03116 ublin City Council		E	Borehole Bl Sheet	<b>H1</b> 2 of 4	



Drilled by MD Logged by PG Checked by MK	Start 20/05/2003 End 26/05/2003	Equipment, Method	us and Rema	ries		Depth from 0.00m 13.50m	n to 13.50m 36.50m	Diameter 250mm 200mm	Casing Depth 13.50m 36.50m	Ground Level Coordinates National Grid	£	+3.64 ( 31992 ( 23343
Samples a					Strate	<u> </u>				1	•	
	1		Date	Time	Strata	Pre-				Depth,Level	T.	Ψ-
Depth 20.00-20.50	Type & No	Records	Casing	Water		Descriptio				Depth,Level (Thickness)	Legend	B: Inst
20.00-20.50	B 26	- <del></del>			Stiff to very stiff dark grey slightly sandy CLAY with lenses. (ESTUARINE DE	h rare fine sa	and	<b></b>	1			
- - 21.00-21.45 - 21.00-21.45	SPT S D 27	N=29 (3,44,8.8,9)	21.00	3.20		•					—:  -  -  -  -	11111
22.00-22.50	B 28											7777
22.50-22.95 - 22.50-22.95	SPT S D 29	N=30 (4,4/6,8,8,10)	22.50	3.20								1
— 23.00-23.50	B 30									1		11111
- 24.00-24.45 24.00-24.45	SPTS D31	N=28 (5,5/5,7,7,9)	24,00	3.20	•	other use.			1		-:	1
24.50-25.00	B 32	٠	77		hurden only at	7			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			1111
25,50-25,95 25,50-25,95 — 26,00-26,50	SPTS D33	N=31 (4,4/5,8,8,9)	25.50 24/05/2000 25.50	3.20 33 FOT 3.330	is edial purpses offst and specific purpses of the purpses of the specific of					(18.50)		1111111
- 27.00-27.45 27.00-27.45	SPT S D35	N=29 (3,444,8,8,9)	27.00	3.20								7/1/1/1
- 28.00-28.50	B 36								44.14.			111
28.50-28.95 28.50-28.95	SPT S D37	N=28 (5.5/6,6,8,6)	28.50	3.20					1111		 	
- 29.00-29.50	Ð 38			ļ					i stati			
		-			Stratum continued	next sheet			1			
	Type & No	Records	Date Casing	Time Water		,						
(m)	st strike behavi	riour liker 20 minutes. Stron	Depth se	ealed (m)	Depth Related Remarks From to (m)					Chiselling Depths (m) Ti	ime Tool	ojs use
ntes: For explanation breviations see key s rels in metres. Stratu depth column.	of symbols and sheet. All depths in thickness give	a and reduced en in brackets	Project Project No Carried ou	o. K	Dublin Waste to Energy KD3116 Dublin City Council					Borehole	BH1 set 3 of 4	



	Drilled by MD Logged by PG Checked by MK	Start 20/05/2003 End 25/05/2003	ł	and Rema	rks	<del>, , , , , , , , , , , , , , , , , , , </del>	Depth from to Diamete 0.00m 13.50m 250mm 13.50m 36.50m 200mm	Casing Depth 13,50m 38,50m	Ground Level Coordinates National Grid	Ε:	3.64 mOD 319923,03 233437,37
	Samples	and Test	<u> </u>			Strata			[		,
	Depth	Type & No		Date	Time	Ottata	Description		Depth_Level (Thickness)	1,,,,,,,	Backfill
ı	30.00-30.45	SPTS	N=24 (3,3/5,5,6,8)	Casing 30.00	Water 3.20		hown	· ,	(Thickness)	Legend	Instrument
	30.00-30.45	D 39				slightly sandy CLAY with ienses. (ESTUARINE DE	rare fine sand	- - - - -			
ļ	— 31.00-31.50 - -	B 40				·					
	31.50-31.95 31.50-31.95	SPT S D 41	N=27 (3,4/5,6,8,8)	31.50 25/05/2003 33.50	3.20 3 3.20	-					
	33.00-33.45 33.00-33.50	SPT S 842	N=29 (4,4/6,6,8,9)	33.00	3.20						
	- 34.00-34.50	B 43	•			Recovered as brown slight	. Nather use.			:	
E	34,50-34,95 34,50-34,95	SPT S D 44	N=27 (3.4/5,6,6,5)	34.50	3. <u>2</u> 0	urposes off	4.0	1		<u> </u>	
F	- 35,00-35,50	B 45				edection of reds		بالتنيا		 	
E	35,50-35,95 35,50-35,95	SPTS D46	N=31 (3,5/5,6,9,11)	35.50	3.20	cobbles. Gravel is angular	to subrounded	<del></del>	ŀ		
	- 36,00-36,39 36,00-36,50	SPT C 6 47	47 (4,6/10,12,18,7 for 10mm)	26/05/2003	211	Sine to coarse. (possible worockhead)  EXPLORATORY HOLE EN			<b>!</b>	20x 6	
	-							بيبينينانين			
L	Depth	Type & No	Records	Date 1 Casing V	inne Vater			1	}		
	(m)	st strike behav	riour liter 20 minutes. Strong		ded (m)	Depth Related Remarks From to (m)		1	Chiselling Depths (m) Tim 36.40 -36.50 45	ne Tools mins Chisel	tised.
a je	otes: For explanation obreviations see key vels in metres. Strat depth column.	sheet. All depth um thickness giv	s and reduced en in brackets	Project Project No. Carried out	K	oblin Waste to Energy D3116 Jublin City Council			Borehole B Shee	H1 et 4 of 4	



Samples and Tes           Depth         Type & N           0.00-0.50         B 1           0.50-1.00         B 2           1.00-1.50         B 3           1.50-2.00         B 4           2.00-2.45         SPT C           2.50-3.00         B 6           3.00-3.45         SPT C           3.00-3.50         B 7           3.60-3.70         B 87           3.70-4.15         SPT S           3.70-4.15         D 9           4.50-4.95         SPT C           4.50-4.95         W 11           4.50-5.00         B 13           5.50-5.95         SPT C           5.50-6.00         B 15           7.00-7.45         SPT C           8.50-8.95         SPT C           8.50-9.90         SPT C           8.50-9.90         B 17		2.00 2.00 3.00 4.50	dry dry	TARMAC pavement overlying grey angular to subangular cobbles (MADE GROUND).  Soft grey brown to black slightly sandy CLAY and GRAVEL FILL with concrete, wood, ceramics and brick fragments. Gravel is angular to subrounded fine to coarse. (MADE GROUND)  Medium dense grey slightly clayey fine SAND with rare shell fragments. Gravel is subangular to subrounded fine to medium. (ESTUARINE DEROSIT).	(0.50) (0.50) (0.50) (0.50) (3.10)	Legend In
Depth         Type & N           0.00-0.50         B 1           0.50-1.00         B 2           1.00-1.50         B 3           1.50-2.00         B 4           2.00-2.45         SPT C           2.50-3.00         B 6           3.00-3.50         B 7           3.60-3.70         B 8           3.70-4.15         SPT S           3.70-4.15         D 9           4.50-4.95         SPT C           4.50-4.95         W 11           4.50-5.00         B 13           5.50-5.95         SPT C           5.50-6.00         B 15           7.00-7.50         B 16	N=10 (2,3/3,2,3,2) N=14 (2,3/3,4,4,3) N=15 (2,2/4,3,4,5) N=12 (1,1/2,2,3,5) N=25 (3,4/4,5,7,9)	1.00 2.00 3.70	dry dry	TARMAC pavement overlying grey angular to subangular cobbles (MADE GROUND).  Soft grey brown to black slightly sandy CLAY and GRAVEL FILL with concrete, wood, ceramics and brick fragments. Gravel is angular to subrounded fine to coarse. (MADE GROUND)  Medium dense grey slightly clayey fine SAND with rare shelf in subrounded fine to sand in the same statements.	(0.50) 0.50 +3.49 (3.10)	
0.00-0.50 B1  0.50-1.00 B2  1.00-1.45 SPT C 1.00-1.50 B3  1.50-2.00 B4  2.00-2.45 SPT C 2.00-2.50 B5  2.50-3.00 B6  3.00-3.45 SPT C B7  3.60-3.70 B7  3.70-4.15 SPT S 3.70-4.15 SPT S 3.70-4.15 SPT S 3.70-4.15 B12  5.00-5.50 B13  5.50-5.95 SPT C B14  6.50-7.00 B15  7.00-7.45 SPT C B16	N=10 (2,3/3,2,3,2) N=14 (2,3/3,4,4,3) N=15 (2,2/4,3,4,5) N=12 (1,1/2,2,3,5) N=25 (3,4/4,5,7,9)	3.00 3.70 4.50	dry dry	TARMAC pavement overlying grey angular to subangular cobbles (MADE GROUND).  Soft grey brown to black slightly sandy CLAY and GRAVEL FILL with concrete, wood, ceramics and brick fragments. Gravel is angular to subrounded fine to coarse. (MADE GROUND)  Medium dense grey slightly clayey fine SAND with rare shell fragments. Gravel is subrounder fine to	(0.50) 0.50 +3.49 (3.10)	
1.00-1.45 SPT C 1.00-1.50 B3  1.50-2.00 B4  2.00-2.45 SPT C 2.00-2.50 B5  2.50-3.00 B6  3.00-3.45 SPT C 3.00-3.50 B7  3.60-3.70 D8 3.70-4.15 D9 4.00-4.50 B10  4.50-4.95 SPT C 4.50 W11 4.50-5.00 B12 5.00-5.50 B13  5.50-5.95 SPT C 5.50-6.00 B15  7.00-7.45 SPT C B16	N=14 (2,3/3,4,5) N=15 (2,2/4,3,4,5) N=12 (1,1/2,2,3,5) N=25 (3,4/4,5,7,9)	3.00 3.70 4.50	dry dry	Soft grey brown to black slightly sandy CLAY and GRAVEL FILL with concrete, wood, ceramics and brick fragments. Gravel is angular to subrounded fine to coarse. (MADE GROUND)  Medium dense grey slightly clayey fine SAND with rare shell fragments. Gravel is subpangular to subprounded fine	0.50 +3.49 (3.10)	
1.00-1.50 B 3  1.50-2.00 B 4  2.00-2.45 SPT C 2.00-2.50 B 5  2.50-3.00 B 6  3.00-3.45 SPT C B 7  3.60-3.70 B 8 3.70-4.15 SPT S 3.70-4.15 D 9 4.00-4.50 B 10  4.50-4.95 SPT C W 11 4.50-5.00 B 13  5.50-5.95 SPT C B 14  6.50-7.00 B 15  7.00-7.45 SPT C B 16	N=14 (2,3/3,4,5) N=15 (2,2/4,3,4,5) N=12 (1,1/2,2,3,5) N=25 (3,4/4,5,7,9)	3.00 3.70 4.50	dry dry	Medium dense grey slightly clayey fine SAND with rare shell ingrenents.  Medium dense grey slightly clayey fine SAND with rare shell ingreents. Gravel is subprounder fine.	3.60 +0.39	
1.50-2.00 B 4  2.00-2.45 SPT C 2.00-2.50 B 5  2.50-3.00 B 6  3.00-3.50 B 7  3.60-3.70 B 7  3.60-3.70 B 7  3.70-4.15 SPT S 10  4.00-4.50 B 10  4.50-4.95 SPT C W 11  4.50-5.00 B 13  5.50-5.95 SPT C B 14  6.50-7.00 B 15  7.00-7.50 B 16	N=16 (2.24.3.4,5) N=12 (1,1/2.2.3,5) N=26 (3,4/4,5,7.9)	3.70 4.50	dry	Medium dense grey slightly clayey fine SAND with rare shell ingments. Gravel is subangular to submunde fine to	3.60 +0.39	
2.50-3.00 86  2.50-3.00 86  3.00-3.45 SPT C 87  3.60-3.70 D8 SPT S 3.70-4.15 D9 4.00-4.50 B10  4.50-4.95 SPT C W11 4.50-5.00 B13  5.50-5.95 SPT C B14  6.50-7.00 B15  7.00-7.45 SPT C B16	N=16 (2.24.3.4,5) N=12 (1,1/2.2.3,5) N=26 (3,4/4,5,7.9)	3.70 4.50	dry	Medium dense grey slightly clayey fine SAND with rare shell ingments. Gravel is subgrounder to subground fine to	3.60 +0.39	
2.50-3.00 8 6  2.50-3.00 8 6  3.00-3.45 SPT C 8.70-4.15 D9 8.10  4.50-4.95 SPT C W11 4.50-5.00 B 13  5.50-5.95 SPT C B 14  6.50-7.00 B 15  7.00-7.45 SPT C B 16	N=16 (2.24.3.4,5) N=12 (1,1/2.2.3,5) N=26 (3,4/4,5,7.9)	3.70 4.50	dry	Medium dense grey slightly clayey fine SAND with rare shell ingments. Gravel is subgrounder to subground fine to	3.60 +0.39	
3.00-3.45 SPT C 3.00-3.50 B7  3.60-3.70 D8 3.70-4.15 SPT S 3.70-4.15 D9 4.00-4.50 B10  4.50-4.95 SPT C 4.50 W11 4.50-5.00 B12 5.00-5.50 B13  5.50-5.95 SPT C 5.50-6.00 B15  7.00-7.45 SPT C B16	N=12 (1,1/2,2,3,5) N=25 (3,4/4,8,7,9)	3.70 4.50	dry	Medium dense grey slightly clayey fine SAND with rare shell fragments. Gravel is subangular to subrounded fine to	1	
3.00-3.50 B 7  3.60-3.70 DB 3.70-4.15 SPT S 3.70-4.15 D9 4.00-4.50 B 10  4.50-4.95 W11 4.50-5.00 B 12  5.00-5.50 B 13  5.50-6.95 SPT C 5.50-6.00 B 15  7.00-7.45 SPT C B 16	N=12 (1,1/2,2,3,5) N=25 (3,4/4,8,7,9)	3.70 4.50	dry	Medium dense grey slightly clayey fine SAND with rare shell fragments. Gravel is subangular to subrounded fine to	1	
3.70-4.15 SPT'S 3.70-4.15 D9 4.00-4.50 B10 4.50-4.95 SPT C 4.50 W11 4.50-5.00 B12 5.00-5.50 B13 5.50-5.95 SPT C 5.50-6.00 B15 7.00-7.50 SPT C B16	N=25 (3,444,8,7.9)	4.50		SAND with rare shell fragments. Gravel is subangular to subrounded fine to	1	
4.50-4.95			3.20	is subangular to subrounded fine to	(2.00)	
4.50 W11 4.50-5.00 B 12 5.00-5.50 B 13 5.50-5.95 SPT C 5.50-6.00 B 15 7.00-7.45 SPT C 7.00-7.50 SPT C B 16			3.20	Section the frequired lift and,	(2.00)	
5.50-5.95 SPT C 5.50-6.00 B 14 6.50-7.00 B 15 7.00-7.45 SPT C 7.00-7.50 B 16	N=24 (4,4/4,8.6.5)	5.50		Section Party Eduly	1	
5.50-6.00 B 14  6.50-7.00 B 15  7.00-7.45 SPT C B 16	N=24 (4,4/4,8,8,8)	5.50	1	0° 0°.	I	!   `
7.00-7.45 SPT C 7.00-7.50 B 16	1		3.20 FOI	Medium dense dark grey to multi-coloured	5.60 -1.62	
7.00-7.45 SPT C 7.00-7.50 B 16			ent of cor	sandy GRAVEL with shell fragments, Sand is fine to coarse. Gravel is subangular to rounded fine to coarse. (ESTUARINE DEPOSIT).	1	
7.90-7.50 B 16		Course				
	N=32 (3,6/8,6,7,9)	7.00	3.20		1	
					7	
						4
011	N=28 (4,4/6,7,7,8)	8.50	3.20			
•						
		27/05/200 10.00	3,20	Stratum continued next sheet		
Depth Type & No	Records	Date Casing	Time Water			
Indwater Entries Struck Fost strike beh. (m) 4.70 Rose to 4.50 m	aviour n after 20 minutes, Slow	Depth s v ingress	belies (m)	Depth Related Remarks From to (m)	Chiselling Depths (m) Tim 1.80 -1.95 45 n	ne Tools use mins Chisel
For explanation of symbols a ations see key sheet, All dep		Project		Publin Waste to Energy	Borehole	
n metres. Stratum thickness of a column.  1:50 to MESG MBM 22	oths and reduced	Project No Carried or		ID3116 Nublin City Council	В	H2 et 1 of 4



٠.,	Drilled by Mi Logged by PC Checked by Mi	3 27/05/2003 End		ods and Re	omarks		Depth from to 0.00m 13,60m 13,60m 34,00m	Diameter Casing Di 250mm 13.60m 200mm 34.00m	epth Ground Leve Coordinates National Grid	E 319847.27
i	Samples	and Test	s			Strata				
	Depth	Type & No	Records	Date Casin			Description		Depth,Leve/	Backfill
	10.00-10.45 - 10.00-10.50 - - - 10.50-10.95	SPT C B 18 SPT C	N=25 (3,444,7,7,7) N=15 (2,3/2,1,3,7)	10.00		Medium dense dark grey sandy GRAVEL with she is fine to coarse. Gravel is	to multi-coloured i fragments. Sand	<u></u>	(Thickness)	Legeria Instrumen
	10.50-11.00	B 19	N=28 (3,44,7,7,10)	12.00	3.00	to rounded fine to coarse. DEPOSIT).	(ESTUARINE			
	12.00-12.50	B 20	N=28 (4,4/4,6,6,12)	13.50	į	·			(12.90)	
	13.50-14.00 - 15.00-15.45 15.00-15.50	8 21 SPT C 8 22	N=27 (3,5/5,6,8,8)	15,00	3.00	Ed its getto put pested f	Tany offer use.		-1	
	16.50-16.95 16.50-17.00	SPT C B 23	N=32 (4,4/7,7,8,10)	18.50	College College	For High owner		-		
<u> </u>	18.00-18.45 18.00-18.50	SPT C B 24	N=27 (5.544,5.8,7)	18.00	J 5	Stiff to very stiff dark grey br lightly sandy CLAY. Sand k ESTUARINE DEPOSIT).	own s fine.	18.00-18.50 m becoming dayey	18.50 -14.51	
	19.50-19.95 19.50-19.95	SPT S D 25	N=19 (3.3/4.4,4,7)	19.50 28/05/200 19.50	3.00 3 3.00	Stratum continued nex	4 mbana	-	-	
	Depth	Type & No	Records	Date Casing	Time Water				}	
No 1	(m) 4.70 Ros	≭ strike behavio se to 4.50 m afte	er 20 minutes, Slow i	Depth s		epth Related Remarks com to (m)			Chiselling Depths (m) Time 14.30-14.45 30 m 17.60-17.80 45 m	Tools used ins Chisel ins Chisel
in d	es: For explanation reviations see key is in metres. Stran. epth column.	of symbols and sheet. All depths a im thickness given to MESO HOM (201), 30	III di actes	Project Project No Carried ou	. ко	blin Waste to Energy 3116 blin City Council			Borehole Bl Sheet	



Drilled by MD Logged by PG Checked by MK	Start 27/05/2008 End 06/06/2003	Equipment, Method:	s and Rema	rics		Depth from to 0.00m 13.60m 13.60m 34.00m	Diameter 250mm 200mm	Casing Depth 13.60m 34.00m	Ground Level Coordinates National Grid	E	3.99 mOD 319847.27 233497.54
Samples a	nd Tests	3			Strata						
Depth	Type & No	Records	Date Casing	Time Water		Description			Depth,Level (Thickness)	Legend	Backfill
20.00-20.50	8 26 SPT S 0 27	N=31 (3,5/5,8,8,10)	21.00	3.80	Stiff to very stiff dark gresightly sandy CLAY. Sar (ESTUARINE DEPOSIT)	nd is fine.					
22.50-22.50 - 22.50-22.95 - 22.50-22.95	B 28 SPT S D 29	N≃35 (4,4/5,9,10,10)	22.50	3.80							
23.50-24.00 - 23.50-24.00 - 24.00-24.45 - 24.00-24.45	B30 SPTS D31	N≈39 (3,5/7,10,10,12)	24.00	3.80	्र <b>ा</b> जिस	other use.					
25.50-25.50 - 25.50-25.95 - 25.50-25.95 - 26.00-26.50	B32 SPTS D33 B34	N=40 (4,488,11,70,11)	25.50	0,	Section purposes only and sight owner required for any sight owner required for any						
27.00-27.45 27.00-27.45	SPTS D35	N=35 (4,6/6,8,10,12)	25.00	3.60	·				(15.50)		
28.00-28,50	836							1			
28.50-28.95 28.50-28.95	SPTS D37	N=28 (3,4/4,7,7,10)	28.50	3.60				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
-		Records	Date	Time	Stratum continued	next sheet					
(m)	st strike behav		Casing Depth se	Water	Depth Related Remarks From to (m)				Chisetling Depths (m) Ti	me Took	s used
Notes: For explanation abbreviations see key tevels in metres. Strate in depth column. Scale 1:50	sheet. All depth um thickness giv	s and reduced en in brackets	Project No Carried ou		Oublin Waste to Energy CD3116 Oublin City Council					3 <b>H2</b> et 3 of 4	



Drilled by MD Logged by PG Checked by MK	Start 27/05/2003 End 06/06/2003	1	s and Rema	ulcs		Depth from to Dia 0.00m 13.60m 25 13.60m 34.00m 200	meter Casing Depth mm 13,60m mm 34,00m	Ground Level Coordinates National Grid	+3.99 mC E 319847 ; N 233497 ;
Samples a	nd Test	s			Strata		· · · · · · · · · · · · · · · · · · ·	4	
Depth	Type & No	Records	Date Casing	Time Water		Description		Depth_Level	Legand Back
30,00-30,45 30,00-30,45	SPTS D39	N=37 (4,4/7,8,11,11)	30.00	3,60	Stiff to very stiff dark gre slightly sandy CLAY, Sa (ESTUARINE DEPOSIT	y brown		(Thickness)	Legend Back
- 31.00-31.50	B 40						- - - -		
31.50-31.96 31.50-31.95	SPTS D41	N=43 (5.7/5.10,11,14)	31.50	3.60			]+++	·	
-	. 1				-				
32.50-33.00	8 42								
33.00-33.44 33.00-33.45	SPTS D43	45 (8,7/10,10,13,12 for 65mm)	33.00 05/06/2003	3.60					
33.50-33.95 33.50-33.95	SPT S D 44	N=42 (5,5/8,8,10,18)	33.00 96/06/2003	3.60			1		
			33.50	3.40	EXPLORATORY HOLE B	NDS AT 34,660 m		11.00 -30.01	-:  \(\sigma\)
				Onser!	EXPLORATORY HOLE E				
	pe & No	Records C	Date Te asing Wa	ne iter			=		
oundwater Entries Struck Post st (m) 4.70 Rose to		our er 20 minutes. Slow ingt	Depth seale (r 'ess	ed Fi	epth Related Remarks om to (m)			oiselling pths (m) Time	Tools used
e: For explanation of siviations see key sheel in metres, Stratum toth column.	ymbols and it. All depths a ictness given	and reduced Pr	roject No.	Dut KD3	(in Waste to Energy		В	orehole BH	<del></del>



	Drilled by MD Logged by JL Checked by MK	07/06/2003 End	Equipment, Methods Dando 175 cable tool di Relocated from BH3 du Hand dug inspection pit Cable percussive boring	frill rig ue to obstruction. it to 1,20m. us to 35.50m.		Depth from to Diameter Casing Dep 0.00m 16.00m 250mm 16.00m 16.00m 35.50m 200mm 35.50m	th Ground Level Coordinates National Grid	E319936.91
	Samples	and Tests	Rombole haddilled with			Strata	1	
	Depth	Type & No	Records		Time Nater	Description	Depth, Level (Thickness)	Legend Backs
	0.00	B1				TARMAC pavement over roadstone (MADE	3	Mastrumen XX
	- 0.50-1.00	82				GROUND) Soft dark brown sandy gravelly CLAY and		<i>//</i> /XX
	E					ASH FILL with occasional subrounded cobbles and fragments of brick, concrete and plastic. (MADE GROUND)	1	
	- 1.20-1.65	SPTC	N=40 (3,4/4,8,10,18)	1.20		1.20-1.70 m	<b>=</b>	
	1.20-1.70	B3	1			concrete cobbles and boulders	E	
	E					compass	4	
	2.00-2.45 2.00-2.50	SPTC B4	N=37 (6,6/7,8,12,10)	2.00			(3.30)	
	<u>t</u>						1	
ļ	<b>t</b>		!				1	
(2.5	3.00-3.45 3.00-3.50	SPTC B5	N=36 (5,7/7,8,9,12)	3.00			-[	// <b>!</b> /XX
S	L	6.0	1		Ì		1	// <del>///////////////////////////////////</del>
	- 3.60-4.05 - 3.60-4.00	SPTS B6	N=8 (2,1/1,2,3,2)	3.60		Soft black sandy slightly gravelly CLAY	3.60 -0.0	'KKKIN'
	4.00-4.50	87		4.00	1800 3.30		4	
	E			08/06/2003 35.00	0800 3.20	(MADE GROUND).	]	
ļ	4.50-4.95 4.50-5.00	SPTS D8	N=7 (2,2/2,2,1,2)	4,50		. इ. वि. वि. वि. वि. वि. वि. वि. वि. वि. वि	(1.60)	
}	<u> </u>		-			nut post relied	1	
	5.20-5.65 5.20-5.70	SPTC B9	N=12 (2.3/3.2.3.4)	5.20		FILL with fragments of concrete and ceramics and rare pockets of sity sand.  (MADE GROUND).  Medium dense to dense dark grey sandy	5.20 -1.6	
ļ		24			10	Sobbles and shell fragments. Sand is	1	0.00
	E .			4	for 1	Sing to modium Count is subangular to	‡	
	6.00-6.45 6.00-6.50	SPT C B 10	N=25 (4,4/7,7,6,5)	6.00 Consent of	٢٠٠٠٠	DEPOSIT).	<b>-</b>	5.3
	Ę			Conseir			3	60.0
	<u>t</u>		ļ				<u> </u>	
	7.00-7.45 7.00-7.50	SPT C B 11	N=30 (3,3/6,6,8,10)	7.00			1	
	<u>t</u>						=	
j	<u> </u>		!			·	3	1-:-
·	8.00-8.45 8.00-8,50	SPT C B 12	N=30 (4,477,7.7.9)	8.00			4	
1							=	0.0
	Ę	}					3	
	9.00-9.45	SPT C	N=34 (6,6/7,8,8,11)	9.00			=	
	9.00-9.50	B 13					· <b>_</b>	1   \ \
	E						1	6 0
	<u></u>					Stratum continued next sheet	1	0.0
	Depth	Type & No	Records	Date To Casing W	inne Vater	Profit Profit Advantage of the Control of the Contr		
	(m)	Post strike beha	sviour after 20 minutes. Slow		led (m)	Depth Related Remarks From to (m)		Time Tools used 90 mins Chisel
r :	<b>.</b>							
ļ	Notes: For explan abbreviations see levels in material	nation of symbols an a key sheet. All depti Stratum thickness gi	nd his and reduced iven in brackets	Project		Dublin Waste to Energy	Borehole	
Ä	in deput column. Scale 1:50		an, somozeos teleses	Project No. Carried out		KO3116 Dublin City Council	Sh	BH3A heet 1 of 4
;				·				



:	Drilled by MD Logged by JL	Start 07/06/2003 End	Equipment, Method	s and Rema	rks	Depth from to Diameter Casing Depth 0.00m 18.00m 250mm 16.00m 16.00m 35.50m 200mm 35.50m	Coordinates	E 319935,91
	Checked by MK	13/06/2003	[				National Grid	N 233526.20
	Samples a	ind Test	\$			Strata		
ı	Depth	Type & No	Records	Date Casing	Time Water	Description	Depth,Level (Thickness)	Legend Backfill
	10.00-10.45 10.00-10.50	SPT C 8 14	N=26 (4,4/8,5,5,8)	10.00		Medium dense to dense dark grey sandy GRAVEL with occasional subrounded cobbles and shell fragments. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse. (ESTUARINE		
	11.00-11.45 - 11.00-11.50	SPT Č 8 15	N=22 (3,444,7,2;5)	11.00		DEPOSIT).	(12.40)	
	- - - 12.00-12.45 - 12.00-12.50 -	SPT C B 16	N=34 (4,444,8.0,14)	12.00		_		
	- - - - - - - - - - - - - - - - - - -	SPT C B 17	N≃39 (6,5⁄8,8,10,13)	08/06/2000 13,00 09/06/2000 13,00	3.30 3 0800 3.20			
	14.00-14.45 14.00-14.50	SPT C B 18	N=30 (5,4/5,6,8,11)	14.00 09/06/2003 14.00	3 1800 3.20	For inspection purposes only any other use.		0 0
	- 15.00-15.33 15.00-15.50 15.50-16.00	SPT C B 19 B 20	55 (4,8/10,20,25 for 25mm)	15,00	3.20	osterion purposedired		
	- 16.00-16.40	SPTS	46 (5,6/9,12,17,8 for 25mm)	16.00	onsen	Forthight Stoophight		
	- 17.00-17.45 17.00-17.50	SPTS B21	N=50 (5,8/2,10,14,18)	10/06/2003 17.00 11/06/2003 17.00	1860 3.20	· ·		
	17.60-18.00 - 18.00-18.45 18.00-18.50	SPTS B 23	N=26 (4,414,6,3,5)	18.00		Stiff to very stiff grey brown slightly sandy CLAY. Sand is fine. (ESTUARINE DEPOSIT).	17.60 -14.01	
	- 19.00-19.45 19.00-19.45	SPT S D 24	N=24 (3,34.8,7,7)	19.00				1.1.1.1.
F						Stratum continued next sheet	Ī	_:  ///
	Depth	Type & No	Records	Date Casing V	lime Vater			
ľ	Groundwater Entri No. Struck Post (m) 1 4.10 Rost	t strike behay	riour fler 20 minutes. Slow in	Depth sea	tled (m)	Depth Related Remarks From to (m)	Chiselling Depths (m) Tir 11.80 - 11.95 30 12.60 - 12.85 45	ne Tools used mins Chisel mins Chisel
a ie in	lotes: For explanation bbreviations see key s rvels in metres. Stratus depth column, cale 1:50	sheet. All depth: In thickness give	s and reduced	Project Project No. Carried out	. *	ublin Waste to Energy D3116 ublin City Council		H3A et 2 of 4



Drilled by MD Logged by JL Checked by MK	Start 07/06/2003 End 13/06/2003	Equipment, Methods	, and Rema	a puid		Depth from to 0.00m 16.00m 16.00m 35.50m	Diameter 250mm 200mm	Casing Depth 16,00m 35,50m	Ground Level Coordinates National Grid	E	3.59 n 31993 23352
Samples a					Strata	<u> </u>			1		
Depth Depth	Type & No	Records	Date	Time		Description		<del></del>	Depth, Level	Legend	B
20.00-20.45	SPTS	N=29 (2,3/8,8,7,5)	Casing 20.00	Water	Stiff to very stiff grey brow	vn slightly		-	(Thickness)	- avid	inst
20.00-20.45	5 25	<b>-</b> -		Ì	sandy CLAY. Sand is fine DEPOSIT).	. (ESTUARINE		3	•		下
20.50-21.00	B 26			ı	J. 9011).			4	<b>(</b>	<u> </u>	N
	1	ı		1	<b>V</b> .			3	Į i	Į —: - <mark> </mark>	1
- 21.00-21,45 - 21.00-21,45	SPTS	N=27 (4,4/6,6,7,8)	21.00	į	1			Ē	Ţ		1
21.00-21,45	027	·	1	1	1			4	1		K
21.50-22.00	8 28			1	<b>(</b>			E	¥ i	[:-]	1
Ì	1 1			1	1			4	Į i	┝╴┷	1
- 22.00-22.45	SPTS	N=27 (3,44,7,7,9)	22.00	į,	ţ			Ē.	Ť i	[.∹∄	1
22.00-22.45	D 29			ı	1		•	<b>=</b>	<b>,</b>	F	1
22.50-23.00	8 30		1	ı	ţ			£	<b>Y</b> :	<u> </u>	1
	į -			i	•			=	<b>(</b>	1 1	1
- 23.00-23.45	SPTS	N=32 (4,4/4,8,9,11)	23.00	<u> </u>	•			<u>-</u> 1	1	누ㅋ	1
23.00-23.45	D31	guy us regressive & Fif		l l					<b>\</b>	:	1
	ļ	•		ı	<b>(</b>			4	<b>Y</b> .		1
ľ				į	1			Ē	<b>Y</b> 1	늗긬	1
- 24.00-24.50	B 32			1	Dedica Buffoses offy, any of the start of th	uee.		4	1	<u> </u> —:-{	1
	0.52		1	l l	1	atter		E	1 :		
94 EA B	em-	Net7 /a mer a a · · ·	24 5-	1	Pa. 14	o <sup>-</sup>		3	Ţ	<u> : 1</u>	1
24.50-24.95 24.50-24.95	SPTS D33	N=37 (4,3/7,9,9,12)	24.50	1	28 Off Strait,			4	<b>T</b> :	t —:-l	1
_	į l		11/06/2003 25.00	13 1800 3.30	"Most red"			E	1	├- <b>-</b> -	1
-	1	•	12/06/2003	3 <b>0800</b>	on Puredu.			4	. 1	. <b>∹</b>	
	4 <u> </u>			ತ.30	pectic when			E	1	<u>  </u>	1
25.50 <b>-26.00</b>	B 34			For in	dito			Ā	!	<u> </u>	K
_	[ ]		26.00	FOL	Pro Contraction of the Contracti			<u>,</u> <u>j</u>	Ţ	ا ـــ ا	1
- 26.00-26.45 26.00-26.45	SPTS D35	N=32 (3,4/4,8,8,12)	26.00	ofcor	1				1	늗극	1
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	1		Con	i	Ţ			E	(17.90)		1
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- 27.00-27.50	8.36	•		1	1			土	1	[ —: <del> </del>	1
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27.50-27.95 27.50-27.95	SPTS D37	N=29 (4,4/6,8,7,10)	27.50	1	1			E	l i	<u> :                                  </u>	1
				l	1			E	<b>!</b>	[ _:-	1
- 28,00-28,50	9 38		1	1	1			4	1 1	[	1
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- 29,00-29,45 29,00-29,45	SPTS 039	N≈38 (3,7/7,8,10,13)	29.00	1	1			4	! }	1 1	K
29,00-29.45	0.39	1	] .	l l	•			Ė	Ţ	는 -	K
i	<b>!</b>	•	1	į	•			∄	' '	1:-:	1
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			Date	Time	Stratum continued	next sheet		<u> </u>	·		1
Depth Groundwater Ent	Type & No tries	Records	Casing	Water	Denth Raisted Re-		<del></del>		Chisel!!	<u></u>	1
No. Struck Pot (m)	st strike beha		Depth se	sealed (m)	Depth Related Remarks From to (m)				Chiselling Depths (m) Ti	ime Too	ols us
	ose to 3,30 m :	after 20 minutes. Slow	ingress						!		
otes: For emplanation obreviations see key wels in metres. Strat	n of symbols an	d is and reduced	Project		Dublin Waste to Energy				Borehole		
obreviations see key vels in metres. Strat depth column.		. 1	Project No	to.	KD3116				В	АЕНЗ	
olepun column. Hate 1:50		51), 30/10/2003 12:4551 AGS	Carried or		Dublin City Council			1	, cho	et 3 of 4	



Drilled by MD Logged by JL Checked by MK	Start 07/06/2003 End 13/06/2003	Equipment, Method	s and Rema	nics	Depth from to Diameter Casing Depth	Ground Level Coordinates National Grid	£31993
Samples a	nd Tests				Strata	1	
Depth	Type & No	Records	Date	Time	Description	Depth,Level	Legend Ba
30.00-30.50	B 40		Casing	Water	Stiff to very stiff grey brown slightly	(Thickness)	instr
-					sandy CLAY, Sand is fine. (ESTUARINE DEPOSIT).		1
- 30.50-30.95 - 30.50-30.95	SPT S D 41	N=35 (4,4/8,8,11,12)	30.50		52 55,17.	1	: - IN
-						1	1-:40
-	1				<u>-</u>	1	
;	}	-			•	} '	
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						1	
- 32.00-32.45 32.00-32.45	SPTS D42	N=35 (4,5/5,8,10,14)	32.00	į	<u>-</u>		1: 1/
	į				:	Ī	
	f		1	j		ì	<del>-</del>
-	Ì			]	<u>-</u>	,	
	j						
33.50-33.95 33.50-33.95	SPTS D43	N=40 (3,6/6,10,12,12)	33.50	i	-		1-:11
					٠٤٠.		
- }	}		1		het use		
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34.50-35.00	844				of or all,		トート
1			12/06/2003 35.00	1800 3.30	oose ited y		
- 35.00-35.45 35.00-35.45	SPTS D 45	N=48 (4,8/8,12,14,14)	13/06/2003		an Pui redu		<u>                                   </u>
			35.00 13/06/2003 35.50	3.30 1200 3.30	gertigatiet		
					TOT TEXT OF THE ENDS AT 35,50 m	35.50 -31.91	<del>                                 </del>
					CONTROL STATE		
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Depth "	Type & No	Records	Date	Time Nater		ļ	
Froundwater Entri	es		Casing 1	Water	Depth Related Remarks	Chiselling	
io. Struck Post (m) 4.10 Rose		iour fter 20 minutes. Slow i	Depth se	aled (m)	From to (m)	Depths (m) Tr	me Tools used
. wie iwse	J.J. (11 4)	on pullings. Other	- igi caa	-			
ites: For explanation of	of symbols and	s and reduced	Project		ıblin Waste to Energy	Borehole	
breviations see key s reis in metres. Stratum depth column.	n thickness give	· [	Project No.		23116		НЗА
ale 1:50		30710/2000 12:45:54 AGS	Carried out	tor [	tblin City Council		et 4 of 4



Drilled by MD Logged by PG Checked by MK	Start 13/06/2003 End 17/06/2003	Equipment, Methoc Dando 175 cable tool Hand dug inspection y Cable percussive drill Installed 50mm diame	drill rig. At to 1,20m. Ing to 33,50m	los	Depth 0.00 14.50	from to Diamete In 14.50m 250mm In 33.50m 200mm	r Casing Depth 14,50m 33,50m	Ground Lev Coordinates National Gri	E	+3.49 mOl 319857.3 233620.0
Samples a	nd Tests	<u> </u>			Strata					
Depth	Type & No	Records	Date Casing	Time Water	Descr	iption		Depth, Leve		Back
0.00-0.50	Bi	<del></del>			Hard standing GRAVEL (MADE	GROUND)		(Thickness 0.10 +3.	-	Instrum
0.50-1.00	B2	·			Soft brown slightly sandy CLAY GRAVEL FILL with fragments of concrete and wood (MADE GRO	and brick				
1.00-1.45 1.00-1.50	SPT C B3	N=12 (3,2/4,3,2,3)	1.00				17711			777
1.50-2.00	84						111111111111111111111111111111111111111	(3.50)	$\otimes$	
- 2.00-2.45 2.00-2.50	SPTC B5	N=25 (4,4/5,4,9,7)	2.00				, <del>1</del>	(4.00)		
2.50-3.00	B6									
- 3.00-3.45 3.00-3.50 3.30	SPT C 87 W 42	N=24 (3,444,6,8,8)	3,00				1		$\bowtie$	
- 4.00-4.45 4.00-4.50	SPTC B8	N=11 (3,3/2,3,3,3)	4.00		Medium to dense grey brown cla GRAVEL with abundant shell fra Gravel is angular to subrounded coarse. (ESTUARINE DERGISIT	gments. pu fine to	3.60-3.90 m Driller reports shing boulder.	3.60 -0.1		
5.00-5.45 5.00-5.50	SPT C B9	N=22 (4,4/4,5,5,8)	5.00		coarse. (ESTUARINE DEROSIT	<b>t</b> a	5.00-5.50 m Occassional butar cobbles.	(1.90)		000000
6.00-6.45 6.00-6.50	SPT C B 10	N=21 (4,3/3,4,7,7)	Consent	For it	Medium dense grey sandy GRAN shell fragments. Sand is fine to in Gravel is subangular fine to medi (ESTUARINE DEPOSIT).	nedium.		5.50 -2.0	2	00000
7.00-7.45 7.00-7.50	SPTC B11	N=26 (3,4/4,5,8,8)	7.00							000 000
8.00-8.45 8.00-8.50	SPT C B 12	N=26 (3,5/5,5,7,9)	8.00		·				9. 9.	00000
9.00-9.45 9.00-9.50	SPT C B 13	N=16 (3,3/4,4,4,6)	9.00				1,11,111			
Depth	Type & No	Records		ime fater	Stratum continued next shee	t.				
Froundwater Entri lo. Struck Pos (m)	ies t strike behav		Depth sea		Depth Related Remarks From to (m)			Chiselling Depths (m)	Time Too	s used
3.60 Ros	e to 3.30 m ai	fter 20 minutes. Slow	inflow	.						
otes: For explanation obraviations see key s vels in metres, Stratu- depth column.	of symbols and sheet. All depths in thickness give (c) MESG Heat (N.T.).	s and reduced en in brackets	Project No. Carried out	i	Oublin Waste to Energy (D3116 Oublin City Council				BH4 eet 1 of 4	-



Drilled by ME Logged by PG Checked by MK	13/06/2003 End	Equipment, Methods	and Remar	lcs		Depth from to Diameter 0,00m 14,50m 250mm 14,50m 33,50m 200mm	Casing Depth 14,50m 33,50m	Ground Level Coordinates National Grid	+3.49 mOD E 319857.30 N 233620.06
Samples	and Test	<u>                                     </u>	=		184-4-				
Depth	Type & No	Records	Date	Time	Strata			Depth,Leve/	1
10.00-10.38	SPTC	N=15 (3 for 60mm/3,3,4,5)	Casing 10,00	Water		Description		(Thickness)	Legend Backfill
11.00-11.45	8 14 SPT C B 15	N=22 (3,4/4,6,5,7)	14/06/2003 11.00 15/06/2003 11.00	3.30	9	fine to medium, to medium			
- - 12.00-12.45 - 12.00-12.50	SPTC B 16	N=21 (4.4/4,6,5,6)	12.00					(13.35)	
13.00-13.45 13.00-13.50	SPT C B 17	N=28 (3,5/5,7,7,9)	13.00				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
- 14.00-14.45 - 14.00-14.50	SPTC B18	N=36 (4,4/8,8,10,12)	14,00		For its petion purposes on the converted to the converted	A. any other use.		ļ.	
15.00-15.45 15.00-15.50	SPT C B 19	N=33 (4.6/6.6,6,11)	15.00		ospection purposer edited	Ó			
16.00-16.45 - 16.00-16.50	SPT C B 20	N=29 (5,5/6,7,7,9)	16. <b>0</b> 0	JIISER	for high				
17.00-17.45 17.00-17.50	SPT C B 21	№29 (6,6/5,4,8,12)	17.00				بيبلييني		
18.00-18.45 18.00-18.50	SPT C B 22	N=41 (4,418,9,10,14)	18,00				عنيلتنين	a .	
18.85-18.90 19.00-19.45 - 19.50-20.00	D 23 SPT S	N=12 (2.3/3,2,3,4)	19.00		Firm to very stiff dark grey slightly sandy CLAY. Sand (ESTUARINE DEPOSIT).	brown is fine.		3.85 -15.36	
<del>-</del> <del>-</del>				1800 3.30	Cu_u		‡	-	
Depth	Type & No	Becomb	Date In	ne iter	Stratum continued n	mr 7 <b>168</b> [	· <del></del>		<del>≠</del> ₹₩₩
(सः)	st strike behavi		Depth scale	T	Depth Related Remarks From to (m)			hiselling epths (m) Time	Tools used
Notes: For explanatio abbreviations see key levels in meres. Strat in depth column. Scale 1:50	r sheet. All depths rum thickness give	n in brackets	Project Project No. Carried out fo	K	Oublin Waste to Energy 203116 Publin City Council		E	Borehole Bl Sheet	<b>-14</b> 2 of 4



Drilled by MID Logged by PG Checked by MK	Start 13/06/2003 End 17/06/2003	Equipment, Method	s and Remarks		Depth from to 0.00m 14.50m 14.50m 33.50m	Diameter C 250mm 200mm	asing Depth 14.50m 33.50m	Ground Level Coordinates National Grid	E	3,49 m 319857, 233620
Samples a		;		Strata	<u> </u>	<del></del>				
Depth.	Type & No	Records	Date Time Casing Water		Description			Depth,Level	Legend	Bac
20.00-20.20 20.00-20.50	SPTS	25 (12,25/25 for 50mm)	16/06/2003 0800	Firm to very stiff dark are	v brown	·		(Thickness)		Instru
20.00-20.50	B 25		20.00 3.00	slightly sandy CLAY, Sar (ESTUARINE DEPOSIT)	d is fine		-			2.1
	. 1		1	1	•		=			
21.00-21.45 21.00-21.45	SPTS D26	N=20 (3,3/4,4,6,6)	21.00	ĺ			4		-	
21.00-21.40	020		1	1			-			
			Ì				•		[ _: <u>]</u>	
ļ	į		1				4			
22.00-22.50	B 27				•		Ē		:	
	j						=		F -1	
	j		Ì	1			=			
							=			
				ļ	·		3			
				1			E		-:-	
23.50-23.95	SPTS	N=24 (4.4/4.6.8.8)	23.50	]	•		=			
23.50-23.95 23.50-24.00	D28 B29	· · · · · · · · · · · · · · · · · · ·					4		<u>[                                    </u>	·
24.00-24.45	SPT S	bings # 7ff a *a *m	24.00	Section purps required for any	use.		E		[-:4	
24.00-24.45	D30	N=38 (5,7/7,9,10,12)	24.00		theri		7		<u> -                                   </u>	
				W. 29	Off		E		→ }	
				as off of ar			- 1			
	ļ		}	ryosered r			3			
25.00-25.50	B 31			an Pilitedil					<b>  -:</b>	
ľ				ection net			- 4		1	
25.50-25.95 25.50-25.95	SPT S D 32	N=39 (6.8/8,8,10,13)	25.50	Spt o'			3			
-	1		For	Tio I			4			:-
•			800							
			asent.			•		(14.62)	-:-	
26.50-27.00	B 33		Coll				E	į		
			ì				E			
27,00-27,45 27,00-27,45	SPTS D34	N=42 (5,7/7,10,11,14)	27.00				- 4		F:	
27,30-27,45							E			
	İ		-				=	ŀ	· <del>- ;</del>	
							= =		<u> </u>	
28.00-28.50	B 35		1				E		:	
							#			
28.50-28.95	SPTS	N=47 (8,679,9,14,15)	28.50				3	ļ	<u>-</u>   ¹	i
28,50-28,95	D36						E		_: <del> </del>	•
		*					#			
1	Ì				•		3		<u></u>	
1			1						· —: ]	
			{ <b>!</b>			•	4	•		
	i		16/06/2003 1800 30.00 3.00	Stratum continued	next sheet		E	}	_; }	
Depth	Type & No	Records	Date Time Casing Water							
roundwater Entri o. Struck Post		iour	Depth sealed	Depth Related Remarks	<u></u>			Chiselling	\ <u>-</u> -	
(m)		fter 20 minutes, Slow i	(m)	From to (m)				Depths (m) Tir	me Tools	s used
tes: For explanation	of symbols and	<del></del>	Project	Dublin Waste to E						
tes: For explanation of breviations see key sels in metres. Stratur depth column.	heet All depth: n thickness giv	s and reduced en in brackets		Dublin Waste to Energy			[	Borehole _		
enz an menear anami			Project No. 1	KD3116					3H4	



Drilled by MD Logged by PG Checked by MK	Start 13/06/2003 End 17/06/2003	Equipment, Method:	s and Remarks			Depth from to 0.00m 14.50m 14.50m 33.50m	Diameter 250mm 200mm	Casing Depth 14.50m 33.50m	Ground Level Coordinates National Grid	=	3.49 mOD 319857.30 233620.06
Samples a	and Tests	L		Strata				·			
Depth	Type & No	Records	Date Tis	ne	· · · · · ·	Description	<del></del>	<del></del>	Depth,Level		Backfill
30,00-30.45	SPTS	N=49 (5,8/10,10,13,15)	Casing Wa		ery stiff dark gre				(Thickness)	Legend	Instrumen
30.00-30.45	D 37	·	17/06/2003 0 30.00 3	Sightly s	ery som cant gre andy CLAY. Sar RINE DEPOSIT)	id is fine		4.2.5.111			
31.50-31.95 31.50-31.95	SPTS D39	N=S3 (5,8/11,13,14,15)	31.50					,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
32.50-33.00	B 40							11111		—    - —    - — .	
— 33,00-33,45 — 33,00-33,45 —	SPTS D41	Na48 (7,7/10,12,12,14)	33.00 17/06/2003 18 33.50 3.	00 00 500	ORATORY NO! E O	VDS AT 22 St. —			33.50 <b>-3</b> 0. <i>01</i>		
			Course	For its peti	on putposes only on putposes of the owner required	NDS AT 33.50 m		<u> </u>			
<u></u>	ype & No	Records	Date Time asing Water		· · · · · · · · · · · · · · · · · · ·						
thes For evelopoliton of	strike behavio	er 20 minutes. Slow inf		Depth Relati From to (m	) 				chiselling eptits (m) Time	e Tools	used
obreviations see key streets in metres. Stratum depth column.	Symbols and weel. All depths a thickness given the MESC HERR (2017), 30	in brackets	Project Project No. Carried out for	Dublin Waste KD3116 Dublin City Co				E	Borehole B Sheet	H4 14 of 4	



rilled by MO ogged by PG hecked by MK	Start 18/06/2003 End 27/06/2003	Equipment, Methods Dando 175 cable tool d Hand dug inspection pit Cable percussive boring installed 50mm standpit	riii rig. Ho 1 20m	rics		Depth from to 0.00m 14.50 14.50m 34.50	Diameter m 250mm m 200mm	Casing Depth 14.50m 34.50m	Ground Level Coordinates National Grid	E	4.38 31991 23368
Samples a	<u> </u>				Strata			<del></del>	1		
Depth	Type & No	Records	Date	Time		Description	·		Depth,Level	T	Ba
0,00 0,00-0,50	B1		Casing	Water	Soft brown sandy CLAY		,		(Thickness)	Legend	instr
0.00-0.50	2,				with occasional cobbles a fragments of metal, brick	and abundant	-	-	İ	$\bowtie$	Z
0.50-1.00	82		-		concrete. Slight hydrocar detected. (MADE GROU	bon odour				$\bowtie$	
			1		account (white output	NO)		-		KXXI	K
1.20-1.65	SPTC							_			
1.20-1.70	B3	N=42 (3,6/6,8,10,18)	1.20					7		KXXI	
		-						3	Ì	XXX	K
			İ					=		$\otimes$	
2.00-2.50	84							7		KXX	
0.50.0.70								]			
2.50-2.78 2.50-3.00	SPTC 85	50 (6,18/25,25 for 55mm)	2.50					#	(5.00)	$\otimes$	6
				Ī				E		KXXI	0
İ								4			٦
3.50-3.71	SPTC	25 (10,25/25 for ¢0mm)	3.50					3		$\bowtie$	00
3.50-4.00	86	TO (10753153 IDL DOLLIN)		Ì				4		<b>KXX</b>	
3.90 4.00-4.50	W39 B7		18/06/2000 4.00	3 1800	Median gense grey sand,	(115°.		=			40
	٠,		24/06/2003 4.00	3 0800 3,90	1	other		亅		$\bigotimes$	
4.50-4.75	SPTC	50 (3,20/25,25 for 20mm)	4.50		जार्थ वार्थ			1	ļ	<b>KX</b> X	0
4.50-5.00	B8	tolerander or control		Ì	ses altor				,		G
5.00-5.50	в9		-	· ]	DUTP! CHITE				500	$\sim$	000
				Ī	aran mant shen hadrinents	and occasional			5.00 -0.62		0
5.50-5.95	SPTC	N=21 (4,4/4,6,5,5)	5.50		subrounded cobbles. Sand medium. Gravel is angular	d is fine to		‡		0	ြ
5.50-6.00	B 10		ŀ	FOT	AND IN ANSWAR ALCOHOLD IN DIE	NE DEPOSIT).		- 3			0
6.00-6.50	B 11		6.50 OT 501	ofcol	-			Ē			0
	]	•	seri	<b>)</b>		•		₹	ŀ	0.0	ို
6.50-6.95	SPTC	N=22 (3,4/4,4,7,7)	6.50 OT	İ				3		0.0	0
6.50-7.00	B 12			ĺ				=	f	[ح.ه.م	٥
}			1	. ]				4	į,	0	0
ŀ				1				Ē	1	ا د د	ွ
7.50-7.96 7.50-8.00	SPT C B 13	N=26 (3,4/4,7,7,8)	7,50					‡	F		
				1				Ē		~ ~ 4 4 1	°
				l				4	Į.	0	0
		;						3		امره	٥
8.50-8.95 8.50-9.00	SPT C B 14	N=23 (3,4/5,5,5,5)	8,50	l				=	ļ.		000
								3	j-	0,	٥
									<u>;</u>	ا ۾	0
	1	i		- {				4	. la	الخذاه	00
9.50-9.95 9.50-10.00	SPT C 8 15	N=28 (4,4/8,6,6,10)	9.50	ı				=		0	۶
		ļ	24/06/2003 10.00	1800 5.60	Stratum continued n	ent sheet			je F	a 'o ' a	<b>%</b>
Depth 7	Type & No	Records	Date	Time Nater							, لـم
undwater Entrie Struck Post		our	Depth sea		Depth Related Remarks				Chiselling		
(m)		ter 15 minutes, slow int		(m)	From to (m)			] '	Depths (m) Tin	ne Tools	use
	440	IT THE INCOME. CHAIR HE	··· <del>· · · ·</del>	-	•						
4,10 Aust											
		<u>-</u>									
s: For explanation of existing seekey st	of symbols and heet, All depths	and reduced	Project Project No.		ublin Waste to Energy D3116	· <u>·</u>			Borehole	- 10	



Drilled by MD Logged by PG Checked by MK	18/06/2003 End	Equipment, Metho	ds and Remarks		Depth from to 0.00m 14.50m 14.50m 34.50m	Diameter Ca 250mm 1 200mm 3	sing Depth 4.50m 4.50m	Ground Level Coordinates National Grid	E	4.38 mOD 319914.98 233683.69
Samples	and Test	<u> </u>	······································	Strata				ĺ		
Depth	Type & No	Records	Date Tim	0	Description	<del></del>		Depth,Leve/	Legend	Backfill
10.50-10.95 10.50-11.00	SPT C B 16	N=22 (2.344,4,7,7)	25/06/2003 06: 10.00 3.	Medium dense grev sand	and occasional ad is fine to at to rounded		1 1 1	(Thickness)	0000	Instrument O
11.50-11.95 11.50-12.00	SPT C B 17	N=20 (1.2/4,4,6,8)	11.50				1.			
12.50-12.95 12.50-13.00	SPT C B 18	N=27 (3,3/4,7,8,8)	12.50					(14.10)		SP
13.50-13.95 13.50-14.00	SPT C B 19	N=26 (4,4/4,7,7,10)	13.50		N <sub>e</sub> c.		7111111			
- 14.50-14.95 - 14.50-15.00	SPT C B 20	\$**26 (4.5/5,6,6,9)	14.50	For its pection purposes only	or any other		Line of the latest		0000	
15.50-15.95 15.50-16.00	SPT C B 21	N=33 (4,4/8,7,8,10)	15.50	For its petiton be read			- Transport	e e	0000	
16.50-16.95 16.50-17.00	SPT C B 22	N=31 (5.44 <u>(8.8,11)</u>	25/06/2003 1800 17.00 3.90 28/06/2003 0800	o <sup>t</sup>				9		
17.50-17.95 17.50-18.00	SPT C B 23	N=18 (3.44,4,5,5)	17.50 4.00 17.50						0.0	
- - 18.50-18.95 - 18.50-19.00	SPT C B 24	N=23 (4,4/5,8,5,5)	18.50					, 0 <del>-</del>	000	
19.10 - - 19.50-19.95 - 19.50-20.00	D 25 SPT S B 26	N=12 (1,2/2,3,3,4)	19.50	Firm to very stiff dark grey b slightly sandy CLAY. Sand i (ESTUARINE DEPOSIT).	rown s fine.	19.10-20.1 säghtly gra		1.10 -14.72		
Depth	Type & No	Records	Date Time	Stratum continued ne	d sheet		<u></u>			777
Groundwater Entr No. Struck Pos (m)	ies t strike behavio		Casing Water Depth sealed	Depth Related Remarks From to (m)			CI	hiselling epths (m) Time	Tools	used
Notes: For explanation abbreviations see key evels in metres. Stratu n depth column. Scale 1:50	of symbols and sheet. All depths a m thickness given to MESO HER (1971), 20		Project No.	Oublin Waste to Energy CD3116 Oublin City Council			B	orehole Bl Sheet	15 2 of 4	



Drilled by MD Logged by PG Checked by MK	Start 18/06/2003 End 27/06/2003	Equipment, Method	is and Rema	rks		Depth from 0.00m 14 14.50m 34	to Diameter 50m 250mm 50m 290mm	Casing Depth 14.50m 34.50m	Ground Level Coordinates National Grid	E.S	4.38 mOD 319914.98 233683.89
Samples a	nd Tests	3			Strata				1		
Depth	Type & No	Records	Data Casing	Time Water		Description			Depth,Level (Thickness)	Legend	Backfil
20.50-20.95 20.50-20.95 20.50-20.95	D 27 SPT S D 28	N≃23 (3,444.6.6.7)	20.50	-	Firm to very stiff dark gree slightly sandy CLAY, San (ESTUARINE DEPOSIT).	d is fine.		· · · · · · · · · · · · · · · · · · ·	(11/mm(e2))		Instrume
21.50-21.95 21.50-22.00	SPT S B 29	N=36 (4,5/8,8,10,10)	21.50					111111111111111111111111111111111111111			
- 22.50-22.95 - 22.50-23.00	SPTS 830	N=29 (4,4/5,7,7,9)	22.50				2 si	2.10-23.00 m			
23.50-23.95 23.50-24.00	SPT S B 31	N=22 (3,34,4,6,8)	23.50			inge.		+ 1.1.1.1.1			
24.50-24.96 24.50-25.00	SPT S B 32	N≃30 (4,4/7,7,7,9)	24,50 26,06/200 25,00 27,06/200 25,00	3 1800 8.00 3 0800 3.90	Tection buttoses only any tight of the state	other					
26.00-26.45 26.00-26.50	SPTS B33	N=30 (3.4/5.7,7,11)	26.00 Consen	For it	or the state of th			***************************************	(14.90)		
27.50-27,95 27.50-28.00	SPTS B34	№31 (3,4/4,8,7,12)	27.50		,	-		Linitation			
29.00-29.45 29.00-29.50	SPTS B35	N=3S (4,4/7,7,10,11)	29,50		.*						
-		<del></del>	Date	71000	Stratum continued r	rext sheet					
(m)	st strike behav	Records viour after 15 minutes, slow i	Casing  Depth se	Time Water ealed (m)	Depth Related Remarks From to (m)				Chiselling Depths (m) Tir	ne Took	s used
Notes: For explanation abbreviations see key levels in metres. Stratu in depth column. Scale 1:50		d instance of the control of the con	Project No Project No Carried oc	o. 1	Oublin Waste to Energy CD3116 Oublin City Council				Borehole E She	3 <b>H5</b> et 3 of 4	



- 1	Drilled by MD	Start 18/06/2003	Equipment, Method	s and Rema	rics		Depth from to	Diameter Casino De	pth   Ground L	evel	
٠.	Logged by PG Checked by MK	End					0.00m 14.50m 14.50m 34.50m	Diameter Casing De 250mm 14,50m 200mm 34,50m	Coordina National (	tes E	4.38 mOD 319914.98 233683.89
Į		27/06/2003									
ŀ	Samples :			Date	Time	Strata					
ļ	Depth	Type & No	Records	Casing	Water	<del></del>	Description		Depth, Le (Thickne	vel Legend	Backtily
	30.50-30.95 30.50-31.00	SPTS B36	N=34 (4,5/5,8,8,12)	30.50		Firm to very stiff dark grey slightly sandy CLAY. San (ESTUARINE DEPOSIT).	d is fine				
	- 32.00-32.45 - 32.00-32.50	SPT S B 37	N=43 (5.678.9,12,14)	32.00		·			4		
										-:-	
E	33.50-33.95 33.50-34,00	SPT S B 38	N=49 (7,8/8,13,14,14)	33.50 27/06/2003	1800					<u>:</u>	
E	-			34.00	1800 3,90	EXPLORATORY HOLE EN	IISE.		34.00 -29	0.62	777
					Conso	EXPLORATORY HOLE EN	A. and				
								-			
上	Depth	Type & No	Records	Date Ti Casing W	ime				4		
1	roundwater Entri lo. Struck Post (m) 4.10 Ros	es strike behavio e to 3,90 m aft	our er 15 minutes, slow inf	Depth seal		Depth Related Remarks From to (m)			Chiselling Depths (m)	Time Tools	used
No abi lev in	tes: For explanation breviations see key s lets in metres, Stratur depth column.	of symbols and heet. All depths : n thickness given	and reduced in brackets	Project Project No.		ublin Waste to Energy D3116	<del></del>		Borehole		
ł		(c) MESC MAIN (201), 3		Carried out (		ublin City Council			SI	BH5 heet 4 of 4	
							<del></del>		<u></u>		



Drilled by MiN Logged by PG Checked by MK	Start 16/05/2003 End 20/05/2003	Equipment, Methods: Casagrande CS rotary dri Hand dug inspection pit to Rotary open hole drilling it Rotary coring to 40.20m. Installed 50mm star/foine	end Remarks Erig o 1.20m. to 33.00m		Depth from to Diam 0.00m 26.70m 131m 26.70m 33.00m 120m 33.00m 40.20m 76m	m 26.70m m 33.00m	Ground Level Coordinates National Grid	+3.91 mOD E 319822.62 N 233458.92
Samples a	nd Tests	HISTORY AND STATE		Strata				
Depth	Type & No	Records	Date Time Casino Water		Description		Depth, Level (Thickness)	Legend Backill
			Casing Water	Driller reports black was strong hydrocarbon (oily strong hydrocarbon (	te FILL with ) odour,			
- 5,70-6.15	SPT C	N=10 (2,3/5,4,4,5) N=21 (4,3/4,5,5,7)	Consent of C	Smiler reports SAND an	G GRAVEL.			
8.70-9.15	SPT C	N=17 (2.2/3.2.5.7)	8.70	Stratum continu	ed next sheet			
Groundwater Ex	ntries Post strike bel		Casing Water Depth sealed	Depth Related Remarks From to (m)			Chiselling Depths (m)	Time Tools used
Notes: For explanat abbreviations see k levels in metres. St in depth column. Scale 1:50		and piths and reduced given in brackets cases, sonozoo 12-1724 AGS	Project Project No. Carried out for	Dublin Waste to Energy KD3116 Dublin City Council			Borehole Si	BR6 heet 1 of 5



Drilled by MN Logged by PG Checked by MK	Start 16/05/2003 End 20/05/2003	Equipment, Methods	and Rema	rics		Depth from to 0.00m 28.70 26.70m 33.00 33.00m 40.20	m 120mm	Casing Depth 26.70m 33.00m 35.90m	Ground Level Coordinates National Grid	+3.91 mOD E 319822.62 N 233458.92
Samples a	nd Tests			<del></del>	Strata		···			
Depth	Type & No	Records	Date Casing	Time Water		Description			Depth,Level	Legend Backfi
-		<u> </u>		vvater	Driller reports SAND and	GRAVEL.			(Thickness)	Instrume
10.20-10.65	SPT C	N=23 (3,4/5,5,7,6)	10.20					1	(10.70)	
11.70-12.15	SPTC	N≈33 (5.777,8,9,8)	11.70			·		1 ( 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	·	
13.20-13.59	SPTC	28 (4,5/6,7,8,7 for 13mm) Flush: 0.00-26,70 Air (oam, 100 %	13.20			17. eth Other tre	٥٠.	1,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
14.70-15.15	SPT C	N=27 (2.2/3,7,7,10)	14.70		For inspection purposes of the control of the contr	for				
16.20-16.65	SPTC	N=33 (8.777,8.9.9)		Cor	Driller reports sandy SILT			111111111111111111111111111111111111111	16.30 <i>-1</i> 2.39	
- 17.70-18.15 -	SPTC	N=29 (9,9/8,7,7,7)	17:70 17:70 17:05:200 17:70	7.80				******		
19.20-19.65	SPTC	N=41 (8,7/9,10,11,11)	19.20		Stratum continued	next sheet		7 *************************************		
Depth	Type & No	Records	Date Casing	Time Water						
Groundwater Entr No. Struck Pos (m) 1 5.20 -	ries st strike behar	viour	Depth s	ealed (m)	Depth Related Remarks From to (m)				Chiselling Depths (m) Ti	ime Tools used
Notes: For explanation abbreviations see key levels in metres. Strati in depth column. Scale 1:50	sheet. All depti um thickness gi	d is and reduced wen in brackets	Project No Project No Carried or	o.	Dublin Waste to Energy KD3116 Dublin City Council				Borehole E She	3 <b>R6</b> eet 2 of 5



Drilled by MN Logged by PG Checked by MK	Start 16/05/2003 End 20/05/2003	Equipment, Methods	nd Remar	iks		Depth from 0.00m 26.70m 33.00m	to 26.70m 33.00m 40.20m	Diameter 131mm 120mm 76mm	Casing Depth 26.70rs 33.00m 35.90m	Ground Level Coordinates National Grid	E	3.91 mC 319822.1 233458.5
Samples a				1	Strata							
	Type & No	Records	Date	Time	Juaca	Description				Depth,Level (Thickness)	Legend	Baci
Depth	Type a No	RECOILS	Casing	Water	Driller reports sandy SILT					(Inickness)	* <u>*</u> . <u>*</u>	Instru
20.70-21.15	SPTC	№39 (10,7/9,9,10,11)	20.76							(10.40)	X X X X X X X X X X X X X X X X X X X	
- 22.20-22.65	SPT S	N=25 (4,4/5,8,7,7)	22.20		:						* * * * * * * * * * * * * * * * * * *	
23.70-24.15	SPT S	N=23 (4.5/5.6.5.7)	23.70		off <sup>A</sup> , of	ly other use			-		* * * * * * * * * * * * * * * * * * *	
- 25.20-25.65	SPT S	N=26 (5,5/6,6,7,7)	25.20	FOT 1 COT 1800 1830 1800 22.00	spection purposes only in				-		* * * * * * * * * * * * * * * * * * *	
26.70-27.15	SPT S	N=27 (4,517,7,8.7)	17/05/20 26.70 18/05/20 26.70			Y			<del></del>	26.70 -22.71	X	
28.20-28.65	SPTS	N=29 (4,6/7,7,8,7)	28.70				-		-		X X X X X X X X X X X X X X X X X X X	
29.70-30.15 Depth	SPT S	N=30 (4,7/7,7,8,8) Records	26.70 Date Casing	Time Water	Stratum continu	ed next sheef	·			(6.00)	x x x x x x x x x x x x x x x x x x x	
Groundwater E	ntries Post strike bel  tion of symbols key sheet. All de traham thickness	naviour	Depth Project Project	sealed (m)	Depth Related Remarks From to (m)  Dublin Waste to Energy KD3116 Dublin City Council					Chiselling Depths (m)		ools us



Drilled by MN Logged by PG Checked by MK	Start 16/05/2003 End 20/05/2003		and Rema	rks	0 26	th from to .00m 26,70m .70m 33,00m .00m 40,20m	131mm 120mm	asing Depth 26.70m 33.00m 35.90m	Ground Leve Coordinates National Grid	· E	+3.91 mC 319822.6 233458.9
Samples	and Test	s			Strata	<del></del>			1		
Depth	Type & No	Records	Date Casing	Time Water		cription			Depth,Level	Legend	Back
31,20,31,65	SPTC	nt=28 (5,6/6,7,7,6)	26.70	1144	Driller reports SILT/CLAY				(Thickness)	*	
32.70-32.88	SPTC	50 (20,5 for Oram) 28,22 for 25mm)	\$2,70 18/05/2003 33.00	0.00	Driller reports clayey GRAVEL weathered rockhead)	_		-	32.70 <i>-</i> 28.79	× × × × × × × × × × × × × × × × × × ×	VIIIIII
33.00-33,75 m	67 0 0	Flush: 25,70-40,20 Water, 100 % TCR 60, SCR 0, RQD 0	33,00	4.90	Core recovered as dark grey a subrounded GRAVEL and CO limestone with some dark brow sitt/day.	BBLES of				0000	
33.75-34.05 m - 34.05-34.60 m	64 0			i	sitt/clay.  For its get in the required for a control of the contr	y other use.			(3.34)	0.0	
34.60-34.70 m 34.70-34.74 m	NI NI NI	TCR 100, SCR 0, RQD 0 TCR 100, SCR 0, RQD 0			roses only a	y *		ייייוון	,	0000	
34.74-35.40 m	0	-			gertion pur fedu.		25 40			0.00	
35,40-35,90 m	26 0 0				For itisking		20.40	~AZGE   =		0 0 0	
35.90-36.34 m	0 0			Onser	Core recovered as very stiff dat to black slightly sandy gravelly Gravel is angular to subangular medium.	CLAY.			36.04 -32.13 (0.30) 36.34 -32.43		
35.34-37.40 m	100 Nt 69 110 63 340				Strong to very strong grey fine- LIMESTONE with rare calcite to Joints are closely spaced, 20 to dip, and planar rough. Weather	veins. 9 45°	37.24-	37.34 m ʃ ]	(1.16)		
37.40-37.88 m	100 NI 65 95 0 120				includes slight day infill along fracture planes and zones of no core reduced to angular to subagravel.	ingular			37.50 -33.59 (0.38) 37.88 -33.97		
37,98-38,70 m	100 65 50 N1 65 320				Moderately strong to strong dar black fine-grained MUDSTONE Joints are closely spaced, 45 to dip, and planar rough. Weather includes zones of weak core.	60°		sak core	(1.42)		
38.70-39.63 m	100 59 32	if NB/100/100	18/05/2003 35.90	1830 8.60	Strong grey fine-grained LIMES Joints are closely to very closely spaced, 30 to 45° dip, and plans Weathering includes zones of wand slight orange discoloration :	y ar rough. reak core	very we 39,30-3	n-intact	39.30 -35.39		
39.63-40.20 m	100 Ni 75 50 40 250		20/05/2003 35,90	0730 4.35	fracture planes. Stratum continued need sh		39.63-3 no	9.73 m [#	39.53 <i>-35.62</i> (0.67)		
Depth Groundwater Ent No. Struck Po- (m) 1 5.20 -	ries st strike beha	Records/Samples	Casing V Depth sea	vater led (m)	Depth Related Remarks From to (m)				Chisetting Depths (m) Ti	me Tool	s used
totes: For explanation bbreviations see key evels in metres, Strat in depth column, icale 1:50	sheet. All dept um thickness gi	ns and reduced wen in brackets	Project Project No. Carried out	·	Oublin Waste to Energy CD3116 Oublin City Council	_				3 <b>R6</b> et 4 of 5	



Drilled by MIN Logged by PG Checked by MK	Start 16/05/2003 End 20/05/2003	Equipment, Methods	and Remarks	Depth from to Diameter Casing Depth 0.00m 25.70m 131mm 25.70m 26.70m 33.00m 120mm 33.00m 33.00m 40.20m 76mm 35.90m	Ground Level Coordinates National Grid	E 3198
Samples a	nd Tests	<u> </u>		Strata	1	
Depth	TOTAL IF	Records/Samples	Date Time Casing Water	Description.	Depth, Level (Thickness)	Legend B
			20/05/2003 35 90	39.30m - 39.53m : Moderately weak to moderately strong dark grey to black fine-grained MUDSTONE. Joints are subhorizontal. Weathering includes core reduced to gravel and core wall and fracture planes coated in stiff black slightly gravelly clay.  39.53m - 40.20m : Strong to very strong grey fine-grained LIMESTONE. Joints are very closely to closely spaced, 20 to 30° dip, and undulating rough. No visible weathering.	40.20 -36.29	
				EXPLORATORY HOLE ENDS AT 40,20 m		
				enge.		
			Consent of cop	Rection thingses only any other use.		
			8	-		
				<u>-</u>		
Depth	IG H	Records/Samples	Date Time Casing Water			
Groundwater Ent No. Struck Po (m) 1 5.20 -	<del></del>	wiour	Depth sealed (m)	Depth Related Remarks From to (m)	Chiselling Depths (m)	firne Tools w
Notes: For explanationabbreviations see key levels in metres. Strain depth column.  Scale 1:50		nd this and reduced even in brackets	Project No.	Dublin Waste to Energy KD3116 Dublin City Council	Borehole	BR6 eet 5 of 5



Drilled by M Logged by P Checked by M	G End	Relocated 1.00m to	ary rig om BH7 due	to mechanic	cal failure. coring to 40.20m	0.00m 22 22.00m 36.	bo Diameter 20m 131mm 40m 120mm 20m 76mm	Casing Depth 22.20m 36.40m	Ground Level Coordinates National Grid	E3	0.66 mOD 19919, 19 33463,25
Sample	s and Test		<del>-                                    </del>		Strata	<u>,  </u>			1		
Depth	Type & No	Records	Dat		)			<del></del>	D	<del>, , , , , , , , , , , , , , , , , , , </del>	
			Casi	ng Wate	<del></del>	Description		• .	Depth,Level (Thickness)	Legend	Backfill/ nstrumen
1.50-1.95	SPTS	N≈3 (1,1/0,1,1,1)	1.50	dry	TARMAC pavement ow (MADE GROUND)  Driller reports black CLA waste material with hydrodors. (MADE GROUNT	Y FILL and			(1.20) 1.20 +2.46		
						-1			(4.10)		
3.60-4.06	SPTC	N=17 (2,3/3,4,5,5)	1.80	dry	Driller reports silty sandy	N. any other use					
5.10-5.55	SPTC	N=24 (3,6/5,5,6,7)	3.60	Ø	Driller reports sitty sandy (	GRAVEL.		7111	:	2000	
6.80-7.05	SPTC	N=28 (4,417,7,5,8)	5.10	Conses							
8.10-8.55	SPTC	N=31 (7.7/6,8,8,9)	7.00				·				
9.60-10.05	SPT C	H=31 (7,7/6,8,8,9)	7.00		Stratum continued ne	ext sheet			2 2 2 2		
Depth	Type & No	Records	Date Casing	Time Water							77
(m) 1 4.30 -	st strike behavior		Depth s		Depth Related Remarks From to (m)			Cr	iselling pths (m) Time	Tools use	od b
otes: For explanation obreviations see key vets in metres. Strati depth column. cale 1:50		nd reduced in brackets	Project No Project No Carried or	. KE	iblin Waste to Energy 33116 iblin City Council			В	orehole BR Sheet		



Logged by PG Checked by MK	Start 20/05/2003 End 23/05/2003	1				0.00m 22.20m 22.00m 36.40m 36.40m 40.20m	13 tram 120mm 76mm	Casing Depth 22.20m 36.40m	Coordinates National Grid	E	3
Samples	and Test	s			Strata	· · · · · · · · · · · · · · · · · · ·		<del></del>			
Depth	Type & No		Date Casing	Time Water		escription		· ·	Depth,Level	Legend	1
			Casary	THEOLET	Driller reports silty sandy GI	<u> </u>	<u> </u>		(Thickness)	· · · · · ·	ŀ
<b>-</b>	1							=		A . A	
- -			1					-		٠. خ	
-	1							=		£. e	
- - 11.10-11.55	SPTC	N-FR MR 44MF 48 44 4 M							(11.30)	0 × 0 × 0 × 0 × 0	
- 11,10-11,35	SPIC	N=S0 (12,11/15,10,11,14)	10,00					=		Ž	
•								=		م ع	
								=		اص ع	
-			1	1				=		200	
• •			İ					7		, A	
•								= =		ج ن ج	ļ
12.60-13.05	SPTC	N=40 (6,9/9,10,10,11)	12.60					3			ł
								Ξ.		P. 3.	ŀ
<del>-</del> ·					,					0 24 0 0 4 0 24 0 0	
• •								3		: : : -	
•  -  -								3		a . a .	ŀ
•								#		2 ×	1
- 44 45 47 55						, USC.					1
14.10-14.55	SPTC	N=35 (7,8/7,8,10,10)	14.10		cité	D.		3			
					Dense grey fine SAND, and GR			#		2.3	
					es a for the			4			K
<u>.</u>					11705 tired			3	,		1
					on puredi			- 1		× ×	
				ı	rection their			‡		e. e	1
				.3	Sylo			3			
				FOT	The state of the s					× * * * * * * * * * * * * * * * * * * *	ŀ
-				ofcor				4	į	e 6	١
	i			at				3			1
16.60-17.05	SPTC	N=51 (4,8/11,12,14,14)	20/05/200 16050	3.20				4		ه في ج	
		or we grow expectable (%)	21/05/020 16.60	0 0730	Dense grey fine SAND.				6.60 -12.94	- O	ľ
<u>.</u>					Driller reports SAND and GR	AVEL		Ę			K
•	i			.				E		·	١
								#	-		1
				1		•		3			ľ
<u>.</u>			1					E	(2.60)		Ľ
18.20-18.65	SPTS	N=39 (7.6/8,10.10,11)	18.20	- 1				4		4	N
18,20	D1			1				4		ا ا	<b>\</b>
				1				3	F	9	
			-					#			
								4	ķ		ľ
				<b> </b>	Very stiff dark grey brown stig	httv		<del></del> ]1	9.20 -15.54		
19.60-19.91	SPTS	50 /3 6M4 94 4E 4	40.00		sandy CLAY.			<u> </u>			
19.60	D2	50 (3,9/14,21,15 for 10mm)	19.60					4	[	<u></u>  [	\
Depth	Type & No	Records	Date	Time Water	Stratum continued next	sheet				<u> </u>	_
roundwater Ent	ries				Depth Related Remarks		<del>"</del>		hiselling		_
(m)	it strike behav	Nour	Depth s	ealed (m)	From to (m)				Depths (m) Tin	e Tools	12
4.30 -	•										
tes: For explanation	of symbols and	1	Project	<u></u>	ublin Waste to Energy				<u> </u>		
Dreviations see key	of symbols and sheet. All depth im thickness giv	s and reduced	_		<del></del>			[ 1	Borehole		
depth column.			Project No		D3116					R7A	



	Drilled by MN Logged by PG Checked by MK	End	1	ds and Rema	arica		Depth from to 0.00m 22.20m 22.00m 36.40m 36.40m 40.20m	Diameter Casing Depth 13 mm 22.20m 120mm 36.40m	Ground Level Coordinates National Grid	E 319919.19
	Samples	and Test	s			Strata			1	
1	Depth	Type & No	Records	Date Casing	Time		Description		Depth,Level	Jacobal Backfill
İ	<del></del>			Cesting	11210	Very stiff dark grey brown		· · · · · · · · · · · · · · · · · · ·	(Thickness)	redeud pacitumen
	21.20-21.65	SPTC	N=37 (4,7/8,8,9,12)	21.20		sandy CLAY.	·			
	22.60-23.05 22.60	SPTS D3	N=28 (9,8/6,7,7,8)	22.20						
	- 24.20-24.58 24.20	SPTS D4	50 (14,11/14,18,18,- for Omen	24.20		For its period burds to direct	diany other use.	***************************************		
	25.60-26.05 25.60	SPTS D5	N=49 (7,8/11,12,13,13)	25.60	Çonse <b>r</b>	For inspection We reev		1	6	
	27.20-27.60 27.20	SPTS s	0 (8,7/11,12,16,11 for 20mm) Flush: 22,20-33,20 Water, 100 %		O'				(15.20)	
	28.60-29.05 28.60	SPTS D7	N≔28 (5,5/7,6,7,6)	28.60				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
Gr	Depth roundwater Entr	Type & No		Casing W		Stratum continued new	d sheet		hiselling	
1 Note abb	(m) 4.30	of symbols and sheet. All depths im thickness give	and reduced of in brackets	Project Project No.	Dı Kı	From to (m)  ublin Waste to Energy  D3116			epths (m) Time	
	le 1:50	(c) paid SG Malay (201);	010200 12:00 AGS	Carried out f		ublin City Council			BR Sheet	/ <b>A</b> 3 of 5



ogged by PG	En				urks		22.00m	22.20m 36.40m	Diameter 131mm 120mm	Casing Depth 22.20m 38.40m	Ground Le	\$	43.66 E 3199
hecked by MK		05/2003	<u> </u>				38.40m	40.20m	76mm		National Gr	id	N 2334
Samples			T	Date	Time	Strata							
Depth	'yı	e & No	Records	Casing	Water		Description	n			Depth, Leve (Thickness	Legen	d B
30.20-30,65	s	PTS	N=38 (5,6/8,8,11,11)	30.20		Very stiff dark grey brown sandy CLAY.	n slightly					<u> </u>	-1
						32.0,021		•			]	<u> </u>	AF
						j				=	1	<u> </u>	-1[\
	-									-	1	-:	ΛĿ
	1	Ì		ļ						_		<del>-</del>	
	l									=			11:
31.60-32.05	_	тc		1						-			JK
31.60		8	N=33 (6,6/7,8,9,9)	31.60						=			$\Lambda$
										=			11
		ļ								7		<u>-</u> -	41)
		İ								= =		—:	11
		ł								3		F	
		ł								3		<b>→</b>	ИF
		Ī		21/05/2000	3 1800							<b>:</b> -	Ήľ
33.20-33,65	SP	тс	N=43 (7,8/10,10,11,12)	33.20 83.20 22/05/200	6.25					=		-:	1K
				33.20	3.85					#			1
										7		<u>.                                    </u>	11
		-		[			other use.			]		· _ ·	11)
					I		nervi						
					Ì					<u> </u>		<b> </b> :	11
14.60-34.78	SP	rc	50 (18,7/50 for 25mm)	34.60	Į	Driller reports gravel, bould	ders and				34.40 -30.7	4: <del>.</del> <del>•</del>	11
	1	1	<u> </u>		]	clay bands. (possible wear nockhead).	thered			=		心六	ſΝ
					]	OUT CHITC				7			ľ
	1			1	1	tion of ter				E		UF	1
					J	eDect owith				E	(2.00)	, O	11)
		- 1		1	for tolco	ight				#	ye.ve)	14.0	11)
	1	[		1	₹0°	A. S.				#		103	
					of co.	•				4		<u>. <del>'</del></u>	$\mathbb{N}$
			TAD 100 000 00 000	رون	<b>&gt;</b>					3		0 =	$    \rangle$
i.40-36.66 m			TCR 100, SCR 35, RQD 0	Contr	Ī	Recovered core is predom	inantiy		36,4	vn slightly	6.40 -32.74		
i.66-36.76 m		NS .	TCR 100, SCR 0, RQD 0 TCR 100, SCR 68, RQD 39	i	1	non-intact strong to very stand cobbles of LIMESTON	imona arawei	ina	GL:	wit sagrapy rvelly clay bands			
.76-37,04 m .04-37,08 m		112	TCR 100, SCR 0, RQD 0	22/05/2003 36.40	1.60	includes rock mass reduce	d to subana	rdar		- T	(0.85)	<del>                                     </del>	
.08-37.25 m			TCR 100, SCR 47, ROD 9 TCR 100, SCR 40, ROD 0	23/05/2003 36.40	U/ 45	medium gravel with soft broday at NI zones. Clay coa	fino mok			7			
.25-37,35 m	$\vdash$		, , , , . , . , . , .			surfaces 0 to 45° and sub-lidip; undutating and rough.	horizontal 30	)*		∄³	7.25 -33.59		
.35-38.10 m	100					Strong to very strong grey t	No. alone	·		<u>_</u>			
.55-56, 10 10	71 59					LIMICS I UNE WITH occasion	ıal calcile ve	ine	37.75-37	7.90 m NI [ _			
[			•			(thickness varying from 1m	•			닠		<del>                                     </del>	
ļ	100	1				Joints are closely to mediur to 40° dip, planar and rough	i. Weatherin	10		7		<del>                                     </del>	
10-38.90 m	81 56			ĺ		includes zones of rock mas soft to firm brown clay, with	s reduced to	5	38.46	38.56 m [ ]			
	×	Ni 130	ĺ		4 1	brown slightly gravelly clay :	infili		n	on-intact -	m ne		
ŀ	$\dashv$	250				along fracture planes at 37. 37.90m. Rare subvertical fra	80m to actures at			#	(2.95)	7	1
	J				F	calcite veins between 38.39	to 38.49m.		39.04	40,04 m			N
	100								with calc	ite veins	j	<del></del>	
90-40.20 m	92 82	ļ			ł					<b>!</b>			1
						<u>.</u>				-	ļ		//
Depth	123	lf	Records/Samples	Date T	me	Stratum continued ne	od sheet			<u>_</u>			$\angle$
ndwater Entr				Casing W	ater	Denth Belete & D							
Struck Pos (m)		behavio	our .	Depth sea	led i	Depth Related Remarks From to (m)					hiselling <del>opths</del> (m)	me Tool	s used
4.30				(	(m)					ا ا	family 16		
For emigration	of same	ok and		Danie : 4									
	wyn 10	deoths:	and reduced	Project	Dı	tblin Waste to Energy				1 .	3orehole		
For explanation lations see key : n metres, Stratu h column.	m thickn	ess giver	in brackets	Project No.		23116				ι,	orende		



	Drilled by Logged b Checked	y PG	Enc	rt 5/2003 1 5/2003	Equipment, Met	hods and Re	marics		Depth from to 0.00m 22.20m 22.00m 36.40m 36.40m 40.20m	Diameter 131mm 120mm 76mm	Casing Depth 22,20m 36,40m	Ground to Coordina National	des	ES	3.66 mOE 319919,19 233463.25
ľ	Samp	oles	and '	Tests				Strata				ł			
ľ	Dept		FCR SCR ROD	If	Records/Sampl	es Date	Time		Description		·	Donth /			
						23/05/2 36.40		Strang to London	y to dark grey onal calcite veins mm to 15mm).			Depth, Le (Thickne 40.20 -3	6.54	Legend	Backfil
	-							to 40° dip, planar and rou includes zones of rock ma soft to firm brown clay, wi brown slightly gravelly cla along fracture planes at 3 37.90m. Rare subvertical calcite veins between 38.3	gh. Weathering ass reduced to th stiff by infill 7.80m to fractures at 39 to 38.49m.						
	<del>-</del> .							EXPLORATORY HOLE E	MDS AT 40.20 m		1111				
											111111				
									i USE.						
					-			igo <sup>ses</sup> onii	d'ary othe		111111111				
-								For its pection but oses only of cool high to when the different section of the cool of th			Leannann				
							Consen	, or			Little Little				
• •							ļ				1111111111				
_											11111111111				
2-	Depth	_	題」	F	tecords/Samples	Date Casing	Time Water			<u>_</u> _	1				- 1
Gro No. 1	(m)	Entric Post	es strike b	ehaviou	ır	Depth se		Depth Related Remarks from to (m)			Ch De	iselling pths (m)	lime	Tools us	bad
-oq	For explar viations ser in metres. oth column.				d reduced 1 brackets 12000 12-4609 AGS	Project No. Carried out	KD:	blin Waste to Energy 3116 blin City Council			В		8 <b>R7</b>		



Lo	illed by MN agged by PG secked by MK	24/05/2003 End	Equipment, Method: Casagnande C6 rotary Hand dug inspection pi Rotary open hole dillin Rotary coring to 46.50s Installed 50mm diametr	drill rig it to 1,20m		Depth from to Diameter Casing De 0.00m 20.70m 131mm 20.70m 20.70m 39.80m 120mm 39.80m 39.90m 46.50m 76mm 41.20m	th Ground Level Coordinates National Grid	E 31996
13	Samples	and Test	<u>I Installed 50mm diamete</u> S	er standnine s	ath stand	Strata		
	Depth	Type & No	Records	Date	Time	Description	Depth,Level	Laured Ba
H				Casing	Water	· · · · · · · · · · · · · · · · · · ·	(Thickness)	Legend Instr
E						Driller reports FILL material with concrete, rubble and bricks. (MADE	4	
E				]		GROUND)	1	
Ŀ							7	$\mathbb{K}XX\mathbb{N}$
Ŀ				l	i		7	$\bowtie$
F		1					-1	$\bowtie$
ţ.				1			(2.30)	$\times$
ļ.	1.50-1.61	SPTC	(25,50 for 35mm)	1.50	dry	• •	<b>E</b>	$\times$
F			,				3	NKXX
F							<u> </u>	$N \times \times N$
E		j				·	=	$N \bowtie$
E						Delta manda da managaria	2.30 +1.65	$N \times XX$
E	260-3.05	SPTC	N=46 (5,1/1,4,2,39)	2.60	-1	Driller reports clayey GRAVEL	1	
E	2000	SF1 C	14-40 (0,111,4,2,00)	2.00	dry		4	
L				1			=	
-							(1.40)	1.11
_							7	
-							4	- N
-						Driller reports light grey SAND and	3.70 +0.25	HIBN
_		1				GRAVEL	<u> </u>	1 1N
-	4.20-4.60	SPTC	50 (7,7/14,13,13,10 for 20mm	4.20	3.80	ther	4.20 -0.25	
						Driller reports grey blue CLAY/SILT	7 4.20 4.25	
•		1		1		25 Of Fot of	<u> </u>	
				}		do ital	<u> </u>	* * 3
_				1		Durch		
						tion net l	1	*: ¥N
				1		Son Ogy	(2.50)	<b> </b>   N
	5.70-5.99	SPTC	50 (5,7/25,25 for 65mm)	670	COLID	ight.	- (2.50)	: :- <del> </del>
			or williams an occurry	5.70	Troop	<b>,</b>	7	<del>                                     </del>
•					of		4	, * , <del> </del>
				seni	ř		<b>∃</b>	1 × × 1 N
				Colli			E	MELL
							6.70 -2.75	** <b>!</b>   \
_	•					Driller reports grey SAND.	<b>-</b> ]	$ \cdots $ N
	7.20-7.65	SPTC	N-10 /F 6/D 4/D 4/D 4/D	7.70	i		(0.50)	$ \cdot $
	120-1.05	3FIC	N=40 (6,6/9,10,10,11)	7.20	Ī	Driller reports coarse GRAVEL.	7.20 -3.25	A
						<u>.</u>	7 1	
				}			1	
				1	- 1		(1.50)	
		1			ļ		] `````	
						•	<u>-</u>	
	070						₫ !	$\mathbb{N}$
	8.70-9.15	SPTC	N=24 (2,3/4,5,5,9)	8.70	ľ	Driller reports GRAVEL with clay bands.	8.70 -4.75	
-						•	<u>-</u> ]	
				-			1	٠.١
					. !		<b>1</b>	امه
		1 1			- 1		<b>‡</b>	20'4
•					- 1		∄ !	
	Depth	Type & No	Records	Date	Time	Stratum continued next sheet	<b></b>	<u> </u>
	oundwater En		Records	Casing \	Water			
		uries ost strike behav	viour	Depth se		Depth Related Remarks From to (m)	Chiselling Depths (m) Ti	me Tools used
1	(m) 3.80 -				(m)			
Vote	s. For explanely	on of symbols are	1	Project		nuhlin Wards to E		
ubr evel	eviations see ke s in metres. Stra	on of symbols and by sheet. All depth atum thickness giv	is and reduced ren in brackets	_		hublin Waste to Energy	Borehole	
ı de	aban connuur			Project No. Carried out		D3116 Whiin City Council		3R8
	e 1:50		, 30/10/2003 12:48:34 ARS				- 01	et 1 of 5



Drilled by MN Logged by PG Checked by MK	24/05/2003 End	1	ods and Remarks	\$		20.70m	to 20.70m 39.80m 46.50m	Diameter 131mm 120mm 76mm	Casing Depti 20.70m 39.80m 41.20m	Ground L Coordina National (	tes	E;	3.95 g 31998; 23349;
Samples	and Test	s			Strata	<u> </u>							
Depth	Type & No	Records		Time	Oute	Description		· <u>-</u>		Depth, Len			<del></del> -
10.20-10.65	SPTC			Vater	Drifler reports GRAVEL v	•				(Thickne		gend	Bac Instru
10.20-10.00	SPIC	N=29 (4,5/7,7,7,8) Flush; 0.00-20,70 Air, 100 %	10.20	- 1	Johorn CrafaCL A	wiei Gay ban	ias,		;	4	ح.	ء ،	N
										]	م	•	N
				- 1					:	1	-	. ح.	N
			e .							(4.50)	ح.	0 4	N
				- 1					=	1	۰	- 9	N
									-	1	خا	٥	N
11.70-12.15	SPTC	N=40 (8,9/9,10,10,11)	11.70						-	1	-	0 4	N
										1	۰	-	N
				ſ					=	•			N
÷				ŀ					=			٦	N
	1 1		-						-		-	-4	N
									_=		٠		
13.20-13.65	SPTC	N=39 (8,7/10,10,9,10)	13.20	10	riller reports brown claye	CDANE				13.20 -9.	25	<u> </u>	7
									= =	10.20	-	-	N
				1	I inspection purposes of the option of the o				E		ه م	<u>.</u> ][	K
				- 1		.38	Š.				<u> </u>	-4	
				-		other		•	$\exists$		٠. ٥	ام	1
			24/05/2003 18	845	417	HIR.			3		-	-4	1
4.70-15.15	SPTC	N=44 (9,7/11,11,10,12)	14.70 4. 25/05/2003 07	.30	es of for	50			4	**		-[[	Y
,			25/05/2003 07 14.70 9	.83 .83	111708 tifeld				3	(3.00)	. 3		$\Gamma$
				1	ion prieds				= =		مع ه	- g	11
				-	Dectronite				Ē		٠ ج	-	1
į					instit c				=		. <del>3</del> -4	-10	1 6
				\$0	oblive				E		-0-2		11
20-16,65	SPTC	N=39 (5,7/8,9,11,11)	16.20	of							٠ ج	<u>:</u> ][	1
İ			CONSE	Drī gra	iller reports black sandy S rvel bands.	SILT with			<u>-</u> 1	6.20 -12.2	Х " ,	7	1 1
			CO.						E		× م. ×		1 6
1	1								#		× ×		][
1											z ***	4	1 [
-	.								4		× , , ,		<b>1</b>
7.70-18.15	SPTC	N=40 (6,8/9,10,10,11)	17.70			,			Ė		*	4/	11
			117.70						3	(2.90)			l
				ľ					- 4			4	1.1
1				1					=		×		١N
				1					4			ΛE	1
}									E		-		
20-19,65	SPTC	Nimita (d. ear in m		<u></u>					4		* *.		1
	J J	N=31 (4,6/5,7,9,9)	19.20	Firm sögt	n to very stiff dark grey bri htty sandy CLAY. Sand is	own fine				).10 <i>-15.1</i> 5			IN
-		ŀ							3		}	ИĘ	
					_				4		<u> </u>	NE	
epth 7	Type & No	Records	Date Time Casing Water	<del></del>	Stratum continued next	Sheet						111	
xdwater Entrie	us .			+	th Related Remarks	·				•			
(tu)	strike behavior	UT .	Depth sealed (m)	From	to (m)					hiselling epths (m) Ti	inso To	ools use	edi
3.80 -			-	1									
or explanation of	f symbols and	<del></del>	Project			· ·							_
tions see key sti metres. Stratum column.	f symbols and eet. All depths ar thickness given i	nd reduced in brackets			Waste to Energy				В	orehole			
CONCRETE !		1 '		KD311 Dublin	6 City Council					E	3R8		
									I	She	et 2 of s	5	



Driffed by MIN Logged by PG Checked by MIK	Start 24/05/2003 End 28/05/2003	Equipment, Methods a	and Remarks			Depth from 0.00m 20.70m 39.80m	10 20.70m 39.80m 46.50m	Diameter 131mm 120mm 76mm	Casing Depth 20.70m 39.80m 41.20m	Ground Level Coordinates National Grid	E	+3.95 mOE 319983.5 233492.8
Samples a	nd Tests	<u>                                     </u>			Strata							
Depth	Type & No	Records		Time Vater		Descripti	DA)			Depth, Level (Thickness)	Legend	Bacidi
20.70-21.15 20.70	SPT S D1	№22 (2,3/3,5,8,8)	20.70		Firm to very stiff dark gre slightly sandy CLAY. Sar	y brown id is fine.						
- 22.20-23.15 22.20	SPT S D2	N=50 (11,12/10,12,15,13)	22.20		·				-			
23.70-24.15 23.70	SPTS D3	89 (9,11/12,13,14,10 for 70mm)	23.70		e dilly. at	Nother use	r		-			
- 25.20-25.65 25.20	SPTS D4	N=30 (4,8/6,7,8,8)	25.20	F <sup>O</sup>	nspection purposes only and				-			
26.70-27.15 26.70 -	SPTS D5	N=37 (5,10/5,10,10,12)	Consent 26.70	,					-			
- 28.20-28.65 28.20	SPT S D G	N=28 (6,717,8,6,7)	28.20						-	(17.10)		
29.70-30.15 29.70 Depth	SPT S D 7	N=29 (7,7/7,8,8,8) Records	29.70 Date T	ime later	Stratum continued	next sheet			-			
Groundwater Ent No. Struck Po- (m) 1 3,80 -	ries st strike beh	aviour	Depth sea	led (m)	Depth Related Remarks From to (m)		,			Chiselling Depths (m)	Time To	oels used
Notes: For explanationable abbreviations see key levels in metres, Stratin depth column.  Scale 1:50	n of symbols a y sheet. All dep turn thickness o	and reduced pives in brackets	Project No. Carried out		Dublin Waste to Energy KD3116 Dublin City Council					<b>Borehole</b> Sh	BR8 eet 3 of	5



Drilled by MN Logged by PG Checked by MK	Start 24/05/2003 End 28/05/2003	Equipment, Metho	ds and Remarks		Depth from to Diameter 0.00m 20.70m 131mm 20.70m 39.80m 120mm 39.60m 46.50m 76mm	Casing Depth 20,70m 39,80m 41,20m	Ground Level Coordinates National Grid	+3.95 mOD E 319963,53 N 233492.81
Samples a	and Tests			Strata	<u> </u>			
Depth	Type & No	Records	Date Tra Casing Wa		Description		Depth,Level	Legend Bacidia
31.20-31.65 31.20	SPTS D8	N=29 (5,6/7,7,8,7)	20.70 3 26/05/2003 01	Firm to very stiff dark gre slightly sandy CLAY. Sai 730 60	ey brown nd is fine.		(Thickness)	
32.70-33.15 - 32.70	SPTS D9	N=28 (5,6/6,5,5,10)	32.70			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
34.20-34,65	SPTC	Flush: 20.70-46.50 Mud drilling, 100 % N=30 (8,777.8,8,7)	34.20		neruse.	1111111		
35.70-35.74	SPT C	(75 for 35mm)	25.70 Conset	For inspection purposes only of the purpose of the	iders and	3	5.20 -32.25	
37.20	SPTC	(50 for Oran)	37,20		•		(2.80)	
39.30-39.70 m 39.70-39.80 m 39.80-40.00 m	50 0 0	CR 100, SCR 60, RQD 0 TCR 50, SCR 0, RQD 0 TCR 0, SCR 0, RQD 0 TCR 0, SCR 0, RQD 0	28/05/2003 1800 39.60 5.20 27/05/2003 0730 Date Time	Recovered as grey sandy G compact dark brown day be subrounded fi sand is fine to coarse. (possweathered rockhead).  Stratum continued ne	ands. Gravel is ine to coarse, iible	39 to in [ 39 ay bands	.00 -35.05	
Groundwater Entrie No. Struck Post s (m) 1 3.80 -	rs strike behavio		Casing Water  Depth sealed (m)	Depth Related Remarks From to (m)		CI Ck	hiseRing epths (m) Time	Tools used
Notes: For explanation of abbreviations see key sh levels in metres. Stratum in depth column. Scale 1:50	f symbots and leet. All depths a trackness given of MESC HEM (281), 30		Project No.	Dublin Waste to Energy KD3116 Dublin City Council		В	orehole BF Sheet	



Drilled by MN Logged by PG Checked by MK	End	5/2003	Equipment, Methods	s and Rema	rks		Depth from 0.00m 20.70m 39.80m	to 20.70m 39.80m 46.50m	Diameter 131mm 120mm 76mm	Casing Depth 20.70m 39.80m 41.20m	Ground Leve Coordinates National Gri		+3.95 mOD 319963.53 233492.81
Samples a	<u> </u>	5/2003   Test:	<u> </u> s		<del></del> -	Strata				41.20til	•		. 200 1020
Depth	TOR SCR RGD	H	Records/Samples	Date	Time		Description	on .			Depth,Level		Backfill
40.00-40.30 m 	29 0	NI NI 70	TCR 17, SCR 6, RQD 0	39.80	Water 8.25	Recovered as grey sandy compact dark brown clay subangular to subrounde sand is fine to coarse. (pr	r GRAVEL bands. Gr	with		- - - - -	(Thickness (2.30)	2 2 5	Instrume
40.65-41.20 m	18 0 0					weathered rockhead).	ossidie					000	
41.20-41.30 m	Ħ		TCR 100, SCR 6, RQD 6				-				41,30 -37,3	× • • • •	
41.30-42.00 m	100 80 70					Moderately weak to stron grained LIMESTONE with content (irregular matrix). Joints are closely spaced	n high calc , 10 to 30°	ite					
42.00-43.50 m	100 77 61					dip, smooth and stepped, includes slight weakening strength at joints; modera crystalline calcite - platy h 90% calcite content)	Weathering of rock tely weak	ng	42	2.00-42.30 m cone of weak rock			
43.50-45,00 m	100 91	NI 200 800					other use.		43 z	.85-44.20 m	(5.20)		
_	85					hespection but poses out of act	3			.55-44.70 m subvertical facture, dutating and rough			
45.00-46.50 m	100 99 99			27/05/2003 41.20	1800 6.35	ne de la companya de la companya de la companya de la companya de la companya de la companya de la companya de			un:	.45-45.60 m subvertical fracture, dutating and mough .50-45.55 m Pyrite veins 15-46.50 m subvertical fracture,			
· · ·						EXPLORATORY HOLE E	NDS AT 46.5	iO m	Urk	dulating and rough	46.50 <i>-42.5</i> 3	5	SP
										111111111111111111111111111111111111111			
-										بمليميهما			
-										بتبيئية			
	_									7 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8			
Depth	羅	Ħ	Records/Samples	Date Casing \	Time Water	····							
Groundwater Entri No. Struck Post (m) 1 3.80 -		behan	riour	Depth se	aled (m)	Depth Related Remarks From to (m)			•		Chiselling Depths (m) 1	Time Tool	is used
lotes: For explanation obtraviations see key sevels in metres, Stratus of depth column.	sheet. A m thickr	Al depth hess giv	s and reduced en in brackets	Project No. Carried out	. 1	Dublin Waste to Energy (D3116 Dublin City Council					Borehole	BR8 eet 5 of 5	



Drilled by M Logged by P Checked by M	G End EN 12/06/2003	Hand dug inspection Rotary open hole dr Rotary coring to 49. Jostalied 500m stan	ny fig n pit to 1,20m liting to 44,70m Som	n		Depth from 0.00m 39.00m 44.70m	to 39.00m 44.70m 49.50m	Diameter 131mm 120mm 76mm	Casing Depth 39,00m 44,70m	Ground Leve Coordinates National Grid	E	H.29 mC 319870. 233701.
Sample	s and Test	s			Strata	<u> </u>				ł		
Depth	Type & No	Records	Date Casing	Time Water		Description	n		· · · · · · · · · · · · · · · · · · ·	Depth,Level	T	Back
•					Driller reports soft light g	rey gravelly			·	(Thickness)	Legend	anes trucci
					CLAY.							
1.50-1.95	SPTC	N=12 (3.2/3,3,2,4)	1.50	dry					*******************	(3.00)		
3.00-3.45	SPTC	N=10 (1,1/2,2,3,3)	3.00	dry	Driller reports soft sandy (	CLAY.		<u> </u>		3.00 +1.29		
4.50-4.95	SPTC	N=11 (2.22.3,3,3)	4.50	4.10	Oriller reports black shale	GRAVEL	 \$.			(1.20) 4.20 +0.09		
6.00-6.45	SPTC	N=16 (1,1/3,4,4,5)	6.00 CON	Ŷ Øs	Oriller reports black shale of interesting the control of the cont	EL with				(1.80)		
7.50-7.95	SPTC	N=21 (3,45,6,5,5)	7.50							(2.70)		
9.00-9.45	SPT C	N=24 (4,5%,8,5,7)	9.00	Dr. sa	iller reports GRAVEL with nd bands.	siit and		<del></del>	8.	70 -4,42		
Depth	Type & No	Records	Date Time Casing Water		Stratum continued next	sheet				- - - - - - - - - -		
andwater Entr Struck Pos (m) 4.10 -	ies t strike behaviou	ir	Depth sealed (m)	Der Fro 0.0	• •	<del></del>			Chi Dep	iselling outs (m) Time	Tools us	rd
For explanation fations see key : in metres. Stratu in column.	of symbols and sheet. All depths an in thickness given in	ı ı	Project Project No. Carried out for	K031	n Waste to Energy 16 n City Council			<del></del>	Bo	orehole BR	9	$\dashv$



Drilled by MN Logged by PG Checked by MK	Start 09/06/2003 End 12/06/2003		and Remai	rica		Depth from 0.00m 39,00m 44.70m	n to 39.00m 44.70m 49.50m	Diameter 131nm 120mm 76mm	Casing Depth 39.00m 44.70m	Ground Level Coordinates National Grid	E:	4.29 m 319870 233701
Samples a	nd Test	 S			Strata	<u></u>						
Depth	Type & No	<del></del>	Date Casing	Time Water		Description	on .	<del></del>		Depth_Level	Lanna	Bac
······		-	Cesnig	mater	Driller reports GRAVEL			-		(Thickness)	Legend	Instru
			1		sand bands.	******	•		3		2.00	N
10.50-10.95	SPTC	N=28 (8,6/7,6,7,6)	10.50						3		_ ≥.	N
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			Į.						= =		2	N
,									-	•		N
					į				=		D . Z.	N
									=			N
		·	1						4			$\mathbb{N}$
12.00-12.40	SPTC	50 (9,10/10,11,12,17 for 20mm	12.00						- 4		2	N
						•			3		6. 6	N
						-			3			N
				i					∄	65 AP.		N
									#	(8.10)		$\mathcal{L}$
			1						4			1
40 50 55 55									4			N
13.50-13.95	SPTC	N=38 (8,8/7,9,11,11)	13.50						3		ا ۾ 'م	N
						୍ଦ ଦ•			3		ام ج	Ν
						rel list			크		ح. ₹٠	N
					Redion Hurdoses only, and	othe			#	ļ	2.00	N
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					ses a for				E			
15.00-15.38	SPTC	ER NO 1000 14 47 7 6- 8	45.00	i	alt Politice				Ī	į.	ام د	Ŋ
10.00-10.00	SPIC :	50 (10,10/12,14,17,7 for 0mm)	15.00		ion or real				= =	ſ	ድ ኔ 📗	$\mathbb{N}$
	- 1				sectionine,				4	ł	اءُ : ع	N
•	†				ish				E	-	.2.0	$\mathcal{N}$
	l			€°	Yite				4	ř	x 29	
	]			ofice					4			
-	1		cent	·					Ε	į.	ج. م ي	$\vee$
16.50-16.95	SPTC	N=35 (8,8/7,8,9,11)	16(50)	l					3		2 2	$N_{\cdot}$
				į					1		جُ جُ جُ	
					Firm to stiff grey brown sli- CLAY. Sand is fine.	ghtly sandy	,			6.60 -12.51 C		
					CEAT, Sand is line.				$\Xi$	1	<b>-</b> 11	
ĺ	]			İ					= =	-	- <u>-</u>	71
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				- 1					4	ľ	[	
18.00-18.45 18.00	SPTS D1	N=31 (4,6/8,7,9,7)	18.00						引	Ĺ.		11
	Ì			Ī					=	F	_:4	11
	- 1	ļ		]					#			11
									‡	}	<b>₩</b>	7
									E	ŀ	[	V
		ĺ							E	Į.	一:引[	1 K
9.50-19,95	SPTS	N=19 (4,5/4,4,5,6)	19,50	- 1					#	<u> </u>		16
19.50	D2	The state of the s		1					4	<u>.</u>	1\	11
		ļ			Stratum continued a	vext sheet			E	F	11:-	11
Depth 1	ype & No	Records	Date Ti Pasing W	ime ater								
undwater Entrie Struck Post		iour	Depth seal		Depth Related Remarks					hiselling		
(m) 4.10 -		···	Sohni 268	(m)	From to (m)				1	epths (m) Time	e Tools	used
r For evolunation -	f sumbole on-	<u> </u>										
s: For explanation o rviations see key sh in metres, Stratum	n sympos and neet. All depths I thickness own	s and reduced en in brackets	roject		ubiin Waste to Energy				1	Borehole		
pun column,		i :	roject No. Carried out 1		D3116 ublin City Council						R9	
e 1:50 (	4) MESS NOR (281).	SOUDOSOS 12-18-50 AGS									2 of 5	



* .	Drilled by MN Logged by PG Checked by MK	US/06/2003	Ī	ods and Rema	rics		Depth from to 0.00m 39.00m 39.00m 44.70m 44.70m 49.50m	Diameter Casing Depti 131mm 39.00m 120mm 44.70m	Ground Leve Coordinates National Grid	E 319870.84
ı	Samples	and Test	S	·		Strata	<u> </u>	-	-	
	Depth	Type & No	Records	Date Casing	Time Water		Description		Depth,Leve/	Legend Backfill
	21.00-21.45 21.00	SPT S D3	N=29 (4.4/6,7,8,8)	09/05/2003 21.00 10/05/2003 21.00	12.47	-1	lightly sandy		(Thickness)	instrument
	22.50-22.95 22.50	SPTS D4	№28 (5,4/5,7,7,9)	22.50			٠			
	- 24,00-24,45 24.00	SPT S D S	N=28 (5.5/6,5,7,8)	24.00		્રે કે કે કે કે કે કે કે કે કે કે કે કે કે	or any other use.	- - - - - - - - - - - - - - - - - - -		
	25.50-25.95 25.50	SPTS D6	N=27 (5,6:6,7,7,7)	25.50	onsei	For its petion burgs esont		11.11.11.11.11.11.11.11.11.11.11.11.11.		
	27.00-27.45 27.00	SPT S D7	N=25 (4,4/5,5,6,8)	27.00					(22.20)	
	28.50-28.95 28.50	SPTS D8	N=22 (5,4/6,5,5,5)	29.50					-	
-					_	Stratum continued ne	xt sheet	]	Ī	11111
	Depth	Type & No	Records	Date Till Casing Wa	ne ter				·	
Gi No 1	roundwater Entr 5. Struck Pos (m) 4.10 -	ries at strike behavio	our ·	Depth scale (r	ed n)	Depth Related Remarks From to (m)			Chiselling Depths (m) Tim	e Tooks used
	es: For explanation revisitions see key is in metres. Strati. epth column.	of symbols and sheet. All depths a an trackness given (c) MESG HEM (201), 32		Project Project No. Carried out fo	KI	ublin Waste to Energy D3116 ublin City Council			Borehole B Shee	R9 13 of 5



Drilled by MN Logged by PG Checked by MK	Start 09/06/2003 End 12/06/2003	Equipment, Method	is and Remarks		0.00m 39.00m 1: 39.00m 44,70m 1:	iameter Casing Depth 131mm 39.00m 120mm 44.70m 78mm	Ground Level Coordinates National Grid	E 31987
Samples a	and Tests	,		Strata	<u></u>		•	
Depth	Type & No	Records	Date Time		Description		Depth,Level	Lamoura Br
30.00-30.45	SPTS	N=25 (4,4/6,7,7,6)	Casing Water			<u> </u>	(Thickness)	Legend Ba
30,00	D9	TWO MAN GIVE THE STATE		Firm to stiff grey brown CLAY. Sand is fine.	slightly sandy	3	1	F
Ē			'			<b></b>	i	1-:10
Ē			'			#	l	1117
<u>-</u>			,			1	<u> </u>	1-:10
				i		£		F -11/2
			'	1		₫		1-: 11/2
	1					<u>†</u>	İ	ドゴフ
- 31.50-31.95 - 31.50	SPTS D 10	N=23 (4,5/4,6,8,7)	31.50	,				[ -:+[>
Ξ !	1		'	-		<u>f</u>		$\vdash - V $
<del>-</del> ,	1		'	1		3		1-11
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<u>.</u> .	1		'	1		. 1		1-11
— 33.00-33.45	0000	** - ** 22 2 2 2 2 2 2		1			i	
- 33,00-33,45 - 33,00	SPTS D11	N=29 (4,6/7,7,7,8)	33.00	1		亅		ľ —: [N
- 1	i		1	ł		Ł		
-			<u> </u>	1		Ė		ニーコン
-	i	Flush: 21.00-46.30 Water, 95 %	1	l		E		
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<u> </u>	.		, i	1	Othe	1	Į	
34.50-34.95	SPTS	50000 16 7E 8 6 51	24.50	Specifor purposes only in a state of the sta	E.	‡		117
34.50	D12	N=22 (5,7/6,6,5,5)	34,50	os of foi		‡		
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:	.		Į.	tion of it		E	1	. <del>-</del> 117
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: 1	,	·	35.00 For	Tito		<b>E</b>	ľ	1/7
— 36.00-36.45	SPTS	N=26 (4,5/5,6,7,8)	36.00	ľ		<u> </u>	Ì	□ 1   1   1   1   1   1   1   1   1
36.00	D 13	¥ •	NO.	į.		Ŧ	ļ	
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			J	i		7	1	-:41/
				i		7	4	N
37.50-37.95 37.50	SPTS D14	N=29 (5,6/6,7,8,8)	37.50	1		1	<b>†</b>	$\dashv \forall$
37.50	ן איט		1	1	•	1	<u> </u>	11/
1			1	l .		j	Ĺ	-:41/
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1			10/06/2003 1745 39.00 8.65			7	<u>[.</u>	11/1
- 39.00-39.45 39.00	SPTS D 15	N=28 (6,7/6,7,7,8)	39.00	Driffer reports acqually \$1	· · · · · · · · · · · · · · · · · · ·	3	9.00 -34,71	! N
33.00	013		39.00 5.86	Driller reports gravelly Sil	41.	4	•	
1	1		1			1	l a	
			1 [			1		*N
1						#	- <u>-</u>	
Depth	Type & No	Records	Date Time	Stratum continued	next sheet	<b>-</b> - <b>-</b> - <b>----</b>		
Groundwater Entri	ies		Date Time Casing Water	Depth Related Remarks		<del></del>	Chiselling	
No. Struck Post (m) 1 4.10 -	t strike behavio	MIF	Depth sealed (m)	From to (m)			Depths (m) Tim	ne Tools used
•			-					
iotes; For explanation of hibraviations see key s wels in metres. Stratur i depth column.	of symbols and		Project D	Oublin Waste to Energy	<del></del>		Borehole	
wale in making Chart	m thirimore nive	and reduced				1 '	Doteilor	
	un american State		Project No. K	CD3116	•			R9



Drilled by Mix Logged by PG Checked by MK	1	Start 19/06/20 End 2/06/20	03	ods and Remai	rics		39.00m 4	to 39.00m 14.70m 19.50m	Diameter 131ann 120mm 76mm	Casing Depth 39.00m 44.70m	Ground I Coordina National	ites	E	4.29 m 319870 233701
Samples	and	Tes	ts			Strata					1			
Depth	T	pe & N	Records	Date Casing	Time Water		Description			·	Depth,La	rve/ ;	gend	Bac
40.50-40,95		SPTC	N=26 (6,7/7,7,5,5)	40.50		Driller reports gravelly SI	LT.			-	(Thickne	*x_	A No.	
- - - - - 42.00-42,45	5	БРТ <b>С</b>	N=28 (5,5/6,7,7,8)	42.00						1	(4.50)	)	K X X X X X X X X X X X X X X X X X X X	
43.50-43.67	s	PTC	<b>22</b> (25,28/22 for 15mm)	43.50		Driller reports gravel, bould clay bands.	ders and	<del></del>				21 0	* * \$ * . *	
44.70-44.80 m	100	Ni	TCR 100, SCR 50, RQD 0			Strong to very strong dark coarse-grained Life STON calcite veins.  Joints are closely to medium to 40° dip, undulating and s	E with occas m spaced, 30	sional	44.70-4	4.80 m No [ -	(1.20) 14.70 <i>–40</i> ,	41		
44.80-46.30 m 46.30-47.00 m	91 85 100 86	70 290		11/05/2003 44.70	1630 O	Weathering includes uncon sit infil along fracture plane	neart area ha	own	fract 10 ca	60 m 50° ure along mm thick licite vein				
47.00-48.15 m	100 89 59	NI 150	Firsh: 46.30-49.50 Water, 0 %						fracti 5mm thi 46,85 occasio in calc 47,00-47 47,40-49, coatin	70 m 20°	(4.80)			
48.15-49.50 m	100 96 79	350	·	12/06/2003 (	7730				fractu pro cak	48,50 m bvertical re along resisting ite vein, ooth and planar				
Depth	100	lf .	Records/Samples		6.30	EXPLORATORY HOLE END	S AT 49.50 m		<u> </u>	49	.50 -45.2	1	00	
roundwater Entr 2. Struck Pos (m) 4.10		behav	riour	Depth sealer	d F	epth Related Remarks ross to (m)					niselling opths (m)	Time 1	Fools us	sed
es: For explanation reviations see key s ds in metres. Stratus epth column.	sheet A m thick	li depth Yess giv	s and reduced en in brackets	Project Project No. Carried out for	KD:	Din Waste to Energy 3116 Din City Council				В		BR9	<u> </u>	-



rilled by MN ogged by Ji. hecked by MK	Start 03/06/2003 End 06/06/2003	Hand dug inspection pit	and Remarks rill dg to 1.20m. to 38,55m.		Depth from to Diamete 0.00m 20.70m 131mm 20.70m 38.55m 120mm 38.55m 43.17m 76mm	20.70m	Ground Level Coordinates National Grid	Ę	4.30 m 20004 33686
Samples a	nd Test	<u> Borehole backfilled with</u> S	ares of	Strata			1		
Depth	Type & No		Date Tin Casing Wa	10	Description		Depth,Level	Legend	Bac
,					nd GRAVEL FILL with	<del></del>	(Thickness)	XXX	pustra.
				metal fragments (MA	DE GROUND)	-	1	KXXI	/
	İ						1	$K\!$	
						=		KXX	
	<u> </u>					_	1	KXXI	
	<u> </u>		}			-	1		
1.50-1.95	SPTC	N=5 (2.1/1.2,1,1)	1.50	day		=	}	KXXI	
						=	į	KXX	N
				· ·		-		KXX	
				1				$\otimes$	
			}			-		$\bowtie$	/
			1	1		=		<b>KXXI</b>	
			]			-	(5.40)	KXXI	$[\ ]$
3.00-3.45	SPTC	N=6 (1,2/1,1,2,2)	3.00	dry		_		KXX	
						-		$\bowtie$	
						=			$\mathbb{N}$
					~•	_		KXXI	
			ļ		netile	_		KXX	
					of Other	_			
4.50-4.95	SPTC	N=6 (2,1/1,2,2,1)	4.50	ary only	an,	_			
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		oses div		-	-		
				Durge Child	•	=		KXXI	
				ation per re		=		KXXI	
				by Delier reports SAND and spicelis.			5.40 -1.10		
			\$c	Driller reports SAND a	and GRAVEL with	-	0.40	٠٠٠ من	
			e.oo ofs	o P		-		ا • ا	
6.00-6.45	SPTC	N=5 (2,1/1,1,1,2)	6.00	80					
			onsell	İ		4			
			C			=			
				Ţ		=		4	/
				1	,	_			/
						=		ام داداد اه م	
7.50-7.91	SPTC	50 (2,4/7,14,17,12 for 35mm)	7.50			3			
						=		خ . م	
				]		1		ار می	
						7			/
	•				,	3		ا ا	
						4		e. e	
		Flush: 0.00-17.70 Air, 100 %				-		أأوض	
9.00-9.45	SPTC	N=36 (2,3/5,9,10,12)	9.00			-			
						-		£	
1						7		ا م	
						3			
			Date Time		wed next sheet				$\overline{}$
Depth	Type & No	Records	Casing Wate	<u> </u>					
oundwater Entr Struck Pos (m)	rles st strike beha	viour	Depth sealed	Depth Related Remarks From to (m)	•		Chiselling Depths (m) Ti	me Tools	use
5,80 -			(m)						
				J					
s: For explanation	of symbols an	d I	Project	Dublia Waste to Energy			Borehole		
es: For explanation reviations see key is in metres. Stratu epth column.	sneer. All depti im thickness gi	ns and reduced ven in brackets	Project No.	KD3116				R10	
Las coupper,		1), 30/14/2003 1/2:4K-53 AGS		Dublin City Council			0	et 1 of 5	



s (	Drilled by MN Logged by JL Checked by MK	U3/05/2003 End	1	and Rema	rics		Depth from to 0.00m 20.70m 20.70m 38.55m 38.55m 43.17m	Diameter 131mm 120mm 76mm	Casing Depth 20.70m 38.55m	Ground Level Coordinates National Grid	E	4.30 mOD 320004.82 233685.92
I	Samples	and Test	s			Strata	<del></del>					-
ı	Depth	Type & No	T	Date	Time		Description		<del>- · · </del>	Depth_Level		Backfill
	10.50-10.95	SPTC	N=35 (3,6/7,6,9,11)	Casing	Water	Driller reports SAND and shells.				(Thickness)	Legend	enstrument
	- 12.00-12.33	SPTC	50 (6,10/12,24,14 for 25mm)	12.00				·		(12.80)		
	13.50-13.95	SPTC	N=49 (9.10/9.9,11,20)	13.50			other use.	·				
	15,00-15,45	SPTC	N=35 (6,5/6,7,10,12)	15.00		For its pedion purposes only of copyright owner required to of copyright owner required to of copyright owner required to one copyright of the copyright of copyright owner required to one copyright of copyright owner requi	A ANY					
المتعددية	16.50-16.90	SPTC	50 (7,6/8,9,9,24 for 20mm)	16.50	Onsen	of cold						
	18.00-18.40	SPTC	49 (8,8/11,10,11,17 for 2Smm)	03/06/2003 17.70 04/06/2003 17.70 18.00	14.10	Firm to stiff grey brown slig CLAY, Sand is fine to medi	htty sandy um.			8.20 <i>-13.90</i>		
	19.50-19.95 19.50	SPTS D1	N=20 (3.2/4,5,5,6)	19.50		Stratum continued n	ext sheet					
	Depth roundwater Ent o. Struck Po (m) 5.80 -	Type & No tries st strike behan		Casing V  Depth sea	ime Vater ded (m)	Depth Related Remarks From to (m)				Chiselling Depths (m) Tim	ne Tools	used
l**	les: For exptanation revisitions see key els in metres. Strail lepth column. else 1:50		, ,	Project Project No. Carried out	K	Oublin Waste to Energy (D3116 Oublin City Council					R10	



Logged by Checked by	JL.	Start 03/06/2003 End 06/06/2003	Equipment, Methods a	nd Remar	rks		Depth from to 0.00m 20,79m 20,70m 38,55m 38,55m 43,17m	Diameter Casing 13 mm 20.7 120mm 38.5 76mm	Dm C	Sround Level Coordinates lational Grid	E3	1,30 mOD 20004,82 33686,92
Sampl	es an	d Tests				Strata						
Depth		Type & No	Records	Date Casing	Time Water		Description			Depth, <i>Level</i> (Thickness)	Legend	Backfill/ Instrumen
21.00-21	1.45	SPTS D2	N=23 (2,3/4,4,7,8)	21.00		Firm to stiff grey brown a CLAY. Sand is fine to m	sightly sandy ledium.					
22.50-22 - 22.50-22 - 22.50		SPTS D3	N=18 (2.3/5,4,4,5)	22.50				,	4.11.11.11.11.11.11			
24.00-2 - 24.00-2 - 24.0	4.45 0	SPTS D4	N≈21 (3.2/4.8.5.5)	24.00		Rection buffer tentified for a	ny other use.					
- 25.50-2 - 25.50-2 - 25.5	25.95 50	SPTS D5	N=21 (5,3/5,4/5,5)	25.50	for i	Pection Parkedur	·					
27.00-	27.45 00	SPT S D6	N=35 (3,6/7,8,10,10)	27.00					*************	(18.30)		
- 28.50 - 28.50		SPT S D7	Flush: 20.70-36.D0 Vulner, 100 % N=24 (4,446,6,7,5)	28.50					<u> </u>			
Dep	water Er	Type & N		Date Casing	Time Wate	r Depth Related Remark	nued next sheet			Chiselling Depths (m)	Time 1	oois used
1 5	(m) 5.80 -	ost strike be	s and leptis and reduced is given in brackets	Projec		Dublin Waste to Energy	,		.,,.	Borehol		
levels in n in depth o	XXILITIA.		is given in brackets in com, somozoos 12-47-91	Ргојес Салтіс	ct No. ed out for	KD3116 Dublin City Council				S	BR10 heet 3 of	5



Drilled by MN Logged by JL Checked by MK	Start 03/05/2003 End 05/05/2003		is and Rema	rics	0.00m 20.70m 13 20.70m 38.55m 12	imeter Casing Depth fimm 20.70m Onm 38.55m Born	Ground Level Coordinates National Grid	+4.30 mOD E 320004,82 N 233686,92
Samples a	nd Test	s	<del></del> -		Strata		[	
Depth	Type & No		Date	Time	Provident		Depth_Level	Sackfill
30.00-30.45	SPTS	N=25 (5,5/5,7,7,6)	Casing 30.00	Water	· · · · · · · · · · · · · · · · · · ·	<u> </u>	(Thickness)	Legend instrumen
30.00	D8				Firm to stiff grey brown slightly sandy CLAY. Sand is fine to medium.	4.1.1.1.1.1		
31,50-31,95 31,50	SPTS D9	N=17 (3,343,5,5)	31.50	i		1111111111111111	,	
- 33.00-33.45 - 33.00	SPTS D10	N=29 (7,6/6,8,7,5)	33.00			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
- 34.50-34.95 - 34.50	SPTS D11	N=27 (8,5:8,7,8,6)	34.50		For inspection purposes only any other use.			
36.00-36.45 - 36.00	SPT S D 12	N=43 (9,11/5,11,9,15)	04/06/2003 36.00 36.90 05/06/2003 36.00	1630 1.20 0730 4.35	Driller reports clayey SAND and GRAVEL and boulders with clay.	3	6.50 -32.20	
37.50-37.56	SPTC	0 (25 for 35mm/50 for 20mm)	37.50				(2.05)	
38.55-39.15 m	100 42 Nt 42 Nt 42 Nt 150	(25 for Omm/50 for Omm)	38.50	ı	Moderately strong to strong dark and light grey slightly fossiliferous medium to coarse-grained LIMESTONE with rare calcite veins.	38.55-38.70 m 38.70 m 38.70 m	8.55 -34.25	
39.15-39.66 m	100 71 53 100 88 78	Flush: 36.00-43,17 Mud, 100 %			Joints are closely to medium spaced, 45 to 60° dip, and rough undulating.  Weathering includes soft grey sandy clay infill along fracture planes.  Stratum continued next sheet	39.40-39.60 m subvertical fracture along calcite vain	(2.45)	
Depth Groundwater Entrie No. Struck Post (m) 1 5.80 -			Depth seal	ine later led (m)	Depth Related Remarks From to (m)		Phiselling Depths (m) Time	Tools used
Notes: For explanation of abbreviations see levy si- levels in metres. Stratum in depth column. Scale 1:50		_	Project Project No. Carried out t	К	ublin Waste to Energy 03116 ublin City Council			<b>R10</b> 4 of 5



rilled by MN ogged by JL thecked by MK	\$tart 03/06 End 06/06	j	Equipment, Methods a	nd Remari	ks	Depth from to Diameter Casing Depth 0.00m 20.70m 131mm 20.70m 20.70m 38.55m 120mm 38.55m 38.55m 43.17m 76mm	Ground Level Coordinates National Grid	E	4.30 mOD 120004.82 133696.92
Samples a	nd T	ests				Strata			···
Depth	TUR SUR ROD	H	Records/Samples	Date Casing	Time Water	Description	Depth,Level (Thickness)	Legend	Bacidii Instrume
40.17-41.67 m	105 93	Ni 70 270				Moderately strong to strong dark and light grey slightly fosslifferous medium to coarse-grained LIMESTONE with rare calcite veins.  Joints are closely to medium spaced, 45 to 60° dip, and rough undulating.	41.00 -36.70		
9U-17-9 1.U7 HF	71			05/06/2000 38.55 06/06/2000 38.55	11.30	Weathering includes soft grey sandy clay Infilt along fracture planes.  Strong dark to light grey medium to coarse-grained thickly laminated to thinly bedded LIMESTONE.  Joints are medium spaced, 35 to 45° dip,	41.00		
41.67-43.17 m	93 93 90	40 150 300		36.33		smooth and planar, predominantly along bedding planes. No visible weathering, slight discolouration along fracture planes.  42.50-42.58 m E subvertical rough fracture	(2.17)		
<b>-</b>				08/08/200 38.55	ß 1500	<del>-</del>	43,17 -38.87		
				Cons	For of Co.	EXPLORATORY HOLE ENDS AT 43,17 m			
Depth	nories	11	Records/Samples	Date Casing	Time Water	Depth Related Remarks	Chiselling		
No. Struck (m) 1 5.80	Post st ation of : key she tratum !	symbols et. All d hickness		Project Project		From to (m)  Dublin Waste to Energy  KD3116  Dublin City Council	Borehok		ools use



Logged by PG Checked by MK	Start 14/05/2003 End 14/05/2003	Equipment, Method Excavated by JCB 3C3 Trial pit terminated at r Pit backfilled with arisis	( equired depth.	Dimensions and Orientation Width 0.75 m Length 3.20 m  Dimensions and Orientation  A 110 (Deg)	Ground Level Coordinates National Grid	E	3.81 mOD 319901,10 233417.70
Complete				<u> </u>	1		
Samples a		Date	Strata	Description	Depth, Level	Legend	Backfilli
Depth	Type & No.	Records	1 Soft, brown slightly sandy slightly gravelly		(Thickness)		Instrument
- 0.50-0.60	81		FILL with rare brick fragments metal and Gravel is subangular to subrounded fine (MADE GROUND)	plastic. to medium	(0.50) 0.50 +3.31		.:
_ 0.50-0.60 _ _	D2		Grey slightly clayey gravelly SAND with A Gravel is subangular to subrounded fine (MADE GROUND)     Soft dark brown sandy slightly gravelly C FILL with occasional brick fragments. Grasubangular to subrounded fine to medium GROUND).	LAY and ASH	0.70 ~+3.11		
- 1.20-1.60 1.20-1.60	B3 D4			2.00 m Rare — shebs and some caranic fragments			
- 2.40-2.60 2.40-2.60 -	B5 D6		Consent of copyright owner require	of for any	(3.30)		
- 3.40 3.40 3.50-3.70 - 3.50-3.70 -	W7 W8 D10 B9		EXPLORATORY HOLE ENDS AT 4		4.00 <i>-0.1</i> 9		
Depth	Type & No.	Records Date	Don'th Painted Persylve				
Groundwater Entr No. Struck Post Str (9) 140 3.40 Very Fa	ike Behaviour st Inflow		Depth Related Remarks From to (m)	· · · · · · · · · · · · · · · · · · ·	Stability Mod Shoring Non Weather		
Notes: For explanation abbreviations see key levels in metres. Stratin depth column.  Scale 1:25	_	nd this and reduced iven in brackets	Project No. KD3116 Carried out for Dublin City Council		Trial Pit T She	<b>P01</b> eet 1 of 1	



Logged by PG	Start	Equipment, Method	is and Remarks	Dimensions and O	lentation		Groun	d Level	4	3.72 mOE
Checked by MK	Start 14/05/2003 End 14/05/2003	Excavated by JCB3C) Trial pit terminated at ( Pit backfilled with arisi	( required depth.	Whith 0.75 m Length 3.42 m	••	285 (Deg)		inzies nai Grid	E	319067.74 233463.92
Samples a	nd Tests	<u> </u>	Strata	· · · · · · · · · · · · · · · · · · ·		-	<del>                                     </del>			
Depth	Type & No.	Date		Description			Depth	, Level	Legend	Bacidill
	-,,	Records	1 TARMAC pavement (MADE GROUND)		<del></del>		(Thic	kness)		Instrum
-  -  -			Grey slightly dayey sandy GRAVEL (sut frequent angular to subangular cobbles, to coarse gravel is angular fine to coarse GROUND)	Sand is fine		<del></del>	0.08 (0 0.38	+3. <i>64</i> ).30) +3.34		
			Soft dark brown slightly sandy gravelly C FILL with many pockets of gravel and oc cobble and boulder-sized fragments of re glass concrete, wood, slate and plastic (I	casional ed brick.			0.36	13.34	$\bigotimes$	
1.00-1.10 1.00-1.10	81 D2		•			- -				
-										
2.00-2.20 2.00-2.20 	B3 D4		onthi ai	Aditer use.		-   + + + +	(3	:.22)		
- - - 3.20-3.40 3.20-3.40	B 5		Consent of copyright owner required for an		3. becoming o					1
-		,	Dark grey fine to medium SAND with son dark grey laminae of SILT. (ESTUARINE	ne medium spaced	ï	1 1	3.60	+0.12 .80)	$\bigotimes$	
-			EXPLORATORY HOLE ENDS AT	4.40 m		-	4.40	-0.68	* * *	
-				<del>-</del>		- - -				
Depth	Type & No.	Records Date								<u> </u>
Groundwater Entr No. Struck Pust Stri (m) 1 3.45 Strong to	ike Behaviour		Depth Related Remarks From to (m)					ity Mode ng None		
Notes: For explanatio abbreviations see key levels in metres. Strat	n of symbols ar sheet. All dept	nd his and reduced	Project Dublin Waste to Energy				Trial	Pit		
levels in metres. Strain depth column. Scale 1:25		iven in brackets 3. sonozous 1250:50 AGS	Project No. KD3116 Carried out for Dublin City Council						<b>P02</b> et 1 of 1	,



Logged by PG Checked by MK	12/12/2003	Excavated by JCS Trial Pit terminates	due to poor stability	Oimensions and Ori Width 0.60 m Length 3.00 m	entation  Declaration 20 (Dec	Ground Lev Coordinates National Gri		+3.67 mOE 319951.50 233435.75
Samples	and Test	s	Strata		c c	-		
Depth	Type & No.	Date	Guata	Description		Depth, Leve		<u> </u>
- - -		Records	TARMAC pavement overlying GROUND).	crushed stone subbase (MAD	DE .	(0.30)	Legend	Backfill
- - - 0.60-0.80 _ 0.60-0.80 - -	B1 D2		Soft brown sandy CLAY and G pockets of coarse gravel and o (50 x 25 x 20cms) fragments or plastic metal, concrete. Sand is gravel is subangular to subrour (MADE GROUND)	ccasional boulder-sized red/yellow brick		0.30 +3.3		
- 1.80-2.00 1.80-2.00	B3 D4			ally; any other use.	-	(3.10)		
- - - 2.80-3.20 2.80-3.20 	B 5 D 6		Consent of copyright owner	the direction	3.20-3.40 m			
			EXPLORATORY HOLE (	ENDS AT 3.40 m	collapse	3.40 +0.27		
Depth T	Ama F No	Records						
Sroundwater Entries	ype & Na.	Date	Death Falls					
lo. Struck Post Strike (m) 1 3.20 Moderate k	Behaviour		Depth Related Remarks From to (m)			Stability poor be Shoring None Weather	¥ow 3.20 m.	
otes: For explanation of obreviations see key streets in metres. Stratum depth column.		in brackets	Project Dublin Waste to Ene Project No. KD3116 Carried out for Dublin City Council	rgy			<b>P03</b> t 1 of 1	



	Logged by PG Checked by MK	Start 14/05/2003 End 14/05/2003	Trial Pit terminated a	DX It required depth.	Dimensions and Ori Widh 0.75 m Langth 3.10 m	entation	Ground Level Coordinates National Grid	E	+3.70 mOD 319855.15 233525.52
	Samples :		<u> </u>	Ctunto		C			
i	Depth Depth	Type & No.	Date	Strata	Description		Depth, Level	T	0
i		Type a Ru.	Records	1 TARMAC pavement over dark gr			(Thickness)	Legend	Backfill Instrum
	- - - - 0.50-0.60 _ 0.50-0.50	B 1 D 2		3 Dark brown sandy CLAY and GR ash and coarse gravel to cobble-	AVEL FILL with pockets of sized fragments of		(0.47) 0.47 +3.23		
	- - - - - 1.20-1.40			red/yellow bricks, concrete, state bars and plastics (MADE GROUI	. wood_steel	-			
	1.20-1.40	B3 D4			net use.	- - - - - -	(2.33)		
	2.40-2.50 2.40-2.50	85 D6		4 Grey clayer gravelly SAND. Grav subrounded fine to medium (EST)	Hor any our	- - - - -			
	2.80-3.00	D8		4 Grey clayer gravelly SAND. Grave subrounded fine to medium (EST)	el is subangular to JARINE DEPOSIT)	- - - - - -	2.80 +0.90 (1.40)		
	3.90-4.10 3.90-4.10	D 10 B 9				- - - -			
			Records	EXPLORATORY HOLE EN	IDS AT 4.20 m	-	4.20 -0.50	•	
L	Depth	Type & No.	Date						
	Groundwater Entri No. Struck Post Strii (m) None observed (see	ke Behaviour Key Sheet)		Depth Related Remarks From to (m)			Stability poor Shoring none Weather		
N a	otes: For explanation bbreviations see key vels in metres. Strate	of symbols and sheet. All depth	s and reduced	Project Oublin Waste to Ener	rgy		Trial Pit		
ľ	ebiu comuur	IM Thickness, giv (c) MESC HBM (2017).		Project No. KD3116 Carried out for Dublin City Council	+1 .		TF Shee	<b>204</b> t 1 of 1	



Logged by PG Checked by MK	Start 15/05/2003 End 15/05/2003	Equipment, Methor Excavated by JCB 3 Trial pit terminated a Pit backfilled with aris	ids and Remarks CX 3.10 m due to obstruction. sings.	Dimensions and Orientation Width 0.90 m Length 2.90 m	270 (Deg)	Ground Level Coordinates National Grid	+3.35 m E 319849 N 233570
Samples ar	nd Tests		Strata				
Depth	Type & No.	Date Records		Description		Depth, Level (Thickness)	Legend Baci
-	٠.		TOPSOIL: soft sandy gravelly CL fine to medium. Gravel is subanged in the to medium.	AY with roots. Sand is ular to subrounded		0.15 +3.20	XXX
• - -			Soft dark brown sandy CLAY and abundant pockets of coarse grave boulder-sized (up to 160cm) fragri concrete, some wood, glass, wire GROUND)	el and occasional nents of brick and			
- 0.70-0.80 0.70-0.80	B1 D2				- - -		
				·		(2.95)	
1.80-2.00 1.80-2.00	B3 D4			i Adherise.			
			ection drive	poses of the any other use.  2.8  DSAT 3.10 m	1		
2.80-3.00 2.80-3.00	B 5 D 6		For its of	2.6	0 m concrete - blocks	3.10 + <i>0</i> .25	
			EXPLORATORY HOLE EN	IDS AT 3.10 m		3.10 +0.25	
					<u> </u>		
-					1		
			·		1		
Depth T	una P Ma	Records					
Sroundwater Entries	ype & No.	Date	Depth Related Remarks				
io. Struck Post Strike (m)			From to (m)		1	Stability poor	
None observed (see Kr	ey Sheet)					Shoring none Weather	
otes: For explanation o phreviations see key sh vels in metres, Stratum depth column. cale 1:25	f symbols and leet. All depths thickness give	and reduced in in brackets	Project Dublin Waste to Ener Project No. KD3116 Carried out for Dublin City Council	997	1		P05



Logged by PG Checked by MK	Start 15/05/2003 End 15/05/2003	Equipment, Method Excavated by JCB3CX Trial pit terminated due Pit backfilled with arisin	to poor stability.	Dimensions and Orio Width 0.90 m Length 3.10 m	entation  Description  15 (Deg)	Ground Level Coordinates National Grid	E:	3.45 mQD 319916.98 233552,27
Samples a	nd Tests		Strata	<u>-</u>				
Depth	Type & No.	Date Records		Description		Depth, Level (Thickness)	Legend	Backfill Instrume
-		Necords	1 Gravel - Hard Standing (MADE C	GROUND).	-	(0.40)		
- 0.80-1.00 0.80-1.00	B1 D2		2 Soft brown slightly sandy CLAY a many pockets of coarse gravel to fragments of yellow/red brick, coblocks, limestone and granite, alter and wood fragments. Sand is fin is subangular to subrounded fine GROUND)	o boulder-sized ncrete, concrete xundant glass, cloth ne to coarse, gravel		0.40 +3. <i>0</i> 5		
- - 1.80-2.00 - 1.80-2.00 	B3 D4		. "Rossi	offy, and other use.	- - - - - -	(3.00)		
- 2.80-3.00 2.80-3.00 - 3.20 3.20	B5 D6 W7 W8		· For its petion purposes for its petion of the consent of copyright owner required to the consent of copyright owner required to the copyright of the copyrigh		2.50 m imestone boulder			1
- 3,50-3,70 3,50-3,70	D 10 B 9		3 Dark grey to black fine to medium DEPOSIT)  EXPLORATORY HOLE	m SAND (ESTUARINE		3.40 +0.05 (0.30) -3.70 -0.25	XXX 	
- - - - - - -					- - - - - - -			
<u> </u>	<u> </u>	Records				<b></b>	<u> </u>	<del>                                     </del>
Depth	Type & No.	Records Date	D-4-D-4-12				1	<u> </u>
Groundwater Ent No. Struck Post St (m) 1 3.20 Very fa	rike Behaviou		Depth Related Remarks From to (m)			Stability poor		
Notes: For explanati	ion of symbols a	nd	Project Dublin Waste to E	inergy		Trial Pit		
abbreviations see to levels in metres. Str- in depth column. Scale 1.25		oths and reduced given in brackets on corresces 121600 AGS	Project No. KD3116 Carried out for Dublin City Course	all .			TP06 eet 1 of 1	l



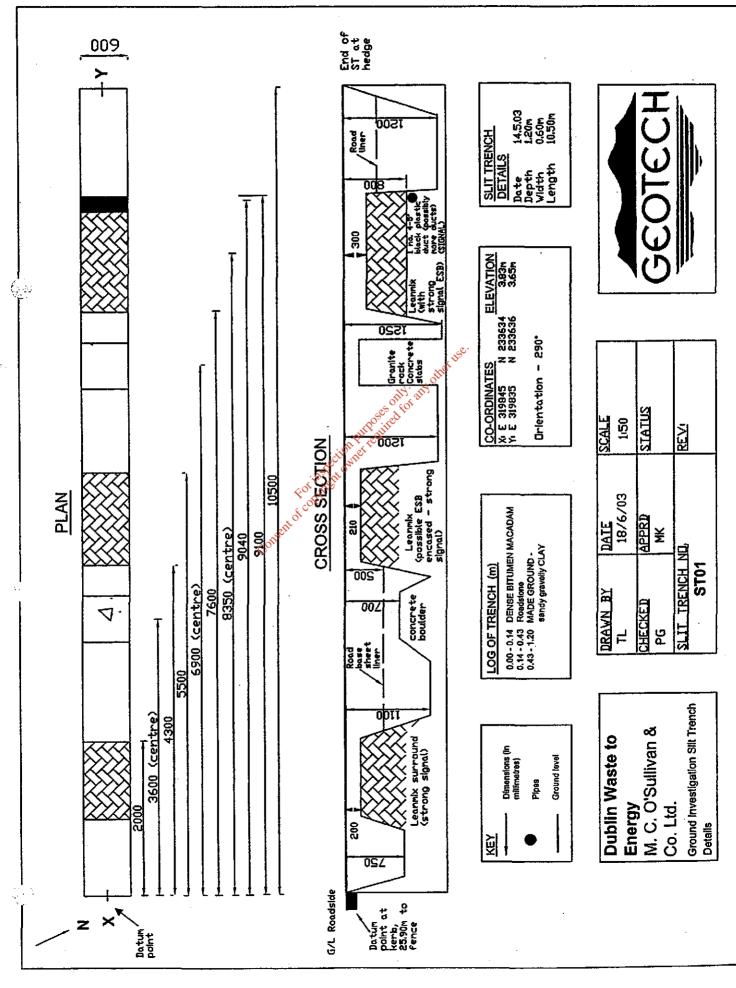
Logged by PG Checked by MK	Start 15/05/2003 End 15/05/2003	Equipment, Methor Excavated by JCB30 Trial pit terminated d Pit backfilled with ari	X Les la poor stability	Dimensions and Orien Width 0,80 m Length 3,20 m	tation 197 (Deg)	Ground Level Coordinates National Grid	E 319965.50
Samples a	لسيا	<u> </u>		C. 1901 3.20 (II	c (204)	<u> </u>	
Depth	Type & No.	Date	Strata	Description	<del></del>	Depth, Lave/	Legand Backfill
	1,770 = 1,00.	Records	1 GRAVEL - Hard Standing (MADE GROU		<del></del>	(Thickness)	Legend Instrumer
- - - - 0.70-0.90 0.70-0.80	B1 D2		Soft brown slightly sandy CLAY and GRA many cobbles and boulders, abundant frorick, wood, plastic, metal, glass, concret and rubble. (MADE GROUND).	VEL FILL with	-	0.10 +3.67	
- 1.80-2.00 1.80-2.00	B3 D4			چې		(3.40)	
- 2.80-3.00 2.80-3.00	B 5 D 6		Consett of copyright owner required to	or any other use	2.00 m boulder sized fragments of concrete (40cm wide) slow progress,		
- - 3.40	W7	!	C		-		<b>XX</b> ;
3.40	B8		<del></del>			3.50 +0.27	$\otimes\!$
Depth T Groundwater Entries No. Struck Post Strike (m) 1 3.40 Slow inflow	Behaviour	Records Date	EXPLORATORY HOLE ENDS AT 3.9  Depth Related Remarks  From to (m)	O M		Stability poor b Shoring none Weather	elow 2.00 m.
Notes: For explanation of abbreviations see key si levels in metres. Stratum in depth column. Scale 1:25 (a)	of symbols and heet. All depths in thickness give passe had (201), 20		Project Dublin Waste to Energy Project No. KD3116 Carried out for Dublin City Council		<u>-</u>	Trial Pit TF Shee	<b>207</b> t 1 of 1



Logged by PG Checked by MK	Start 27/06/2003 End 27/06/2003	Equipment, Metho Excavated by JCB 3 Trial pit terminated d Pit backfilled with an	nds and Remarks LX ue to poor stability. sings	Dimensions and Or Width 0.60 m Length 3.20 m	Sentation 230 (Dec	Ground Level Coordinates National Grid	E	4.26 mOE 319982.7: 233677.3
Samples a	ınd Test	}	Strata		——————————————————————————————————————			
Depth	Type & No.	Date Records		Description	·	Depth, Level (Thickness)	Legend	Backfi
	,		Soft brown sandy gravelly CL and fragments of brick, metal	AY FILL with rare cobbles and plastic.		(0.70)		
0.80-1.00 0.80-1.00	B1 D2		Loose orange grey dayey sar with fragments of charcoal an subangular to subrounded fine	ody GRAVEL and ASH FILL d burnt wood. Gravel is e to medium.	-	0.70 +3.56		
1.80-2.00 1.80-2.00	B3: D4			T Hise.	_	- - -		
2.80-3.10 2.80-3.10	85 D6		Consent of copyright owner red	es only any other liked for any other	- -	(3.30)		
4.88 4.00	<del>87</del> D8		EXPLORATORY HOL	-	3.80 m rare " subangular boulders	4.00 +0.26		
		Records						
Depth	Type & No.	Date						
Groundwater Entri io. Struck Post Stri (m) None observed (see	ke Behaviour		Depth Related Remarks From to (m)			Stability poor Shoring none Weather		
iotes: For explanation bbreviations see key wels in metres. Strati depth column, cale 1:25	of symbols and sheet. All depth are thickness given thickness given	is and reduced yen in brackets	Project Dublin Waste to Project No. KD3116 Carried out for Dublin City Coun				P08	

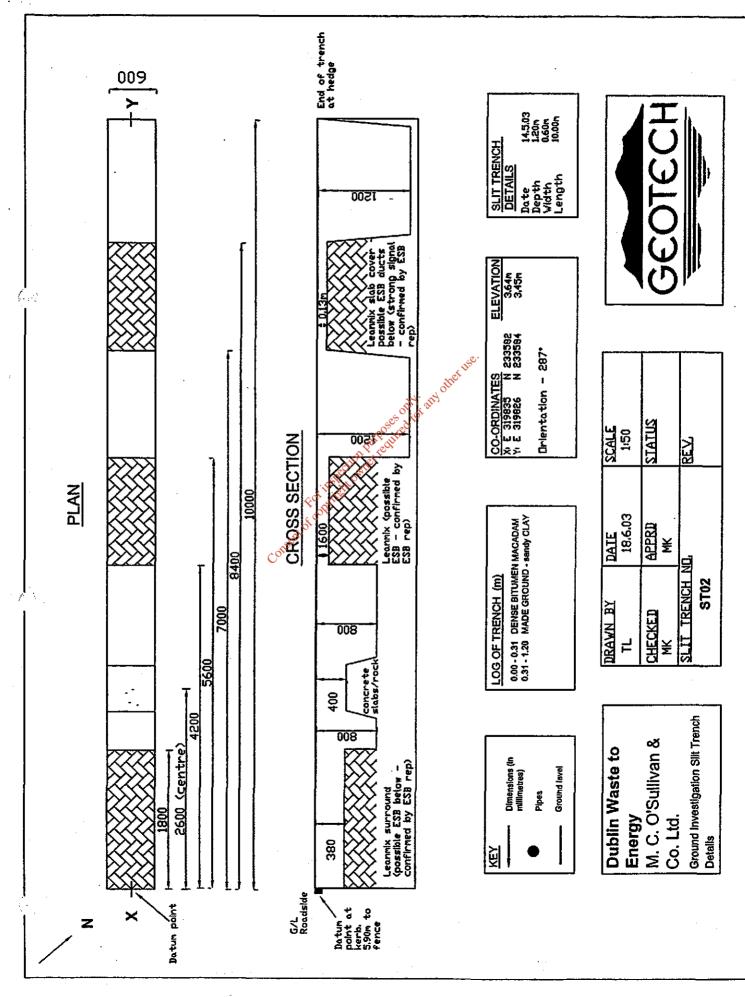


1	Logged by PG	Start 27/06/2003	Equipment, Method	s and Remarks	Dimensions and Oriental	ion	Ground Level Coordinates		4.36 mOD
Ì	Checked by MK	End 27/06/2003	Excavated by JC8 3CX Trial pit terminated due Pit backfilled with aristn	to poor stability.	Width 0.70 m	195 (Deg)	National Grid	N 2	119876.08 233676.72
	Samples a	اا		Strata					
ı		<del></del>	Date	Strata	Description		Depth, Level	Legend	Backfill
ı	Depth	Type & No.	Records				(Thickness)	rederio	Instrument
	- - - - - 0.70-0.90 - 0.70-0.90	B1 D2		<ol> <li>Soft brown sandy CLAY and GRAVEL FI subangular cobbles and fragments of bric wood, plastic, metal etc. (MADE GROUN</li> </ol>	k. concrete.	-			
	- - - - -					- - - -			
	- 1.70-1.80 1.70-1.80 - - - -	B3 D4		Consent of copyright owner require	did any other use.	1.80 m many subangular boulders 2.00-3.40 m concrete blocks	(3.50)		
	- 2.80-3.10 2.80-3.10	85 D6		Consent of copyright o		-			
. 1	3.50	<del>- D7</del>		EXPLORATORY HOLE ENDS AT 3	.50 m		3.50 + <i>0.86</i>	~~~	
		Type & No. ies ke Behaviour	Records Date	Depth Related Remarks From to (m)		-	Stability poor		
	(m) None observed (see	o. Struck Post Strike Behaviour		ाज्या <i>स्व</i> ापा			Shoring none Weather	,	
	Notes: For explanations see key levels in metres. Stratin depth column.  Scale 1:25		nd this and reduced iven in brackets ), 30102000 123127 AGS	Project No. KD3116 Carried out for Dublin City Council			Trial Pit T She	<b>P09</b> et 1 of 1	



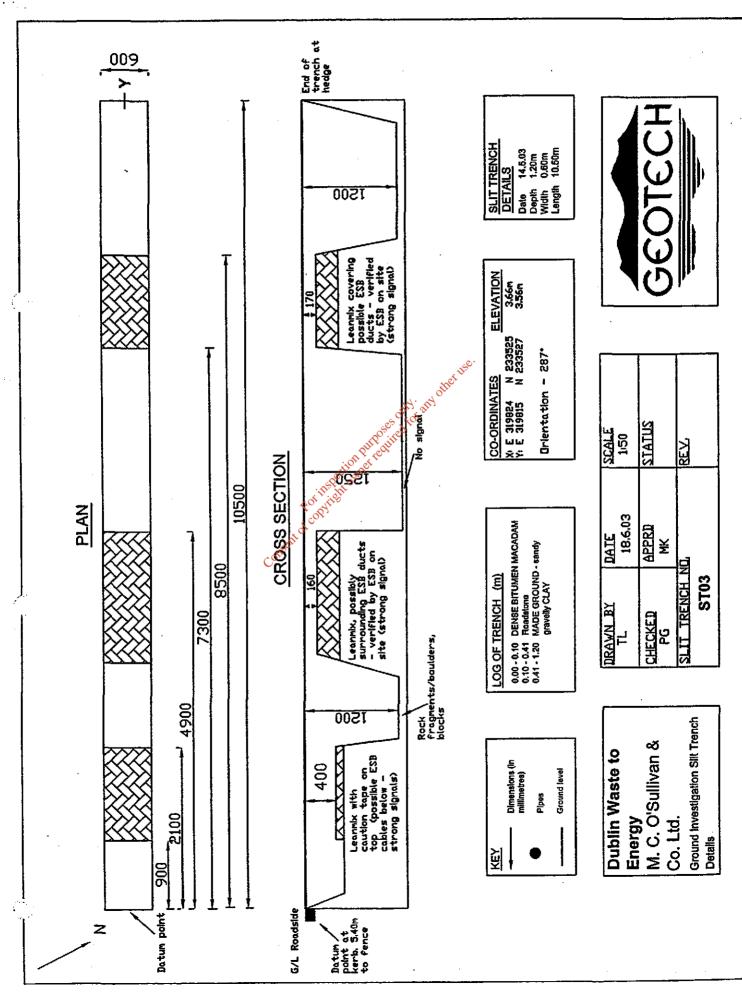


Logged by PG	Start 14/05/2003	Equipment, Method	s and Remarks		Dimensions and Orie	entation		Ground Level Coordinates		•
Checked by MK	14/05/2003 End 14/05/2003	Estavated by JCB and ESB representative on gravel, reinstated surfa	Komatsu Mini-digger site for dig. Backfilled with ce.		Width 0.50 m Length 10.50 m	•	290 (Deg)	National Grid		1
Samples a	nd Tests		Strata							
Depth	Type & No.	Date Records			Description			Depth, Level (Thickness)	Legend	BackfilV Instrument
			1 Dense Bitumen N	Macadam						
-	1			ROADSTONE subbase	(Leanmix over		-	0.14	50 4	000
-			ducts)				• -	(0.29)		6°0°
-			3 Firm howen fine to	o coarse sandy gravelly (	CLAY FILL			0.43	XXX	600
	1		with brick and blo	ock fragments. Gravel is a ne to coarse. (MADE GR	subangular		_	]	$\mathbb{K}\!$	10 - O
-			w admodified W	io io weise. (MADE GIV		• .	_	<b>{</b>	$K\!$	000
-						0.80 Rare sti	1.20 m = ==	(0.77)	XX	
<b> </b>			-			brown : gravel clods. In	lightly ty clay	1	XXX	000
	·					clods. In	egutar		KXX	
			EVEL	LORATORY HOLE ENDS AT 1	20 m			1,20	XX	000
_			EXP1	DONOR HOLE ENES AT 1	.e. (II		-	1		
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Depth	Type & No.	Records Date			· · · · · · · · · · · · · · · · · · ·					
Groundwater Entr	ies ike Behaviour		Depth Related Rema From to (m)	urks				Stability Pox	r from 0.43m	bgl
(m) None observed (see								Shoring N/A		
}				•				Weather -		
Notes: For explanation	n of symbols a	nd the cod serious	Project D	Sublin Waste to Energy				Trial Pit		
Notes: For explanatio abbreviations see log levels in metres, Strat in depth column.	/ sneet, All Gep turn thickness (		Project No. K	D3116				l. (	ST01	
Scale 1:25	(c) MESG HB41 (28	n, 2010/200 12:50:21 AGS	Carried out for D	Oublin City Council				Sh	eet 1 of 1	



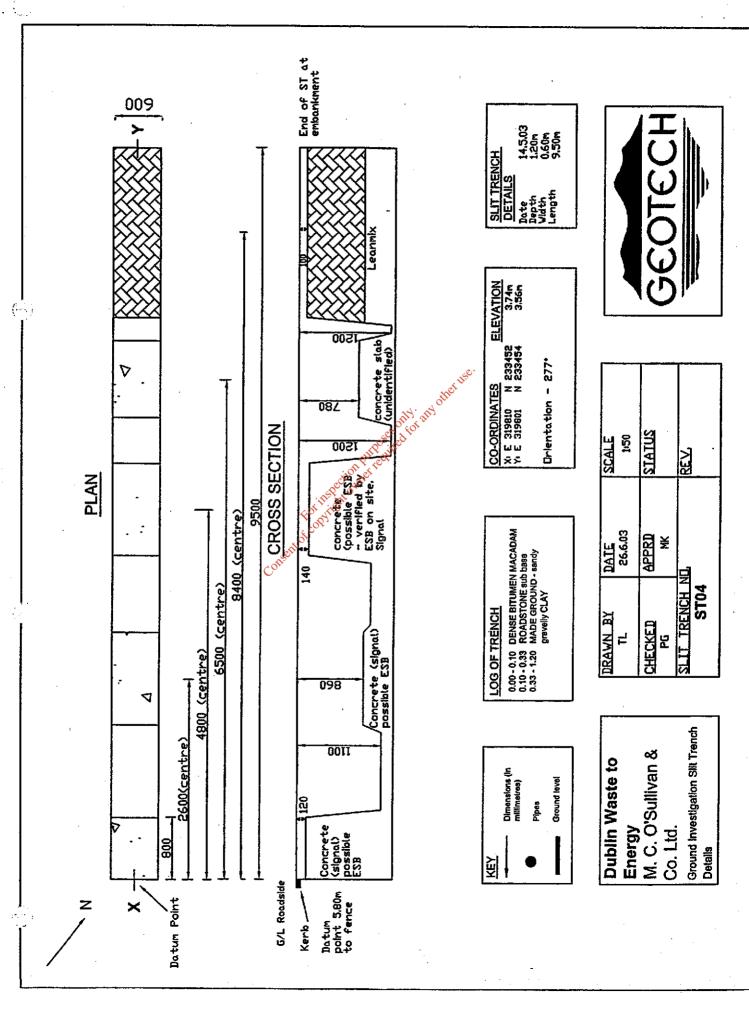


Logged by PG Checked by MK	Start 14/05/2003 End 14/05/2003	ESB representative	d Komatsu Mini-digger		Dimensions and Orientation Width 0.80 m	a 287 (Deg)	Ground Level Coordinates National Grid		
Samples a	and Test	<u></u>	Strata						
Depth		Date	Suata		Description		Denth Louis	<del>,</del>	D. et en
Depth	Type & No.	Date Records	with many granite fragments, rare costrips. Gravel is su coarse. (MADE G	medium sandy gravelly of boulders, brick and metropper pipe, plastic, rubber unled	al of and iron i, fine to		(0.31) (0.31) (0.89)	Legend	Bacidilli Instrume
			Cansental	of inspection purposes only copyright owner required to a second control of the copyright owner required to the copyright owne	A and after use.				
iroundwater Entries lo. Struck Post Strike		Records Date	Depth Related Remarks			S	tability Poora	hedge side	
(m) None observed (see K	lay Sheet)		From to (m)  Project Dublin	What to Ferri		s	horing N/A leather -	.cogo 306	
otes: For explanation of obreviations see key si rels in metres. Stratum depth column. Tale 1:25 #3	heet. All depths n thickness give MESG MBH ( 201), 30		Project No. KD31	n Waste to Energy 16 n City Council	,	T	rial Pit <b>S7</b> Sheel	<b>702</b> 11 of 1	





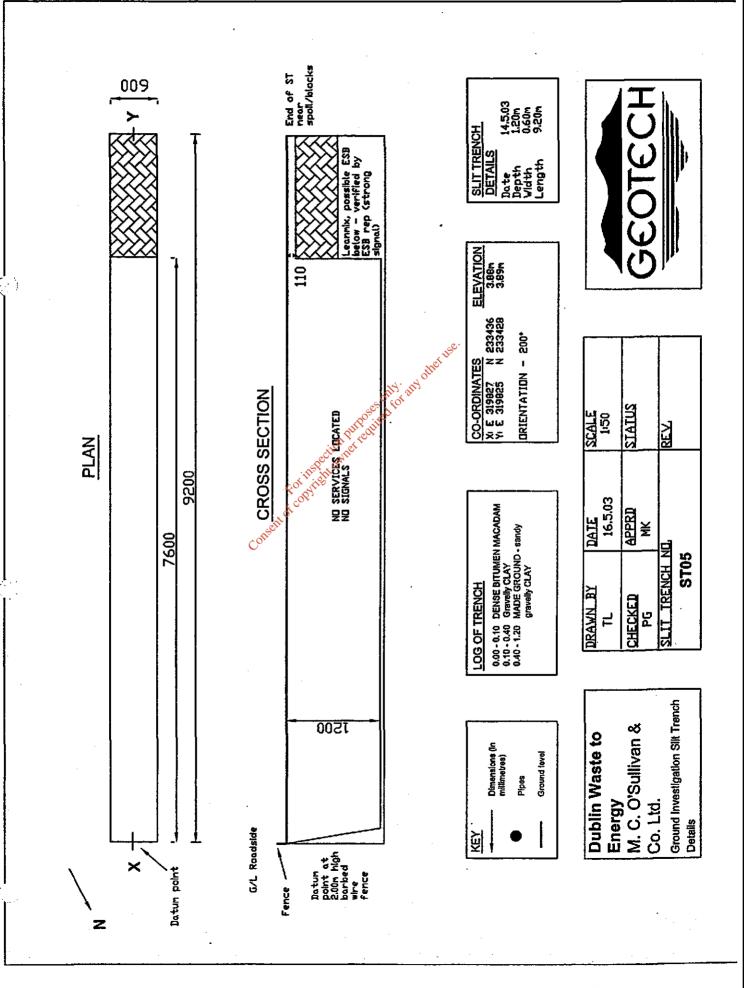
Logged by PG Checked by MK	Start 14/05/2003 End 14/05/2003	Equipment, Methods Excavated by JCB and ESB representative on gravel, reinstated surface	Komatsu mini-digger site for dig. Backfilled with	Dimensions and Orientation Width 0.80 m Length 10.50 m  G  287 (De	Ground Level Coordinates National Grid		•
Samples a	nd Tests		Strata		<u> </u>		
Depth	Type & No.	Date		Description	Depth, Level (Thickness)	Legend	Backfill/ Instrument
	7,000	Records	1 Dense bitumen macadam	· ·		0 4	. O 4
-			2 Grey slightly clayey ROADSTONE su	bbase.	0.10	0 -	000
<u> </u>					(0.31)	0	666
_ _					-0.41		00000
-			3 Soft mottied grey brown fine to mediu CLAY FILL with many concrete, grani	te and brick	-		8,8
-			fragments, wiring, cables, metal and v	vood fragments, ch) and	1	XXX	
-			plastic. Rare yellow sandstone blocks angular to subrounded fine to coarse.	. Gravel is	(0.79)	KXXI	
<b>-</b>			argual to subject the to course.	(III-DZ CIOOIIS).	(0.78)	KXXI	
						$\bowtie$	ုိိရ
_					4	XXX	
			EXPLORATORY HOLE ENDS	AT 1.20 m	1.20	XX	0 0 0
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- ·					1		
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-			Consent of copyright owner rec		-		
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Depth	Type & No.	Records Date				.	
Groundwater Ent No. Struck Post St	ries rike Behaviou	•	Depth Related Remarks From to (m)		Stability po	or from 0.41m	bgl.
(m) None observed (se	e Kev Sheet)				Shorting NA		
					Weather -		
Alabam For available	on of makes		Project Dublin Waste to Energ	V	Trial Pit		
Notes: For explanati abbreviations see kn levels in metres. Str	un of symbols a ey sheet. All dej atum thickness	piths and reduced given in brackets	·	,	4	STU3	
in depth column.		•	Project No. KD3116  Carried out for Dublin City Council		SI	ST03 neet 1 of 1	
Scale 1:25	(c) MESC HBM (2	2015 DEVELOPE TEXTS OF THE STREET	l				



#### **PRELIMINARY**



Logged by PG Checked by	Start 14/05/2003 End 14/05/2003	ESB representative of	d Komatsu mini-digger n site for dio. Backtilled with	Dimensions and Orientation  Moth 0.60 m P 277 (Dec	Ground Leve Coordinates National Grid		-
Samples a	ınd Test	5	Strata			······································	
Depth	Type & No.	Date Records		Description	Depth, Level	Legend	Backfill
		- 200 0000 000	1 Dense bitumen macadam		(Thickness)	1.4.0. 4	Instrume
_			2 Grey ROADSTONE subbase.		0.10		0 0 0
_					1	-	
-			3 Soft to firm dark brown fine to coarse sandy	gravelly	0.33		000
_			CLAY FILL with many red brick and concret wood chips, metal bars and plastic. Gravel i	ie -		KXXI	000
-			subangular to subrounded fine to coarse. (N GROUND).	MADE	4	KXX	600
<u>L</u>			GROONDJ.		-	KXX	
•	·				(0.87)	$\bowtie$	00
<del>-</del>					1	$\bowtie$	а°
_				-	1	XXX	000
					1,,,,	<b>KXXI</b>	
_			EXPLORATORY HOLE ENDS AT 1.20	) m	1.20		
<u></u>				•	4	]	
-					4		
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Depth	Type & No.	Records					
Groundwater Entri	:s	Date	Depth Related Remarks				
No. Struck Post Strik (m)	e Behaviour		From to (m)		Stability Poor	from 0.33m bg	y.
None observed (see I	e observed (see Key Sheet)				Shoring N/A		
Inject For annianation	of combols as		Bulliota Bankara		Weather -		
lotes: For explanation obbreviations see key : evels in metres. Stratu	sheet All depth	s and reduced	Project Dublin Waste to Energy		Trial Pit		
n depth column.	-	_ 1	Project No. KD3116 Carried out for Dublin City Council			T04	
Scale 1:25 (	(c) NESC (488) (381), 1	20100000 12:50:25 ABS	and manner		Shee	st 1 of 1	





Logged by PG Checked by MK	Start 14/05/2003 End 14/05/2003	Equipment, Methods Excavated by JCB and ESB representative on gravel, reinstated surface	Komatsu mini-digger site for dig. Backdilled with 0.60 m		Ground Level Coordinates National Grid		-
Samples a	nd Tests	,	Strata		<u> </u>		
Depth	Type & No.	Date Records		Description	Depth, Level (Thickness)	Legend	Backfill/ Instrument
		- Very 109	1 Dense bitumen macadam			. 0 4	
			2 Stiff brown gravelly CLAY (possible subb is subangular to subrounded fine to coars a subangular to subrounded fine to coars and yellow brit blocks, wood chips, plastic, cloth, glass, strips and re-inforcing bars (not local to the Gravel is subangular to subrounded fine (MADE GROUND).	ravelly x fragments, metal ench). to coarse.	(0.30) (0.30) (0.40 (0.80)		
Depth Groundwater Entr No. Struck Post Str (m) None observed (see	ike Behaviour	Records Date	Depth Related Remarks From to (m)	- - -	Stability Poor leng	along entire th of trench to m bgl.	
Notes: For explanational abbreviations see ker levels in metres. Strain depth column.  Scale 1:25	y sheet. All dep turn thickness (	nd tits and reduced given in brackets n, sorozeos 1250-00	Project Dublin Waste to Energy Project No. KD3116 Carried out for Dublin City Council		Trial Pit S She	T.05 eet 1 of 1	

					ВС	ORING LO	G	
			Drill Rig:	Cable Percus	sion D	ate Drilled:	03/03/05	Logged By:
		_	Boring Dia	: 8 Inc	ches B	oring Number:	MW01	Y.C.
Sample	Blow Counts	Completion	Depth Meters	Lithology		C	Description	
			. ,		FILL c	omprising concrete	e, rubble	
					FILL c Fill als	omprising brown sa o contains red brick	andy CLAY with k fragments	silt and cobbles.
					FILL c brick fi	omprising sand with agments and tree	h cobbles. Fill a bark.	also contains red
				ı.	<i>***</i>	omprising sand with s. Fill also contain		
				goecii	n Pittoses of Fill c	্য omprising sand with	h occasional gra	avels and small
			<del></del> 5	Foringlight	cobble	s. Fill also contain	s red brick fragr	nents
			c	nsent	Natura	l Ground - Sand ar	nd Gravel	
						1		
	pletion Notes		iak watan di i	ina drillina -*	1 6mba	Site:		
Struc	k hydrocarb	to 1.2m. Struon contaminati tended from 4.	ion at 4.5mb	g. Hydrocarb	on	DWTE ,		
						Project No.:		Page 1
						i Toject No		1 age 1

					3			
			Drill Rig: (	Cable Percussion	Da	ate Drilled:	02/03/05	Logged By:
			Boring Dia:	8 Inches	з Во	oring Number:	MW02	Y.C.
Sample	Blow Counts	Completion	Depth Meters Lithology			D	escription	
Comp Inspe Obse conta conta	rved hydroca minaition ext mination at 2	to 1.2m. Structurbon contaminated from 4.2m due to odou	k water durination at 4.0r 0mbg to 5.0r ur. Samples	ng drilling at 4.5mmbg. Hydrocarbombg. Also posited to let	Very bla	mprising dark brown obles. Fill also contacts ack silty SAND.  Site:  DWTE	wn to black SAN	D and GRAVEL
analy		iihies iiniii iili	, Jili aliu 781	submitted to lab	101	Project No.:		Page 1
						1,550511		

						BORING LOC	j.	
			Drill Rig:	Cable Percus	sion	Date Drilled:	02/03/05	Logged By:
			Boring Dia:	: 8 Inc	hes	Boring Number:	MW02	Y.C.
Sample	Blow Counts	Completion	Depth Meters	Lithology		D	escription	
	pletion Notes		- 6 - - 7 - - 8 -	For its pedicing to the formal period to the formal		ND and GRAVEL with	cobbles	
Inspection pit dug to 1.2m. Struck water during drilling at 4.5mbg. Observed hydrocarbon contamination at 4.0mbg. Hydrocarbon contaminaition extended from 4.0mbg to 5.0mbg. Also possible contamination at 2m due to odour. Samples taken at 1m intervals during drilling. Samples from 1m, 5m and 7m submitted to lab for analysis.						DWTE		Page 2

					E	ORING LO	<b>G</b>	
			Drill Rig: (	Cable Percus	sion	Date Drilled:	04/03/05	Logged By:
		<b></b>	Boring Dia:	: 8 Ind	ches	Boring Number:	MW03	Y.C.
Sample	Blow Counts	Completion	Depth Meters	Lithology		С	escription	
						DE GROUND compris		
			1		con	. comprising dark bro ains red brick fragme	nts, metal, glas:	5
			_ , _			. comprising dark bro bles. Fill also contain		
		:			cob	comprising dark bro bles. Fill also contain		
			_ 2 _	- 2 — Recht Recht in der Sill Sandy Sill with clay. Fill Sandy Sill with clay. Fill Sandy Sill with clay.				
				aspecific	A Part Con	comprising dark broa ains red brick fragme	wn sandy SILT v nts	with clay. Fill
			— з —	For it right				
			ÇĠ	nse.	San	dy SILT with clay		
			_ 4 _					
Com	pletion Notes			·		Site:		
Struc	k hydrocarbo aminaition ex	to 1.2m. Structon contamination tended from 4.	on at 4.5mbg .5mbg to 6.5r	<ol> <li>Hydrocarbo mbg. Sample</li> </ol>	n s taken a			
	itervals durin o for analysis	g drilling. Sam	iples from 1m	n, 5m and 7m	submitt	ed ,		
						Project No.:		Page 1

				BORING LOG							
			Drill Rig:	Cable Percus	sion	Date Drilled:	04/03/05	Logged By:			
			Boring Dia:	: 8 Inc	ches	Boring Number:	MW03	Y.C.			
Sample	Blow Counts	Completion	Depth Meters	Lithology		D	escription				
			_ 6 _ 7 8 9	For its edito		ID with occasional gra	avels				
Inspe Struc conta 1m in	k hydrocarbo aminaition ext	to 1.2m. Structon contamination tended from 4 g drilling. Sam	on at 4.5mbg .5mbg to 6.5	g. Hydrocarbo mbg. Sample:	n s taken a	ed ,					
						Project No.:		Page	2		

			BORING LOG						
			Drill Rig:	Cable Percus	sion	Date Drilled:	05/03/05	Logged By:	
			Boring Dia:	8 Inc	ches	Boring Number:	MW04	Y.C.	
Sample	Blow Counts	Completion	Depth Meters	Lithology		D	escription		
					МА	DE GROUND including	g concrete, rubb	ole	
					FIL and	comprising brown silt	ty SAND with oc	casional gravels	
			:					•	
			_ 1 _						
	į								
			_ 。 _			John any other use.			
			_ 2 _			aly any other			
					1005°11	dioti			
				is	n Pur reduir				
		:	— з —	or inspecto	41				
				of copy.					
			ζģ	is ent					
			_ 4 _						
							··-·		
Completion Notes:  Inspection pit dug to 1.2m. Terminated borehole having struck pipe						Site:			
at 1.5	im	W 1,2111. 1 <b>G</b> [[]	maisu DOPEI	ole naving St	iruon pip	e DWTE			
						1			
						Project No.:		Page 1	

		*** <del>*</del>			В	ORING LO	G	
			Drill Rig: Cable Percussion Da			Date Drilled:	08/03/05	Logged By:
			Boring Dia:	8 Inc	ches	Boring Number:	MW04(A)	Y.C.
Sample	Blow Counts	Completion	Depth Meters	Lithology		С	Description	
					FILL	GROUND comprise GROUND comprising dark brown fragments	_	vith gravels and red
			'		FILL	comprising dark bro	wn SILTY with r	ed brick fragments
			_ 2 —	ي:	FILL conta	with silt. Fill also glass		
			— з —	For ingledic	FILL comprising dark brown sandy CLAY with silt. Fill a contains red brick fragments, car battery, glass that the brick fragments are battery glass.  FILL comprising light brown SAND. Fill contains glass, brick, metal, car battery.			
			_ 4 <del>_</del>		FILL	comprising SAND.	Fill also contains	s wood, glass, tiling
Com	pletion Notes			···· <del>-</del>		Site:		
Struct conta 1m in	k hydrocarbo aminaition ex	to 1.2m. Struen contamination tended from 4 and drilling. Same.	ion at 4.0mbg .0mbg to 6.0i	g. Hydrocarbo mbg. Sample	on s taken at	DWTE ,		
						Project No.:		Page 1

			BORING LOG						
			Drill Rig: (	Cable Percus	sion	Date Drilled:	08/03/05	Logged By:	
			Boring Dia:	8 Inc	ches	Boring Number:	MW04(A)	Y.C.	
Sample	Blow Counts	Completion	Depth Meters	Lithology		D	Description		
			- 6 - - 7 - - 8 -	For inspection		outal Ground. SAND a	nd GRAVEL with	n cobbles	
Inspection Struck his contamination	ydrocarbo naition ext	to 1.2m. Struen n contaminati ended from 4 g drilling. San	ion at 4.0mbg .0mbg to 6.0	at		Page 2			

	_			-		BORING LO	G		
			Drill Rig: Cable Percussion Drill Rig: Cable Percussion			Date Drilled:	10/03/05	Logged By:	
			Boring Dia:	8 Inc	ches	Boring Number:	MW05	Y.C.	
Sample	Blow Counts	Completion	Depth Meters Lithology			Г	Description		
				_	M/	bble.			
					FILL comprising silty SAND with occasional gravels an brick fragments				
			1 -		FII bri	d cobbles and red			
			_ 2 _	:	FII	L comprising sandy Sontains red brick and wo	ILT with clay and ood	d cobbles. Fill also	
		:		citos	purposes nerrequir	off of sur			
:			_ з —	For its age of	FILL comprising sandy SILT with clay and cobbles. Fill also contains red brick and wood  Petitor That begins and the same sandy clay with silt and cobbles. Fill also contains red brick, glass, plastic and wood				
i			රත්	\$.					
			— 4 <i>—</i>		Na	utural ground. SAND w	rith cobbles.		
Com	pletion Notes	s:				Site:			
Struc conta 1m ir	k hydrocarbo aminaition ex	to 1.2m. Structor contamination contamination tended from 4 g drilling. Samor analysis.	on at 4.5mbo .5mbg to 6.5	g. Hydrocarbo mbg. Sample	on s taken	DW1-			
						Project No.:		Page 1	

-	BORING LOG						
	Drill Rig: Cable Percussion D			Date Drilled:	10/03/05	Logged By:	
	Boring Dia:	Boring Dia: 8 Inches Bo			MW05	Y.C.	
Blow Completion	Depth Meters	Lithology		D	escription		
	6 8 9	For its gedical		tural ground. SAND and		cobbles.	
Completion Notes: Inspection pit dug to 1.2m. Struct Struck hydrocarbon contaminati contaminaition extended from 4. 1m intervals during drilling. Sam submitted to lab for analysis.	on at 4.5mbg .5mbg to 6.5	DVVIL		Page 2			

			BORING LOG							
			Boring Dia: 8 Inches Bori			Date Drilled:	10/03/05	Logged By:		
						Boring Number:	MW05	Y.C.		
Sample	Blow Counts	Completion	Depth Meters	Lithology		D	escription			
			11 12 13	For inspection	Purposes of Purpose of	AN any other use.				
	Completion Notes:									
Struc	Inspection pit dug to 1.2m. Struck water during drilling at 4.5mbg. Struck hydrocarbon contamination at 4.5mbg. Hydrocarbon contaminaition extended from 4.5mbg to 6.5mbg. Samples taken at									
1m ir	ntervals during nitted to lab fo	g drilling. San	nples from 1r	,						
						Project No.:		Page 3		

			BORING LOG						
			Drill Rig:	Drill Rig: Cable Percussion Dat			05/03/05	Logged By:	
			Boring Dia:	8 Inches Bori		Boring Number:	MW06	Y.C.	
Sample	Blow Counts	Completion	Depth Meters	Lithology		D	escription		
					MA	DE GROUND, concret	te and rubble		
			_ 1 _		and	L comprising very dark d occasional gravels. F gments.	t brown sandy S Fill also contains	ILT with some clay red brick	
					FIL gra	L comprising very blac vels. Fill also contains	k silty SAND wi red brick fragm	th occasional ents	
			_ 2		FILL comprising brown sandy SILT with cobbles. Fill also contains red brick tragments				
			_	ecit	FILL comprising brown sandy SILT with cobbles. Fill also contains red brick tragments				
	ł.		3 	For its the					
			- 4 -						
l '	pletion Notes					Site:			
		to 1.2m. Drilli arge boulder.		ed at 2.7m afte ncountered	er 1hr o	f DWTE			
						,			
						Project No.:		Page 1	

			_		В	ORING LO	G	
			Drill Rig:	Cable Percus	sion	Date Drilled:	08/03/05	Logged By:
			Boring Dia	: 8 Inc	hes	Boring Number:	MW06(A)	Y.C.
Sample	Blow Counts	Completion	Depth Meters	Lithology		Г	Description	
<u>.,</u>					MAC	DE GROUND compris	sing concrete, ru	ubble.
			_ 1 _		fragi	comprising very dark ments		
					brick	comprising sandy Configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the comprising sandy Configuration of the comprising sandy Configuration of the comprising sandy Configuration of the comprising sandy Configuration of the comprising sandy Configuration of the comprising sandy Configuration of the comprising sandy Configuration of the comprising sandy Configuration of the con	LAY with silt. Fi crete	ll also contains red
			_ 2 _	in Redin	n purposesson	oses of the other ties.  FILL comprising silty SAND with very occasional gravels. If also contains red brick fragments and concrete.		
			_ 3 ු	For yies	FILL aiso			
			4		Natu	ral Ground - SAND		
Com	pletion Notes	<u> </u>	I	I.	1	Site:		
Struc conta termi	k hydrocarbo aminaition ob nated at 7.3	on contaminati served extend Samples take	truck water during drilling at 4.5mbg. nation at 4.0mbg. Hydrocarbon ended from 4.0mbg to 7.0mbg. Hole aken at 1m intervals during drilling. 3m submitted to lab for analysis.					
						Project No.:		Page 1

					8	ORING LO	G	
			Drill Rig:	Cable Percus	sion	Date Drilled:	08/03/05	Logged By:
			Boring Dia	: 8 Inc	ches	Boring Number:	MW06(A)	Y.C.
Sample	Blow Counts	Completion	Depth Meters	Lithology		Γ	Description	
			- 6 - 7 - 8 - · · · · · · · · · · · · · · · · ·	toringledic	Nati	aral Ground - SAND a		th cobbles
1	pletion Notes					Site:		
Struc	k hydrocarbo	to 1.2m. Struen contaminati	ion at 4.0mb	<ul><li>g. Hydrocarbo</li></ul>	n	DWTE		
conta termi	aminaition ob inated at 7.3.	served extend Samples take , 4m and 7.3m	led from 4.0r en at 1m inter	mbg to 7.0mb; rvals during d	g. Hole rilling.	,		
						Project No.:		Page 2

					В	ORING LO	G	
			Drill Rig:	Cable Percus	sion I	Date Drilled:	07/03/05	Logged By:
			Boring Dia	: 8 Inc	hes I	Boring Number:	MW07	Y.C
Sample	Blow Counts	Completion	Depth Meters	Lithology		E	escription)	
			_ 1 _ _ 2 _ _ 3 _	For its Rectife to the first of copyright of	FILL conta	comprising SILT with and plastic comprising sandy Cins red brick fragments and comprising clayey Sins red brick and comprising sandy Cins red brick and comprising sandy Cins red brick fragments red brick fragments red brick fragments.	LAY with silt and rents and glass  h cobbles and rents and glass	so contains red d cobbles. Fill also es. Fill also
	pletion Notes		ck water dur	ing drilling at 4	4.5mba.	Site:		
Hydr conta 6.9m	ocarbon cont aminaition ex . Samples ta	amination obs tended from 4	served at 4.0 .0mbg to 5.5 ervals during	mbg. Hydroca imbg. Hole ter drilling. Samp	irbon minated a	DWTE		
						Project No.:		Page 1

·						BORING LO	G	
			Drill Rig:	Cable Percus	sion	Date Drilled:	07/03/05	Logged By:
			Boring Dia:	8 inc	hes	Boring Number:	MW07	Y.C.
Sample	Blow Counts	Completion	Depth Meters	Lithology		0	escription	
			— 6 — — 7 —		Sa	ndy GRAVEL	ith shells	
			8 9	for inspection for for for for for for for for for for	ante i			
Com	oletion Notes					Site:		
Hydro conta 6.9m	ocarbon conta iminaition ext . Samples tal	to 1.2m. Struction observed to 1.2m. Struction observed to 1. Struction 4 to 1. Struction of 1	erved at 4.0r .0mbg to 5.5 rvals during	rbon minated	DWTE			
			-			Project No.:		Page 2



Logged AB Checked MK	Start 22/03/2005 End 22/03/2005	Equipment, Methods Excavated by JBC 3C. Trial pit backfilled with	X. Pit terminated due to instability.	Dimensions and Orientation  Width 0.60 m Length 3.80 m  Dimensions 350 (Deg)	Ground Level Coordinates National Grid	- -
Samulas an			Streets			
Samples an		Date	Strata	Description	Depth, Level	Learnel Backfill/
Depth	Туре & No.	Records			(Thickness)	Legend Instruments
  0.50	ES 1		Grey angular GRAVEL FILL with concre fragments. (MADE GROUND)	te and brick	(1.00)	
-			Dark grey brown slightly clayey gravelly coarse SAND with rare coobbles. Graw to rounded fine to coarse. (MADE GRO	el is subangular —	1.00	
-			3 Brown clayey SAND and GRAVEL FILL	with concrete,	(1.30)	
- 2.80	ES 2		3 Brown clayey SAND and GRAVEL FILL bricks and metal fragments. (MADE GRAVEL FILL bricks and metal fragments.)	RECOUNTY -	(1.40)	
- 3.50 -	ES 3		EXPLORATORY HOLE ENDS A		3.70	
Depth Groundwater Entrie No. Struck Post Strik (in) None observed (see	e Behavlour	Records Date	Dopth Related Remarks * From to (m)		Stability poor Shoring non- Weather	
Notes: For explanationable abbreviations see key levels in metres. Strain depth column.  Scale 1:25	/ sheet. All de/ turn thickness	oths and reduced	Project Ringsend Project No. KD5032 Carried out for			<b>P01</b> eet 1 of 1



Logged AB Checked MK	\$tart 22/03/2005 End 22/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X. Plt terminated due to instability.	Dimensions and Orientation  Width 0.60 m p A Length 3.90 m p C	Ground Level Coordinates National Grid	- - - -
Samples ar	nd Tests		Strata			
Depth	Тура & Мо.	Date Records		Description	Depth, <i>Level</i> (Thickness)	Legend Backfill/ Instrumen
0.20		Records	Grey yellow slightly clayey sandy GRAV angular fine to coarse. (MADE GROUN	D)	(0.35)	
0.30	ES 1		Brown clayey SAND and GRAVEL FILL and rare boulders and fragments of bric tin and pipes. (MADE GROUND)	- ( <scm)< td=""><td>0.35</td><td></td></scm)<>	0.35	
- 2.00 - 3.00	ES 2		Foi inspection of of copyright on the	Tooks of M. and other use.	(2.85)	
			EXPLORATORY HOLE ENDS AT		3.20	
-				- - - - - - - - -		
<b>-</b>		Bassada		-		
Depth	Туре & No.	Records Date			<u> </u>	
roundwater Entri o. Struck Post Stril (m) None observed (se	ke Behavlour		Depth Related Remarks * From to (m)		Stability poo Shoring non Weather	
otes: For explanation obreviations see ke vels in metres. Stra depth column. cale 1:25	tum thickness	nd ths and reduced given in brackets page 17.0350	Project Ringsend Project No. KD5032 Carried out for			Γ <b>Ρ02</b> eet 1 of 1



Logged AB Checked MK	Start 22/03/2005 End 22/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X. Pit terminated on obstruction.	Dimensions and Orientation  Width 0.60 m D A B D O90 (Deg)	Ground Level Coordinates National Grid	- - -
Samples an	d Tests		Strata			,
Depth	Туре & No.	Date Records		Description	Depth, Level (Thickness)	Legend Backfill Instrument
. 0.50	ES 1		Dark grey brown clayey sandy GRAVEL of silt and some cobbles and boulders ( and some fragments of brick, concrete, plastic, etc. Gravel is angular to rounde coarse. (MADE GROUND)	up to 800mm) cable,		
	231				(3.40)	
2.20	ES 2		Consent of Convincer	Redired for any our		
3.20	E\$ 3		Collise		1	
					3.40	
Groundwater Entrie		Rscords Date	EXPLORATORY HOLE ENDS AT	3.40 m Suder obstruction	Stability go	ad a
No. Struck Post Strik (m) None observed (see	e Behavlour		From to (m)		Shoring nor	
					MANUEL	<u> </u>
otes: For explanatio otersviations see key wels in metres. Stra depth column. cale 1:25		nd oths and reduced given in brackets 0a2004/2005 17:00:54	Project Ringsend Project No. KD5032 Carried out for			<b>TP03</b> eet 1 of 1



Logged AB Checked MK	Start 24/03/2005 End 24/03/2005	Equipment, Methods Excavated by JBC 3C: Trial pit backfilled with	(, Pit terminated due to instability.	Orientation  o	Ground Level Coordinates National Grid		- - -
Samples ar	nd Tests		Strata			1	
Depth	Туре & No.	Date Records	Description		Depth, Level (Thickness)	Legend	Backfill/ Instrument
- 2.00	ES1	* WHAT NO	Dark brown slightly clayey SAND and GRAVEL FILL wit rare subrounded cobbles and some fragments of brick, reinforced concrete, plastic, etc. Gravel is subangular to rounded fine to coarse. (MADE GROUND)	1.20 m struck okt pipe, some unkrown fluid	(3.60)		
- 3.00	ES 3		Consent of copyright owner teeling office and	-	3.60		
			EXPLORATORY HOLE ENDS AT 3.60 m		3.60		
				-	]		
				_			
					1		
				-			
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				-			
				-	ł		
				-	1		
				-	1		
				-	1		
				-	1		
	,			-	1		
	_	Records			<del>[                                    </del>	+	<del>                                     </del>
Depth	Type & No.	Date		<u></u>			Ц
oundwater Entri			Depth Related Remarks *		Stability poo	or to modera	te
o. Struck Post Stri (m)	Ke Behaviour		From to (m)				
one observed (se	e Key Sheet)				Shoring nor Weather	16	
tae: Eos avelanas	an of number -	and	Product Diagram d		Tul-1 27		
res. For explanation previations see ke	on of symbols a y sheet. All der	and oths and reduced given in brackets	Project Ringsend		Trial Pit	TDA -	
els in metres. Stra lepth column.	tum thickness		Project No. KD5032		<b>I</b>	TP04	
e 1:25	(c) NESC WALLS	0a20/04/2005 17:03:58 AGS	Carried out for		St	neet 1 of 1	



Logged AB Checked MK	Start 22/03/2005 End 22/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	and Remarks X. Pit terminated due to instability. artsings.	Dimensions and Orientation  Width 0.80 m Length 4.10 m  O  C  O10 (Deg)	Ground Level Coordinates National Grid	- - -
Samples an	d Tests		Strata			
*		Date		Description	Depth, Level	Legend Backfill/
Depth	ES 1	Date Records	Dark brown slightly clayey SAND and GF some fragments of brick, concrete, steel Gravel is angular to rounded fine to coarfine to coarse. (MADE GROUND)	RAVEL FILL with and plastic.	(Thickness)	
Depth Groundwater Entrie No. Struck Poet Strik (m) None abserved (see	e Behaviour Key Sheet)	Records Date	EXPLORATORY HOLE ENDS AT Consent to (m)	3.00 m	3.00 Stability poor Shoring non Weather	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
Notes: For explanationabbreviations see key levels in metres. Strain depth column.  Scale 1:25	rsheet. All de <sub>l</sub> tum thickness	and oths and reduced given in brackets coursecord/2005 17:04:02	Project Ringsend Project No. KD5032 Carried out for			<b>TP05</b> eet 1 of 1



Logged AB Checked MK	Start 23/03/2005 End 23/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X. Pit terminated on obstruction.	Dimensions and Orientation Width 1.10 m Length 4.20 m	Ground Level Coordinates National Grid		-
	1	·		<del>-</del> c			
Samples an	d Tests		Strata		Depth, Level	1	Backfill/
Depth	Туре & No.	Date Records		Description	(Thickness)	Legend	Instrumenta
			1 TARMAC over gravel subbase		0.05		
i i			Medium dense grey SAND and GRAVEL GROUND)	FILL. (MADE	(0.35)		
			3 TARMAC	<del></del>	0.40 0.45		H a Manif
-· 0.50 	ES 1	:	Soft to firm grey brown sandy gravelly CL cobbles and boulders and some fragmer concrete, metal, plastic, etc. Gravel is ar	nts of brick, ngular to	0.45		
			rounded fine to coarse. (MADE GROUNI		(1.95)		
	ES2		EXPLORATORY HOLE ENDS AT	240 m offler per reports pushing bushing	2.40		
   			EXPLORATORY HOLE ENDS AND FOR THE PROPERTY OF				
- - -							
- - -				· · · · · · · · · · · · · · · · · · ·			
_					1		
_					4		[
<u> </u>					4		
_					1		
<u>_</u>					1		
Depth	Type & No.	Records			1		+
Groundwater Entri	38	Date	Depth Related Remarks *		Stability goo	i d	
No. Struck Post Strii (m) None observed (see			From to (m)		Shoring non Weather		
Notes: For explanation	n of symbols	and _ bne	Project Ringsend		Trial Pit		
abbreviations see key levels in metres. Stra in depth column.	/ sheet. All de	oths and reduced given in brackets	Project No. KD5032		1 -	TP06	
Scale 1:25	(c) MESG 356 v1.	20±20/04/2005 17:04:05 AGS	Carried out for		Sh	eet 1 of 1	j



Logged AB Checked MK	Start 23/03/2005 End 23/03/2005	Equipment, Methods Excavated by JBC 3C: water inflow / instabilit arisings.	and Remarks X. Pit terminated due to ground y. Trial pit backfilfed with	Dimensions and Orientation  Width 1.00 m Length 4.00 m  D  A  O45 (Deg)	Ground Level Coordinates National Grid	- - -
Commission			Strata			············
Samples an		Date	Strata	Description	Depth, Level	Legend Backfill/
Depth	Туре & No.	Records			(Thickness)	Instrumed
  			TARMAC over gravel subbase.     Medium dense grey SAND and GRAVEL to rounded fine to coarse. (MADE GROUNDED COARSE)	. Gravel is angular IND)	(0.35) (0.40	
- 0.50	ES 1		TARMAC     Soft to firm grey brown slightly sandy grawith rare cobbles and some fragments o concrete, metal, etc. Gravel is angular to fine to coarse. (MADE GROUND)	f brick, rounded -	0.45	
3.00	ES 3		Consent of copyright owner	- - 	(3.25) 3.70	· · · · · · · · · · · · · · · · · · ·
Depth	Type & No.	Records Date	EXPLORATORY HOLE ENDS AT	3.70 m		
Groundwater Entrie No. Struck Post Strik (m) 1 3.50 slow seep	ce Behaviour		Depth Rolated Remarks * From to (m)		Stability poo Shoring non Weather	
Notes: For explanationabbreviations see key levels in metres. Strain depth column.	y sheet. All dep tum thickness	oths and reduced	Project Ringsend Project No. KD5032 Carried out for		1	<b>ГР07</b> eet 1 o <u>f</u> 1



Logged AB Checked MK	Start 23/03/2005 End	Equipment, Methods Excavated by JBC 3C obstruction. Trial pit b	X. Pit terminated due to	Dimensions and Orientation Width 1.00 m Length 4.00 m	Ground Level Coordinates National Grid	
	23/03/2005	<u> </u>		<del>c</del>		<del></del>
Samples an	d Tests		Strata			T = 1-11
Deptin	Туре & No.	Date Records		Description	Depth, Level (Thickness)	Legend Backfill/ Instruments
			1 TARMAC over gravel subbase		0.05	
-			Medium dense grey SAND and GRAVEL GROUND)	FILL. (MADE	(0.40) 0.45	
- 0.50	ES 1		3 TARMAC		0.45	
-			4 Firm grey brown slightly sandy gravetly 0 rare cobbles and some fragments of brid metal, etc. Gravel is angular to subround coarse. (MADE GROUND)	k, concrete,		
2.00	ES 2			ner use.	(2.55)	
	ES 3		For inspection pure	ages of the and other time.	3.10	
J. 10			EXPLORATORY HOLE ENDS AT	3.10 m abstruction		
Depth  Groundwater Entrice No. Struck Post Strik (m) 1 2.20 slow seep	se Behavlour page	Records Date	Depth Related Remarks * From to (m)		Stability poo Shoring non Weather	
Notes: For explanation abbreviations see key levels in metres. Stra	/sheet. All der	oths and reduced	Project Ringsend		Trial Pit	TP08
in depth column. Scale 1:25		00020/04/2005 17:04:14 AGS	Project No. KD5032 Carried out for			eet 1 of 1



Logged AB Checked MK	Start 23/03/2005 End 23/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X. Pit terminated on obstruction.	Dimensions and Orientation  Width 1.00 m D A Graph 1.00 m	Ground Level Coordinates National Grid	
Samples an	d Toete	-	Strata			
		Date	Strata	Description	Depth, Level	Legend Backfill/
Depth	Тура & No.	Records			(Thickness)	instruments
0.50	ES1	Records	TARMAC over gravel subbase  Medium dense grey SAND and GRAVEL GROUND)  TARMAC  TARMAC  Soft to firm dark grey brown slightly sand CLAY with rare subangular cobbles and of brick, concrete, metal, wood, etc. Gravangular to rounded fine to coarse. (MADI	ly gravelly some fragments 0.60-0.70 m vel is 0.60-0.70 m	(0.35) (0.35) 0.40 0.45	
 2.00	ES 2		EXPLORATORY HOLE ENDS AT	2.20 m obstruction	2.20	
Depth  Groundwater Entrie No. Struck Post Strik (m) 1 0.70 slight see	ke Behavlour page	Records Date	EXPLORATORY HOLE ENDS AT  EXPLORATORY HOLE ENDS AT  FOR PRINTED AND THE PRINTE	Rediric	Stability mod Shoring non Weather	
Notes: For explanationabbreviations see key levels in metres. Stra- in depth column. Scale 1:25	y sheet. All dej itum thickness	oths and reduced	Project Ringsend Project No. KD5032 Carried out for			<b>TP09</b> seet 1 of 1



Logged AB	Start 23/03/2005	Equipment, Methods Excavated by JBC 3C	and Remarks X. Pit terminated on obstruction.	Dimensions and Orientation	Ground Level Coordinates	-
Checked MK	End 23/03/2005	Trial pit backfilled with	arisings.	Width 1.00 m P	National Grid	-
Samples an	d Tests		Strata	. <del>.</del>		
Depth	Type & No.	Date		Description	Depth, Level (Thickness)	Legend Backfill/
		Records	1 TARMAC over gravel subbase		0.05	-04
-			2 Medium dense SAND and GRAVEL FILL	(MADE GROUND)	5.00	
-			1700 and 0.100 and 0.10 and 0.		(0.35)	
_					0.40	
- 0.50	ES 1		3 TARMAC		0.40 0.45	
- 0.30	E3 1		Soft to firm grey brown sandy gravelly CL	AY with some		
_,			fragments of brick, concrete, glass, meta etc. Gravel is is angular to subrounded fi	ne to -		
_			coarse. (MADE GROUND)	-	•	
-				-		
				-		
-				-		
				<del>-</del>		
				_		
				-	12.25	
<b>-</b>				-	(2.35)	
-				_		
- ,				.ق.		
2.00	ES 2			ex 118		
-	İ			- Office		
-				ally, ally		
-				See of to		
			atti	20 mile		
			ion 8	· -		
-			Tech which	-		
-				2.80 m obstruction	2.80	
			EXPLORATORY HOLE ENDS AT	2.89 m obstruction		
			S. Co.			
-			sent	_		
			Cotte	_		
				_		
<u>,</u>				-	1	
-				-		
-				-	1	
-				-		
-				-		
<u> </u>				-		
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L				-	I	
<b> </b> -				-	ł	
				-		
<b>-</b> -				-		
- <i>·</i>				-	1	
-				-		
,						
Depth	Type & No.	Records Date				
Groundwater Entrie No. Struck Post Strik			Depth Related Remarks * From to (m)		Stability mod	lerate
(m) None observed (see	Key Sheet)				Shoring non	e
·	,				Weather	
					<u> </u>	
Notes: For explanation abbreviations see key	/ sheet. Alt der	oths and reduced	Project Ringsend		Trial Pit	FD40
levels in metres. Stra in depth column.	tum thickness	given in brackets	Project No. KD5032			ΓP10
Scale 1:25	(c) MESG 358 v1.2	10x20/04/2005 17:04:22 AGS	Carried out for		Sh	eet 1 of 1



Logged AB Checked MK	Start 23/03/2005 End 23/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X. Pit terminated due to instability.	Dimensions and Orientation Width 1.00 m Length 4.00 m D C 0 D45 (Deg)	Ground Level Coordinates National Grid	•	
Samples an	d Tests		Strata				
		Date		Description	Depth, Level	Legend	Backfill/
	.,,	Records	1 TARMAC over gravel subbase			°	THE IT
0.50		Date Records	Strata  1 TARMAC over gravel subbase. 2 Grey SAND and GRAVEL FILL with brick bottles and pipes. (MADE GROUND) 3 TARMAC over gravel fill. 4 Grey brown slightly sandy gravelly CLAY fragments of brick, concrete, glass, plas Gravel is subangular to rounded fine to GROUND) 5 Loose grey gravelly fine to coarse SAND subrounded to rounded fine to coarse. (ground) 5 Loose grey gravelly fine to coarse SAND subrounded to rounded fine to coarse. (ground)	with some tic, etc. coarse. (MADE 1.10 m driller reports some brange staining track.)  Office only in the property of the prop	Depth, Level (Thickness) 0.05 (0.45) 0.50 (0.40) 0.90  (2.40)	Lagend	
Depth  Groundwater Entric No. Struck Poet Strik (m) None observed (see	e Behaviour	Records Date	Depth Related Remarks * From to (m)	- - - - -	Stability mod		
Notes: For explanational seekey levels in metres. Strain depth column.	/ sheet. All deg turn thickness	and oths and reduced given in brackets	Project Ringsend Project No. KD5032 Carried out for		Weather Trial Pit	<b>FP11</b> eet 1 of 1	



Logged AB Checked MK	Start 23/03/2005 End 23/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X. Pit terminated due to instability.	Dimensions and Orientation  Width 1.10 m Length 4.20 m  D  A 135 (Dec	Ground Level Coordinates National Grid		-
Samples a	nd Tests		Strata				_
Depth	Type & No.	Date Records		Description	Depth, Level (Thickness)	Legend	Backfill/ Instrumer
-			1 TARMAC over gravel subbase.		0.05		di is
0.50	ES 1	•	Soft to firm brown slightly sandy grave some fragments of concrete, brick, m Gravel is angular to rounded fine to or GROUND)	etal, glass, etc.			
					(2.65)		
- 2.00	ES 2			putdoses of the any offer use.  avel is ydrocarbon odour			
. 3.20	ES 3		3 Loose grey slightly gravelly Santa Graubrounded fine to medium. Strong hydetected, some oil seepage at 3.20m. GROUND)	avel is ydrocarbon odour (possible MADE	2.70 -		
					(1.30)		
			EXPLORATORY HOLE ENDS	AT 4.00 m			
		D			1		
Depth	Type & No.	Records Date			+		
roundwater Ent o. Struck Post St (m) None observed (s	rike Behaviour		Depth Related Remarks * From to (m)		Shoring por Weather		
otes: For explana poreviations see k vels in metres. St depth column. cale 1:25		and of reduced given in brackets	Project Ringsend Project No. KD5032 Carried out for			<b>TP12</b> neet 1 of 1	



Logged AB Checked MK	Start 23/03/2005 End 23/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X. Pit terminated due to instability.	Dimensions and Ottentation  Width 1.00 m  Length 4.00 m  D  C	Ground Level Coordinates National Grid	-
Samples an	d Tests		Strata			
Depth	Type & No.	Date		Description	Depth, Level	Legend Backfill/
- 2.00	ES 1	Date Records	2 Soft grey brown sandy gravelly CLAY wi fragments of brick, concrete, metal, etc. subangular to rounded fine to coarse. (N	th some Gravel is MADE GROUND)	Depth, Level (Thickness)  0.05  (3.65)	
3.50	ES 3			3.50 m possible — oil contamination in water sample	- - - - - - 3.70	
	į		EXPLORATORY HOLE ENDS AT	3.70 III	1	
-						
	İ				4	
					1	
					4	
Depth	Туре & No.	Records			<del></del>	1 1
roundwater Entrie		Date	Depth Related Remarks *			<u> </u>
lo. Struck Post Strik			From to (m)		Stability mo	derate
(m) 1 1.90 slight see	page				Shoring no	ne
otes: For explanation	n of symbols	and	Project Ringsend		Telel Pit	
otes: For explanatio obreviations see key vets in metres. Stra	sheet. All der	oths and reduced			Trial Pit	TD42
vers in metres. ਠਥਾਬ depth column.	out directions		Project No. KD5032			TP13
e 1:25	(c) MESG 368 v1.2	0s20/04/2005 17:04:34 AGS	Carried out for		St	neet 1 of 1



Logged AB Checked MK	Start 24/03/2005 End 24/03/2005	Equipment, Methods Excavated by JBC 3C / ground water inflow.	s and Remarks X. Pit terminated due to instability Trial pit backfilled with arisings.	Dimensions and Orientation  Width 1.10 m  Length 4.00 m  D  C  D  D  D  D  D  D  D  D  D  D  D	Ground Level Coordinates National Grid	
Samples an	d Tosts		Strata			
Depth	Type & No.	Date	Judiu	Description	Depth, <i>Level</i>	Legend Backfill/
Ceptii	тура в но.	Records	A TARMAC I subbase		(Thickness)	Instruments
- 0.50 - 0.50 - 2.00	ES 2		TARMAC over gravel subbase.  Soft to firm grey brown sandy gravelly CL fragments of brick, concrete, glass, wood Gravel is angular to rounded fine to coars GROUND)  GROUND	d, etc. se. (MADE	(3.55)	
_,			EXPLORATORY HOLE ENDS AT	3.60 m		
		Records		-		
Depth	Type & No.	Date			<u> </u>	
Groundwater Entric No. Struck Post Strik (m) 1 3.30 moderate	te Behavlour		Depth Related Remarks * From to (m)		Stability poor	
Notes: For explanation	n of symbols 2	and	Project Ringsend		Trial Pit	
Notes: For explanationabbreviations see key levels in metres. Strain depth column.  Scale 1:25	tum thickness	oths and reduced given in brackets 0a20/04/2006 17:04:38	Project No. KD5032 Carried out for		1	<b>FP14</b> eet 1 of 1



Logged AB Checked MK	Start 24/03/2005 End 24/03/2005	Equipment, Method: Exceveted by JBC 30 Trial pit backfilled with	X. Pit terminated due to instability.	Dimensions and Orientation  Width 0.70 m D B 060 (Deg)	Ground Level Coordinates National Grid	
Samples ar	nd Tests		Strata			
Depth	Type & No.	Date Records	- ""	Description	Depth, Level (Thickness)	Legend Backfill
		1400103	1 Grass over sandy gravelly CLAY with r	roots. (TOPSOIL)	0.05	
. 0.50	ES 1		Soft to firm brown slightly sandy grave fragments of brick, concrete, metal, et subangular to rounded fine to coarse.	Ily CLAY some c. Gravel is		
-				- -  - -	(1.45)	
			Light brown clayey SAND with rare brigglass fragments. (MADE GROUND)	ck, metal and	- - 1.50 -	
- 2.00	ES 2			ou ou other use.		
			For Hall to wi	purposes of the stand of the st	(2.10)	
3.00	ES 3				3.60	
			EXPLORATORY HOLE ENDS A	41 3.60 m		
				- - -		
				- - -		
Depth	Type & No.	Records		-		a and
roundwater Entri		Darte	Depth Related Remarks *		Stability need	,
o. Struck Post Stril (m) lone observed (sec	e Behaviour		From to (m)		Stability poor	
otes: For explanation observations see key wels in metres. Stra- depth column. cale 1:25	/ sheet. All dep turn thickness (	ths and reduced	Project Ringsend Project No. KD5032 Carried out for			<b>FP15</b> eet 1 of 1



Logged AB Checked MK	Start 24/03/2005 End 24/03/2005	Equipment, Methods Excavated by JBC 3C Trial pit backfilled with	X, Pit terminated due to instability.	Direcrisions and Orientation  Width 0.70 m Length 4.10 m  Diameter 270 (Deg)	Ground Level Coordinates National Grid	·
0	J.		D44			
Samples an		Date	Strata	Description	Depth, Level	Legend Backfill/
Depth	Туре & No.	Records			(Thickness)	Instruments
0.50	ES 1		Grey sandy GRAVEL hard standing. (M/     Grey brown slightly clayey SAND and Grobbles and some fragments of brick, or plastic, etc. Gravel is subangular to rour coarse. Sand is fine to coarse. (MADE Coarse.)	RAVEL with rare oncrete, metal, ded fine to	(0.35) 0.35	
- 2.00 - 2.00 - 3.00	ES 2 ES 3		FOI THE BELLION THE CONTROL OF THE C	Roses of the any other use.	(2.75)	
Depth	Type & No.	Records	Con			
	-	Date	Don'th Related Remarks *		A. 1 W.	<u> </u>
Groundwater Entrie No. Struck Post Strik (m) 1 3.00 moderate	e Behavlour		Depth Related Remarks * From to (m)		Stability poor Shoring none Weather	
Notes: For explanatio abbreviations see key levels in metres. Strat in depth column. Scale 1:25	/ sheet. All dep turn thickness	oths and reduced	Project Ringsend Project No. KD5032 Carried out for			<b>P16</b> eet 1 of 1

Logged AB Checked MK	Start 24/03/2005 End 24/03/2005	Equipment, Method Excavated by JBC 30 / obstruction. Trial pit	s and Remarks X. Pit terminated due to instability backfilled with arisings.	Dimensions and Orientation Width 0.70 m b B 060 (Deg	Ground Level Coordinates National Grid		- - -
Samples a	nd Tests		Strata				
Depth	Type & No.	Date Records	l .	Description	Depth, Level (Thickness)	Legend	Backfill/ Instrumen
			1 Grey sandy GRAVEL hard standing. (f	WADE GROUND)	(0.40)		i. Rappy
0.50	ES 1		Grey brown slightly clayey SAND and fragments of brick, concrete, pottery, r Gravel is subangular to rounded fine to is fine to coarse. (MADE GROUND)	netal, etc.	0.40		
				g;	(2.20)		
- 2.00	ES 2			puttos solity any other use.  2.60 m driller reports boulder			
-			EXPLORATORY HOLE BIOS.  For insperior	PT 2.60 m reports boulder -	- - - - - - -		
-				·	- - - - - -		
					1		
Depth	Туре & No.	Records Date			1		
iroundwater Enti lo. Struck Post St (m) None observed (s	rike Behaviour		Depth Related Remarks * From to (m)		Stability poor		
lotes: For explanat obtreviations see k evels in metres. St n depth column. scale 1:25	ratum thickness	and oths and reduced given in brackets	Project Ringsend Project No. KD5032 Carried out for			<b>TP17</b> eet 1 of 1	

Logged AB Checked MK	Start 24/03/2005 End 24/03/2005	Equipment, Method Excavated by JBC 3C Trial pit backfilled with	X. Pit terminated due to instability.	Dimensions and Orientation Width 0.80 m D B 24		Ground Level Coordinates National Grid		-
Samples ar	nd Tests		Strata					
Depth	Туре & No.	Date Records		Description		Depth, <i>Level</i> (Thickness)	Legend	Backfill/ Instrument
		-	Compacted grey sandy GRAVEL hard GROUND)  Grey slightly clayey SAND and GRAV	EL with fragments	-	(0.30)		
0.50	ES 1		of brick, concrete, glass, metal, etc. G subangular to rounded fine to coarse. coarse. (MADE GROUND)	Sand is fine to		(2.70)		
2.00	ES 2		koring edion	AT 3.00 m		3.00		
3.00	CS 3		EXPLORATORY HOLE ENDS	AT 3.00 m				
Depth	Type & No.	Records						
Groundwater Entri No. Struck Post Stri (m) None observed (se	es ke Behaviour	<u> Date</u>	Depth Related Remarks * From to (m)			Stability poor Shoring none Weather		<del>!  </del>
Notes: For explanati abbreviations see ke evels in metres. Stra n depth column. Scale 1:25		and oths and reduced given in brackets	Project Ringsend Project No. KD5032 Carried out for			Trial Pit	<b>P18</b> eet 1 of 1	

REPORT NO: 11183  CONTRACT: Elsam Waste to Energy	GEOTECHN	IVAL E	OHIN	IG RE	CUP		IOLE :	IGSL L	<u>.ta.</u>	
						BOREF Sheet 1	of 4	IO: BH1		
CLIENT: Elsam Engineering	GROUND LEVE BOREHOLE DIA		nm)			DATE S	TART	ED: 06/ ETED: 12/	10/20 10/20	
O-ORDINATES : E -	BOREHOLE DE CASING DEPTH		90	9.20		BORED BY: J. O'Hara				
			T	SA	MPLES		I —	T <sub>E</sub>	Ų	
DESCRIPTION		LEGEND ELEVATION (mOD)	DEPTH (m)	REF. NUMBER	SAMPLE	EPTH (E)	SPT TYPE	FIELD TEST	STAND PIPE	
MADE GROUND consisting of compacted of gravel with cobbles and boulders, fragments concrete, bricks, glass, timber	oarse &		1 -	<del></del> _	0.0		- "	<u> </u>	8	
ocitoretti, orional, giassa, tirripor	-			6031	В	1.00				
				6032	В	2.00	С	N=R		
				6033	В	3.00	С	N=36		
Soft grey/brown SILT with shell fragments  Medium dense coarse sandy GRAVEL with o	pobbles	xxx	3.60 3.90	6034	В	4.00				
	:. O ' No	andosé de redi	edi	6035	В	5.00	С	N=15		
	Collegio			6036	В	6.00	С	N=25		
				6037	В	7.00	С	N=24		
				6038	В	8.00				
				6039	В	9.00	С	N=24	,	
Continued next sheet				6040	В	10.00				
Hard Strata Boring / Chiselling	ments	Water	Casier			Details	·	\ 		
0.00 2.00 2.00 2.00 2.00 1.50 11.50 16.30 2.00	11101113	Strike 3.90 10.30 22.70 39.20	Depth 3.90 10.30 22.70 39.20	Sealed At 22.70	7.20	7ime 20 20 20 20	Seepa Fast	sealed		
Standpipe Installation Details		Date	Hole	Groundy Casing	Depth	Dbservat to	ions	strike iments		
			Depth	Depth	Water	. 1	- UII	a de la la la la la la la la la la la la la	- 1	

	O: 11183	<u> </u>	EOTEC	HAICA	AL D	OHIN	ICI NE	ال	ער		IGSL I	<u>_td.</u>
CONTRACT:	Elsam Waste to Energy	y 						}	BOREL Sheet 2	OLE N	10: BH1	
CLIENT:	Elsam Engineering		GROUND L	-		-			DATE S	TART		/10/200
ENGINEER :			BOREHOLE			m)			DATE C	OMPI	ETED: 12,	
CO-ORDINAT	ES: E -		BOREHOLE						BORED	BY:	J. O'Hara	
	N -		CASING DE	P ( H ( m )		39	9.20			<del></del>	J. 011414	1 .
	DESCRIPTION				ELEVATION (mOD)	Ē		WPLES		پ ⊦	EST	STAND PIPE
	DESCRIPTION			LEGEND	S S	DEPTH (m)	REF. NUMBER	SAMPLE	TYPE DEPTH (m)	SPT TYPE	FIELD TEST	₹
				<u>"</u>	- I E			₹	EPT (E	8	# #	ST
Medium de	nse coarse sandy GRAV	EL with co	bbles								ļ	
	,	•								С	N=37	
										1		
							6041	В	11.00			
									ĺ			
				陽器								
	•						6042	В	12.00	С	N=35	
				機劃		}	_	-		]		
								1				
				國家計						}		
							6043	В	13.00			
							6045			С	N=35	
							150	•			}	İ
						ļ	6944	В	14.00		ļ	
						14. 25	Jour				İ	
					ے	our, ar						
					205er	SOL					i	
•				<	Sitt Gir			١_	1	_		
				300	er, j		6045	В	15.00	С	N=49	
				20,00								
			Fort			i						
			, cob									İ
			On Sent of copy		)	Ì	6046	В	16.00			
			ansett .			16.30		}				
Grey black s	silty SAND/sandy SILT	(	OV	X		15.50	6047	U	16.50			
				XXXXX					10.00			
				XXXXX								
				XXXX XXXXX		İ						
Oracelle				XXXXX		17.40				-		ĺ
Grey black v SAND	ery sandy SILT with thin	ayers of		X						C	N=1	
				**** ****					}			\ 
				**** ****			6048	В	18.00			
				XXXX								]
				XXXXX XXXX								
				* * * * * * * * * * * * * * *					]	İ		
				**** ****			6049	В	19.00	С	N=1	
				****	1		UU-13		19.00	۲	1.4= 1	
				XXXX				1				1
				XXXX						Į		
Continued no	ext sheet		Ì	* * * * * * * * * *								
				XXXX			6050	В	20.00			1
	Hard Strata Boring / Ch								e Details			
	o (m) Hours 2.00 2.00	Comme	ents	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Water Strike 3.90 10.30 22.70 39.20	Casing Depth 3.90	Sealed At	Rise To	Time	- (	Comments	
2.00 11.50	3.60 1.00 6.30 2.00				3.90	3.90		7.20	20	Seepa Fast	ige	
11.50	2.00			3	22.70 39.20	10.30 22.70 39.20	22.70	3.00	20 20 20	Water Water	sealed strike	
				Ĺ,		JJ.EU	Ground		Observat			
	Standpipe Installation D	etaile		["	Date	Hole	Casing	Depth	td		nments	
		Z Base	Туре	101	10/2005	Depth	Depth	Wate				
Date Tip	Debui UZ Job 172	L Dase	1 1 1 1 1	1127	ロリスひいつ	39.20	39.20	39.20	i i			

	PORT NO: 11183  VTRACT: Elsam Waste to Energy	EOTECH	HAIC	ML D	ווחָט	NG NE	COF		 	IGSL I	<u>.tu.</u>
	THE TOTAL CONTROL OF THE STATE	T-1						Sheet 3	of 4	NO: BH1	
	ENT: Elsam Engineering	BOREHOLE	-	•	-			DATE S			10/200
	RINEER:	BOREHOLE			urij		Г			LETED: 12/	10/200
CO-	ORDINATES : E - N -	CASING DE			3	9.20		BORED	BY:	J. O'Hara	
				1	E		MPLES		T	TS.	<u> </u>
	DESCRIPTION		LEGEND	ELEVATION (mOD)	DEPTH (m)	REF.	SAMPLE	∐ <u>₹</u>	SPT TYPE	FIELD TEST	STAND PIPE
			8	ELEVA (mott)		뛽	SAM	DEPTH	SPT	FIEL	STA
9	Grey black very sandy SILT with thin layers of	of	X X X X X							1	
-	V 4 7 6		XXXXX								
			*****		1				С	N=3	
			X X X X				_				
			***** *****		,	6051	В	21.00			
			XXXX		{	}		Ì			}
			XXXX								
			XXXXX								
2			X			6052	В	22.00	С	N=6	}
			****			•					
			*****		22.70						
Si la	tiff to very stiff black slightly sandy CLAY uninated and fissured (Port Clay)	·· <del>···</del>			£2./U		}		}	}	1
ia						6053	В	23.00	С	N=34	1
										l	[
						6054 6055					
						6054	U	24.00			
		,		į	27.0	3°C	1				
				e e	official			] ]	С	N=49/ 150mm	
		İ		11705U	SO						
		i		St. tody		6055	В	25.00			
				de.	İ						
		d'in									
		Consent of con					_	_	_	}	
		at of C				6056	В	26.00	С	N=82	
		Onseli									ļ
		C		İ							
			1444								
						6057	В	27.00		İ	
		ļ			Ì			1 1			
	•	ſ							С	N=70	
				į							
						6058	В	28.00			[
		į		J			[				
				İ							
										]	
						6059	U	29.00			
								İ			
			D/区/区								
Co	ontinued next sheet										
			VA-17			6060	В	30.00	С	N=68	
Fror	Hard Strata Boring / Chiselling m (m) To (m) Hours Comr	nents	ļ <del></del> ,	Water	Caeine	Wate Sealed		Details	I		
0.0	00 2.00 2.00		-	Strike 3.90	Depth 3.90	At	Rise To	Time	l	Comments	
2.0 11.	00 3.60 1.00 50 16.30 2.00			3.90 10.30 22.70 39.20	10.30	22.70	7.20	20 20	Seepa Fast Water	ige 'sealed	
		ĺ		39.20	22.70 39.20		3.00	20	Water	strike	
			,	Dete	Hole	Ground	water C	bservat			
Dat	Standpipe Installation Details te Tip Depth RZ Top RZ Base	Type		Date	Depth			-	Cor	nments	
	in paper the top the base	( ) De	112)	10/2005	39.20	39.20	39.20				
						1		1			1

	11183		GEOTEC	HNIC	AL B	ORIN	IG RE				IGSL L	td.
CONTRACT:	Elsam Waste to Ene	ergy							BOREH Sheet 4	OLE N	10: BH1	
CLIENT :	Elsam Engineering	**	GROUND L	EVEL (ı	nOD)				DATE S		ED: 06/	10/20
ENGINEER:	g		BOREHOLI			ım)		- 1			ETED: 12/	
CO-ORDINAT	ES · E -		BOREHOLE			,						
	N -		CASING DE	PTH (m	<del></del>	39	9.20		DOUED.	OT:	J. O'Hara	
				_	ELEVATION (mOD)	Ê		MPLES	<del></del>	<u>س</u>	S	STAND PIPE
	DESCRIPTIO	N		LEGEND	YAT (c	DEPTH (m)	REF. NUMBER	SAMPLE	DEPTH (m)	SPT TYPE	PIELD TEST RESULTS	Ş
<b>_</b>					1 m E	) jj	# <b>2</b>	SAMPI		[E	15 E	STA
Stiff to ver	y stiff black slightly sar and fissured (Port Cla	ndy CLAY		72.2	-							
rammate0	and resoured (POR UIA)	<b>y</b> /		ESE						1		
				1000000					i		-	
							6061	В	31.00	l		
					4					С	N=64	
									1			
	~				]	]	6062	В	32.00	}		
					1							1
					}							
Stiff to very	stiff grey CLAY, lamir	nated and	· · · · · · · · · · · · · · · · · · ·	EEE	1	33.00	6063	U	33.00			
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End of Bore	hole at 39.20 m					-5.24				_		
										С	N=49/ 225mm	
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		<u> </u>							<u> </u>			
France (- ) 1 - 2	Hard Strata Boring /				142-1				Details			
0.00	To (m) Hours 2.00	Gom	ments		Water Strike 3.90 10.30	Casing Depth 3.90	Sealed At	Rise To	Time	i	Comments	
2.00	3.60 1.00 16.30 2.00				3.90 10.30	10.30	-	7.20	20	Seep:		
	2.00				22.70 39.20	22.70 39.20	22.70	3.00	20 20 20	Water	r sealed r strike	
				_ _			Ground	water C	) Observat	ions		
· · · · ·	Standpipe Installatio	n Details			Date	Hole Depth	Casing Depth	Depth	td		mments	
Date T	p Depth RZ Top	RZ Base	Туре	12	2/10/2005		39.20	39.20	i			

_	REPORT NO: 11183	GEOTEC	TIVIC	AL E	OHIL	NG HE	<u>COI</u>	עא		IGSL L	<u>-td.</u>
_	CONTRACT: Eisam Waste to Energy	1	· <u> </u>			<u> </u>		BOREF Sheet 1	OLE N	VO: BH2	
	CLIENT: Elsam Engineering	GROUND L	-	-				DATE S			10/20
_	ENGINEER:	BOREHOLE BOREHOLE			nm)		ŀ	DATE	COMPL	ETED: 17/	10/20
CI	CO-ORDINATES ; E - N -	CASING DE			3	9.70		BORED	BY:	J. McDonn	eli
				3	T =		MPLES		J	T 50	<u> </u>
	DESCRIPTION		LEGEND	¥ €	ОЕРТН (т.)	5	핕	₹	SPITYPE	RELID TEST	- E
			1 2	ELEVATION (mOD)	.   함	REF.	SAMPLE	TYPE DEPTH (m)	S F	FIELD TES	STAND PIPE
	MADE GROUND consisting of tarmac and	gravel		\$				<del>  -</del>			
_	MADE GROUND consisting of gravelly cla				0.40		ĺ				
	some brick, concrete, rubble, ash, cinders	A MITT									1
						3824	В	1.00	С	N=20	F
	<u></u> /				}		}	1		1	1
						3825	В	2.00	С	N=23	l
		•					1				
				•					}		}
				!		3826	В	3.00	С	N=22	
	Loose fine black silty gravelly SAND with shiftagments	eli			3,50				}		
	nagmente					1150.	_				
						olite27	В	4.00	С	N=3	
					ीत्रिं वर्ष	3	1				
				Sec	gior						
			* 2	OHI COLL	F 00				_		
	Loose fine very gravelly SAND with some st (strong organic odour)	hells		ver to	5.00	3828	В	5.10	С	N=6	
	(or only organic occour)	•4		<b>(</b> *			İ				
		Eot.					}	1		}	
					6.00				С	N=31	
	Dense medium to coarse GRAVEL with occ cobbles and boulders	asional			0.00	3829	В	6.10	ا	IN=31	
		Cours									
						3830	В	7.00	С	N=35	
						2000	"	1.00	ا ک	N=35	
						3831	В	8.00	c	N=39	
						0001	"	0.00	١	14=35	
							ļ .				
				!							
						3832	В	9.00	С	N=47	
								3.55	_	15-71	
		l		ļ			ĺ		.	 	
								.			
•	Continued next sheet	}				3833	В	10.00	С	N=40	
	Hard Strata Boring / Chiselling					Water	· Strike	Details	1		
		nments		Water Strike	Casing Depth 3.50	Sealed At	Rise	Time	(	Comments	
1	0.00			3.50 22.00 38.90	3.50 22.00 38.90	22.00	<u>To</u> 2.50	5 5 5	Modera Water	ate sealed	
-				38.90	38.90		3.00	5		gravel	
			_		1 11-1-	Groundy	vater (	) Diservat			
r	Standpipe Installation Details  Date   Tip Depth   RZ Top   RZ Base	Tima	<u> </u>	Date	Hole Depth	1	Wate	<u>- — </u>		nments	
_	TIP DEPUT TO TOP RZ Base	Туре	17/	/10/2005	38.90	38.90	3.00	End	of boreh	iale	

REPORT NO: 11183	EOTECH	IAICE		<u>Unii</u>	YU RE	COL	שו	-	IGSL L	<u>.ta.</u>
CONTRACT: Elsam Waste to Energy							BOREF Sheet 2	IOLE I	VO: BH2	
CLIENT: Elsam Engineering	GROUND LEV	-					DATE S	TART		10/20
NGINEER:	BOREHOLE C			m)		_	DATE	OMP	_ETED: 17/	
O-ORDINATES : E - N -	BOREHOLE D CASING DEP			9	9.70		BORED	BY:	J. McDonn	ell
		(11)		Τ		MPLES		7	T F	ш
DESCRIPTION		S.	ELEVATION (mOD)	DEPTH (m)		щ	ı	7 ₹	HELD TEST RESULTS	1 2
		LEGEND	ELEV moo	ZEP1	REF. NUMBER	SAMPLE	OEPTH (m)	SPTTYPE	HELD TEX	STAND PIPE
Dense medium to coarse GRAVEL with occa	sional	<u> </u>		† <del>-</del>		<b>-</b>	+ = 3	+ · · ·	- L	\ \oldsymbol{\sigma}^2
cobbles and boulders	);  :									
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					3835	В	12.00	С	N=57	
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					3837	В	14.00	С	N=61	
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			205.2	di	3838					
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	tot y	<b>%</b>								
	i of cost				3839	В	16.00	С	N=60	
	Consent of copy			}						
Grey black sandy slightly gravelly SILT/CLAY	COY .	×		16.50						
with bands of grey silty SAND				1					] .	
ŧ		* * * * * *		, }	3840	В	17.00	С	N=2	
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Continued next sheet					3540	В	20.00	_	ا ء اد	
Hard Strata Boring / Chiselling					3843		20.00	С	N=2	· 
rom (m) To (m) Hours Comn	nents	[ V	Vater	Casing	Sealed	Rise	Details Time		Comments	
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98.90 39.70 2.50		3	3.50 2.00 8.90	3 <b>8</b> .90	22.00	3.00	5 5 5	Lower	sealed gravel	
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Standpipe Installation Details			Date	Hole Depth	Casing Depth	Depth Water	to		nments	
Date   Tip Depth   RZ Top   RZ Base	Type	17/1	0/2005		38.90	3.00		of borei	nole	
Date in Deptil 112 Top 112 Dase		1.,,			1	-,		20.0.		- 1

	IO: 11183 Elsam Waste to Energy	GEOTECH	HNIC	AL E	BORIN	IG RE	CO	RD	10.	IGSL I	_td.
		A==:-:= :	line ame					BOREI Sheet 3	OLE I	NO: BH2	
CLIENT : ENGINEER :	Elsam Engineering	GROUND L BOREHOLE	-		- nm\			DATE S			/10/200
		BOREHOLE			ruri <i>)</i>		}	DATE	COMP	LETED: 17/	10/200
CO-ORDINAT	ES : N -	CASING DE			3	9.70	ŀ	BORE	BY:	J. McDonr	ell
				₹	Ê		MPLES		T	<u></u>	1 2
	DESCRIPTION		LEGEND	ELEVATION (mOD)	DEPTH (m)	REF. NUMBER	SAMPLE	س\ ≩ اس	SPTTYPE	FIELD TEST	STAND PIPE
			<u> </u>	# 6		# 5 2	AS.	SEPTH (m)	SP	FES SES	STA
with bands	sandy slightly gravelly SILT/	CLAY	×								
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carey black	sandy CLAY with some grey	sandy SILT	Î X X		]					,,,,,	
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			¥ 2 2		]	3846	В	23.00	С	N=3	
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Ctiff to your	- AFFE LITTLE OF ANY INC.	<del></del>			23.50						
fissured (Po	stiff black CLAY, laminated a ort Clay)	nd	EEE			.01*					ļ
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Continued no	ext sheet					3853	В	30.00	c	N=55	
	Hard Strata Boring / Chisellin	l ng					<u> </u>	Details			
From (m) T	o (m) Hours C	comments		Water	Casing		Rise	Time	1	Comments	$\overline{}$
0.00 15.40 138.90	0.40 1.00 5.60 2.00 9.70 2.50			Vater Strike 3.50 22.00	3,50 22 00	Sealed At 22.00	<b>To</b> 2.50		Moder	ate	
30.90	9.70   2.50		3	38.90	22.00 38.90	-	3.00	555	Water Lower	sealed gravel	
			L	L		Groundy	vater C	)bservat	ions		
	Standpipe Installation Details			Date	Hole Depth	Casing Depth	Depth	to		nments	
Date Tip	Depth RZ Top RZ Bas	е Туре	17/	10/2005		38.90	3.00		of boret	ole	

REPORT NO: 11183	GEOTEC	HNIC	AL E	BORIN	NG RE	COL	RD_		IGSL L	td.
CONTRACT: Elsam Waste to Energy	···	<u> </u>					BOREH Sheet 4	IOLE N	10: BH2	
CLIENT: Elsam Engineering	GROUND I			-		1	DATE S			10/20
ENGINEER :	BOREHOLI			nm)		1	DATE	COMPL	ETED: 17/1	0/20
CO-ORDINATES : E - N -	BOREHOLI CASING DE			_	10.70		BORED	BY:	J. McDonne	ali
N -	CASING DE	EP (M)	<u> </u>	7	19.70	AMPLES		<del></del>	1	
DESCRIPTION		9	ELEVATION (mOD)	DEPTH (m)				_  ₩	PELD TEST RESULTS	STAND PIPE
DEBOM NON		LEGEND	ELEVA (mOD)	î   Ē	REF.	SAMPLE	OEPTH	SPT TYPE	PIELD TEX	STAND PI
Stiff to very stiff black CLAY, laminated and			□ 5	<u> </u>	2 2	S S	<u> </u>	8	# # # # # # # # # # # # # # # # # # #	ST
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Doman group consults ODA 751			Ì	38.90				ļ		
Dense grey angular GRAVEL with fragments limestone	of				3860	В	39.00	c )	N=67	
End of Borehole at 39.70 m				39.70		-		l		
Hard Strata Boring / Chiselling							Details			
	nments		Water Strike	Casing Depth	Sealed At	Rise To	Time	(	Comments	
0.00 0.40 1.00 15.40 15.60 2.00 38.90 39.70 2.50			3.50 22.00 38.90	3.50 22.00 38.90	22.00	2.50	5 5 5	Moder Water	sealed	
2.50			38.90	38.90	-	3.00	5	Lower	gravel	
					Ground	water (	) Observat	ions		
		1 -	Date	Hole	Casing	Depth	to		nments	
Standpipe Installation Details		Į	Date	Depth	Denth	Water	: \	COII	IIIIemo	ı
Standpipe Installation Details  Date Tip Depth RZ Top RZ Base	Туре	17/		Depth 38.90	Casing Depth 38.90	Water 3.00		of boreh		-

	O: 11183 Elsam Waste to En	ergy	EOTEC	🗸	<u> </u>	<u>~1 m/</u>	<u>-~ : 1                                  </u>		BOREH	OLE NO	GSL L	<u>.u.</u>
CLIENT :	Elsam Engineering		GROUND	LEVEL (n	nOD)			-	Sheet 1	of 2		0/5-
ENGINEER:	Eisam Engineering		BOREHOL			ım)				TARTED OMPLE	):	0/20 0/20
CO-ORDINAT	ES · E -		BOREHOL			,		t				
	<u> N -                                  </u>		CASING D	EPTH (m)		1	6.00		BORED	BY: J.	O'Hara	
					ELEVATION (mOD)	Ē		MPLES	T	ا سٍ ا	EST	STAND PIPE
	DESCRIPTIO	N		LEGEND	¥ 6	DEPTH (m)	REF.	SAMPLE	TYPE DEPTH (m)	SPT TYPE	PIELD TEST RESULTS	3
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gravel with	OUND consisting of cobbles and boulder	compacted co s	oarse				Samples	3	0.00			=
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Grey/black	sandy SILT (wet)						, 15°C.			1	i	H
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Grey silty sa	indy fine to coarse G	RAVEL (wet)		* 6	phi techin	5.00						目
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Grey coarse	GRAVEL (wet)		Courser	X. X.		6.30						H
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	Hard Strata Boring /	/ Chiselling	<u> </u>				M/c4-	p Claute.	Data"			
	o (m) Hours		nents	] [	Water	Casing	Sealed	Rise	Details Time	Co	mments	
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				<u> </u>			Ground	unta- f	Theor 'c*	000		
	Standpipe Installation	n Detaile			Date	Hole	Casing	Depth	Observat to	ons Comm	nents	
D	Depth RZ Top	RZ Base	Type SP	\		Depth	Deptn	vvate	<del></del>			
Date Tip 1/10/2005 16	3.00 0.00	16.00		į i			1 1		- 1			

Elsam Waste to Energy				<del> </del>	NG RE		BOREH	OLE N	IGSL I	
Elsam Engineering	GROUNE	D LEVEL (n	nOD)				Sheet 2	of 2		10/200
			_	nm)						
ES : E - N -				•	16.00		BORED	BY;	J. O'Hara	
				Т	SA	MPLES		T	T 10	1
DESCRIPTION			N S	i į	5	PLE	ᆈ	Ĭ.	D TE	STAND PIPE
a GRAVEL (west)		<u> </u>	<u> </u>			A S	E # @	- E	E 25	STA
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					Groundy	vater (	Observati	ODS		
Standpipe Installation De	tails		Date	Hole Depth	Casing Depth	Depth Wate	to r		ments	$\neg$
Depth RZ Top RZ	Base Type .00 SP									
	Elsam Engineering  ES : E - DESCRIPTION  GRAVEL (wet)  ity SAND  ole at 16.00 m	Elsam Engineering GROUNE BOREHC BOREHC CASING  DESCRIPTION  e GRAVEL (wet)  ity SAND  ole at 16.00 m  Consent of Comments  70 2.00  GROUNE BOREHC CASING  CASI	Elsam Engineering  ES: E -	Elsam Engineering  GROUND LEVEL (mOD) BOREHOLE DIAMETER (p BOREHOLE DEPTH (m) CASING DEPTH (m)  PESCRIPTION  DESCRIPTION  GRAVEL (wet)  Ity SAND  ole at 16.00 m  Conference of the control of the contro	GROUND LEVEL (mOD)   BOREHOLE DIAMETER (mm)   BOREHOLE DIAMETER (mm)   BOREHOLE DEPTH (m)   CASING DEPTH (	Elsam Engineering  S: E - SORCHOLLE DIAMETER (mm) BOREHOLLE DEPTH (m) CASING DEPTH (m) CASING DEPTH (m)  P GRAVEL (wet)  DESCRIPTION  GO GO GO GO GO GO GO GO GO GO GO GO GO G	Elsam Engineering  SROUND LEVEL (mOD) BOREHOLE DIAMETER (mm) BOREHOLE DEPTH (m) CASING DEPTH (m)  DESCRIPTION  P GRAVEL (wet)  SAMPLES  A GREAT COMMENT CASING DEPTH (m)  16.00  SAMPLES  SAMPLE	Elsam Engineering GROUND LEVEL (mOD) BOREHOLE DIAMETER (mm) BOREHOLE DEPTH (m) 16.00 SAME STATE OF THE DETAILS	Elsam Engineering  GROUND LEVEL (mOD) BOREHOLE DIAMETER (mm) BOREHOLE DEPTH (m)  DESCRIPTION  DESCRIPTION  PARTIES  DESCRIPTION  DESCRIPTION  PARTIES  PARTIES	Elsam Engineering  GROUND LEVEL (mOD)  BOREHOLE DEPTH (m)  CASING DEPTH (m)  CASING DEPTH (m)  DESCRIPTION  D

	NO: 11183 : Elsam Waste to	Eneray	GEOTEC	HNIC.	AL E	BORI	NG RE	CO	RD	OLE M	GSL L	<u>.td.</u>
			GROUND L	EVEI (n	וטטטו				Sheet 1	of 1		40/0-
LIENT : NGINEER :	Elsam Engineer	ang	BOREHOLE	-	-				DATE S		D: 21/ :TED: 22/	10/200 10/200
O-ORDINA			BOREHOLE	DEPTH	ł (m)	r		}	BORED			.,
	N -		CASING DE	:PTH (m)			3.00 SAI	APLES		 		111
	DESCRIF	TION		2	ELEVATION (mOD)	DEPTH (m)		Щ		<u> </u>	RELID TEST RESULTS	STAND PIPE
			_	LEGEND			REF.	SAMPLE	TYPE (m)	SPT TYPE	RESULTS	STAN
MADE GF cinders	ROUND consisting	of rubble, brick					Samples	T .	0.00			ÌН
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End of Box	rehole at 3.00 m					3.00						
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	Hard Ctorte De 1	m= / Chi==!!!=	•	<u> </u>			147 :		<u></u> _			
rom (m)	Hard Strata Bori To (m) Hours		ments		Water	Casing	Water   Sealed	Strike R <u>i</u> se	Details Time	C	etnemments	
0.00	3.00 2.50	-		-	Strike No Gra	Depth indwaller (	Sealed At	To de la constante de la const	Die Elikosi			ecuchte
				ļ		<del> </del>	Groundy	ater (	Observati			
Date T	Standpipe Install	lation Details	Type SP	-	Date	Hole Depth	Casing	Jepth Wate	to r		πents	
	A Depart MY 10t	DZ 13888	LVDA	- 1		1			1			- 1

	PORT			<u>.</u>	1183	·							G RECORD IGSL L
	NTRACT	1116	B3 		<del></del>							· <u>-</u>	DRILLHOLE NO: RC1 SHEET: Sheet 1 o
CLIE	ENT: SINEER:	Els	sam Ei	ngines	ering			ORE DIA	METER LEVEL (	(mm) (mOD)	: 7 :	72	DATE STARTED: 19/10/200 DATE COMPLETED:21/10/200
CO-6	ORDINA	TES:		-			11	VCLINATI	ON (De			0	DRILLED BY: Millennium
							F	LUSH: A	ir/Mist				LOGGED BY: IGSL
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	UCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION
													Hole opened by Shell & Auger
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2											358	p•	
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MAR	RKS:		,_,					LATION I					Continued next sheet
						De	pth t	tion Type : o Respon: o Respon:	se Zone				
							mme		~ 20116	20110	a (m)		

		. 1118	_	1	1183		G	ΕO	TECH	NICA	L C	ORE	LO	DRILLHOLE NO : RC1
	TRACT				<del></del>				<del></del>					SHEET: Sheet 2 of
CLIE	NT: INEER:	Els	sam Er	ngine	ering				ORE DIAI ROUND L				2	DATE STARTED: 19/10/2008 DATE COMPLETED:21/10/2008
CO-C	DRDINA	TES:						- 1	CLINATIO		grees)	: 9	0	DRILLED BY: Millennium
Т		T						FL	USH: A	r/Mist		Γ	1	LOGGED BY: IGSL
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Specing (mi		UCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION
-9						-				-			-	Hole opened by Shell & Auger
-10														
.								į						
11								į	tion pur	l	ļ	1158	•	
								ļ		RG	anyo	net "		
12									TUIT	ses of fo	į			
								a Sport	tion Prof.	<b>S</b>				
13							ÇOT S CO	Dylig Dylig						
						Cons	entor							
14							]							
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EMAR	KS:						Ins De	tallati pth to	LATION I ion Type Respon Respon	: se Zone	top (i			

RE	POR	TNO	).	11	1183		GE	OTECH	INICA	LC	ORE	LO	G RECORD	IGSL Ltd
COV	NTRACT	r: 1118	33								_		DRILLHOLE NO : SHEET:	RC1 Sheet 3 of 6
CLIE ENG	ENT: SINEER	: Ek	sam Er	nginee	ering			CORE DIA				'2	DATE STARTED: DATE COMPLETE	19/10/2008 D:21/10/2008
CO-0	ORDINA	ATES:			· · ·		-	NCLINATI	ON (De	grees)	. 9	10		1illennium
		<u> </u>					<u> </u>	FLUSH: A	ir/Mist_	Ţ	T -	ŢŢ	LOGGED BY: K	GSL
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mn	<u>(8</u>	POINT LOAD IS(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	DЕРТН (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL D	DESCRIPTION
- 18					2.0								Hole opened by Shell & Aug	ег
- 19														
- 20								otion pur	oses only	Kany of	get us	b•		
21							For inc	petion pur petion pur						
22						Conser	rof cox.					!		
23														
24			ļ									10		
25														
													Continued post at a	ot
EMAF	ARKS:							ALLATION ation Type to Respor to Respor	: nse Zone	e top (i		<u> </u>	Continued next she	स्।

RE	POR	TNC	). 	1	1183			GEC	TECH	INICA	L C	ORE	LC	OG RECORD IGSL Ltd		
COI	NTRACT	r: 111	83											DRILLHOLE NO: RC1 SHEET: Sheet 4 of 6		
	ENT: SINEER:	: Ei	sam En	ginee	ering				ORE DIA				2	DATE STARTED: 19/10/2008 DATE COMPLETED:21/10/2008		
CO-	ORDINA	ATES:					INCLINATION (Degrees): 90							DRILLED BY: Millennium		
						<del></del>		FI	_USH; A	ir/Mist		LOGGED BY: IGSL				
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fract Spacing	g (mm)	UCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	DEPTH (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION		
-27 28 30 31							Consent	inspirit copyris	ction pure	oses of the state	S S S S S S S S S S S S S S S S S S S	Ret 188		Hole opened by Shell & Auger		
							-	INSTALLATION DETAILS  Continued next sheet								
KEMA	.RKS:				·			Installation Type: Depth to Response Zone top (m): Depth to Response Zone bottom (m): Comments:								

	EPOR		-	<u> </u>	1183							/1\L	LO	G RECORD   IGSL L
CC	NTRAC	T: 111	83											DRILLHOLE NO: RC1 SHEET: Sheet 5 of
	IENT:	R: E	lsam E	ngine	ering				ORE DIAN				2	DATE STARTED: 19/10/2008 DATE COMPLETED:21/10/2008
co	-ORDIN	ATES:						INCLINATION (Degrees): 90						DRILLED BY: Millennium
	T		Γ.					F	LUSH: Air	/Mist			· T	LOGGED BY: IGSL
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (m		UCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLICLOG	ELEVATION (mOD)	DEPTH (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION
- 36														Hole opened by Shell & Auger
37			i											
<b>38</b>										es afo	, शाप व	pet use		
39							Ŷ	or inst	ction pure	Hitel	39.20			SYMETREX: OPEN HOLE DRILLING: Observed by driller as
40						C	Stisent of	ψ°,						angular gravel size returns of limestone
41 42	41.00	100	45	33							41.00			Moderately strong to strong, thin to medium bedded, grey, fine grained LIMESTONE, fresh to locally moderately weathered, intersected by rough, planar, tight to open fractures of sub-horizontal dip
13	42.50	100	65	11 ,										
	44.00													Continued next sheet
EM.	ARKS:						II	nstalla Depth	LLATION I ation Type to Respond to Respond	: se Zone				

R	EPO	RT NO	D	1	1183			GEC	TECH	INICA	L C	ORE	ELC	OG RECORD IGSL Ltd.
C	ONTRAC	ετ: <sup>11</sup>	183											DRILLHOLE NO: RC1 SHEET: Sheet 6 of 6
	LIENT: NGINEE	- R: E	isam 6	Engine	ering		· <u> </u>		ORE DIA				2	DATE STARTED: 19/10/2008 DATE COMPLETED:21/10/2008
C	D-ORDII	NATES					····		CLINAT		grees):	: 9	0	DRILLED BY: Millennium
$\vdash$	<del></del>	T				<del></del>	<u> </u>	[F]	LUSH: A	ir/Mist	LOGGED BY: IGSL			
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	Ra.D.%	i	ng (mm so	SS (MPa)	POINT LOAD IS(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	DEРТН (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION
- - - 45		100	37	9										Moderately strong to strong, thin to medium bedded, grey, fine grained LIMESTONE, fresh to
È	45.50				<b> </b>									locally moderately weathered, intersected by rough, planar, tight to open fractures of sub-horizontal dip
F	45.50	83	67	67			,				İ			sup-nonzontal dip
- 46	46.10										46.00			End of Borehole at 46.00 m
-									tion duff		3	get use	,	
47										ces only	i any c	į		
ŧ									on Pur	Schilleg				
48								insp	otiowner	i				
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49		:	i				Consent							
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- 51			ļ											
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-52														
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REN	IARKS:							Installa Depth t	LLATION tion Type to Respon to Respon	: nse Zon	e top (r		):	

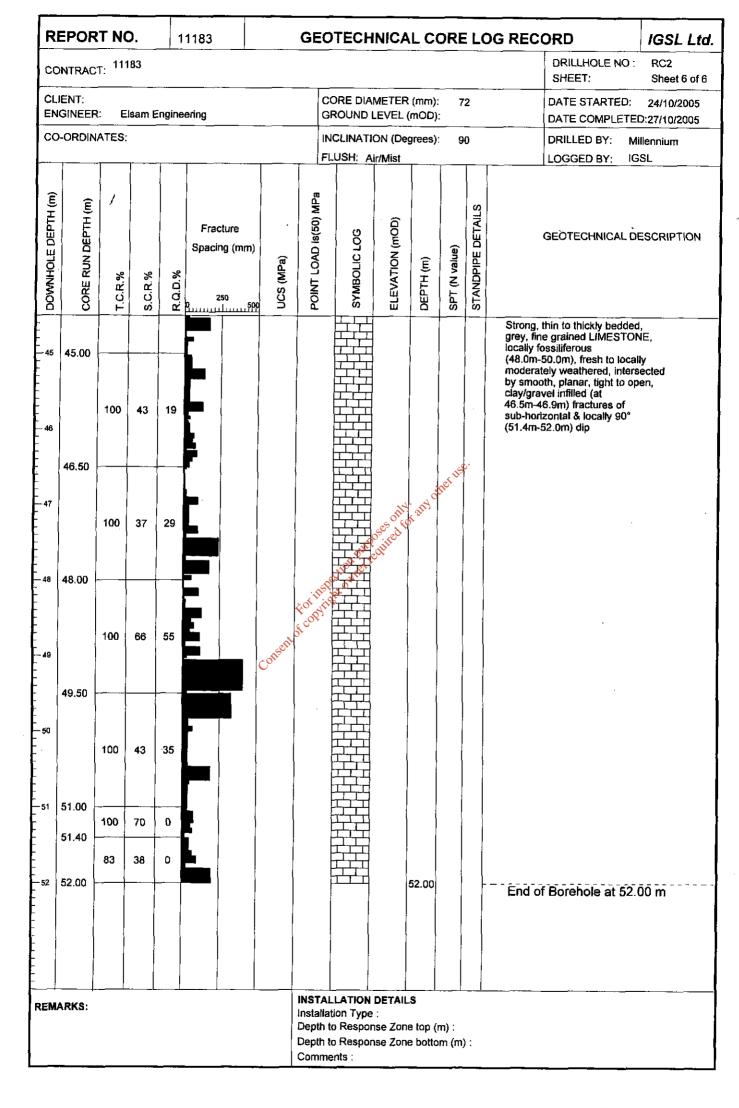
F	REPOF	TNO	<b>)</b> .	1	1183			GE	OTEC	INICA	L C	ORE	LC	OG RECORD IGSL Ltd
c	ONTRAC	T: 111	83											DRILLHOLE NO: RG2 SHEET: Sheet 1 of 6
	LIENT: NGINEEF	2· F	lsam Er	ngine	aring				CORE DIA				2	DATE STARTED: 24/10/2005
	O-ORDIN			giile		<del></del>			INCLINAT				0	DATE COMPLETED:27/10/2005 DRILLED BY: Millennium
-		7	<del>  -</del> -		Γ			- 1	FLUSH: /		- <i>′</i>	LOGGED BY: IGSL		
DOMANIACI E DEBTU (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fractu Spacing 250	(mm)	UCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	<b>ДЕРТН (m)</b>	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION
1 2 5 6 7									Special Dure			RELIES NO.		Continued next sheet
REN	IARKS:				-		1   1   1	Instal Depti Depti	ALLATION lation Type to Respo to Respo nents:	e : nse Zone	top (r			

RE	POR	T NO	) <u>.                                    </u>	1.	1183		G	ΕO	TECH	G RECORD IGSL Ltd						
CON	TRACT	-: 1118	33									DRILLHOLE NO: RC2 SHEET: Sheet 2 of 6				
CLIE	NT: INEER:	Eis	sam Er	nginee	ering				ORE DIA			DATE STARTED: 24/10/2005 DATE COMPLETED:27/10/2005				
CO-C	ORDINA	ATES:						IN	CLINATI	ON (De	DRILLED BY: Millennium					
							T	FL	USH: A	ir/Mist		-		LOGGED BY: IGSL		
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (m	- 1	OCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	ОЕРТН (м)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION		
-9								-			_			Hole opened by Shell & Auger		
10	ļ										ı					
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11								į			ą	nei is	·			
										es only	anyo					
12					į				ction pure	Spired,						
								insp	at Owner							
13							\$00	SPYTIC	2							
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EMAF	RKS:	<u>-                                </u>		<u> </u>		<u> </u>	INSTALLATION DETAILS Installation Type: Depth to Response Zone top (m): Depth to Response Zone bottom (m):									
								mme		<del></del>						

Ri	EPOR	TNO	<b>)</b>	1	1183			GEOTECHNICAL CORE LOG RECORD IGS									
co	NTRAC	T: 111	83											DRILLHOLE NO: RC2 SHEET: Sheet 3 of	6		
	IENT: GINEER	: E	lsam Er	ngine	ering				CORE DIA				2	DATE STARTED: 24/10/2005 DATE COMPLETED:27/10/2005	-		
СО	-ORDIN	ATES:							INCLINAT			DRILLED BY: Millennium	· · · · · · · · · · · · · · · · · · ·				
_	T		<u> </u>		<u> </u>			1	FLUSH: A	ir/Mist		_	T	LOGGED BY: IGSL	_		
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (r	nm)	UCS (MPa)	POINT LOAD (s(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	DЕРТН (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION			
							Consent	For in the control of	Retion purples	o edited to edited to	i and	ite is a second of the second		Hole opened by Shell & Auger			
							-	INST	ALL ATION	DETAIL	s			Continued next sheet			
REM/	ARKS: 	····						INSTALLATION DETAILS Installation Type: Depth to Response Zone top (m): Depth to Response Zone bottom (m): Comments:									

R	EPOR	T NC	).	1	1183			GEO	TECH	NICA	L C	DRE	LO	G RECORD IGSL Ltd
cc	ONTRACT	. 111	83	_										DRILLHOLE NO: RC2 SHEET: Sheet 4 of 6
	IENT; IGINEER	E	sam Er	ngine	ering				ORE DIAI				2	DATE STARTED: 24/10/2005 DATE COMPLETED:27/10/2005
cc	ORDINA	ATES:						IN	CLINATIO	ON (Deg		<del>-</del>	)	DRILLED BY: Millennium
				i				1+4	USH: A	r/Mist				LOGGED BY: IGSL
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fractu Spacing	(mm)	UCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLIC LOG	ELEVATION (mOD)	DEРТΗ (π)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION
28 27 30 31								For the state of t	tion out	se out	any of	Return		Hole opened by Shell & Auger
REM.	ARKS:								LATION		s			Continued next sheet
	- ·							Depth to	ion Type o Respor o Respor ints :	ise Zone			:	

R	EPOF	RT N	0.	1	1183				GE	OTECH	NICA	LC	DRE	LC	G RECORD IGSL Lt
cc	ONTRAC	T: 11	183												DRILLHOLE NO: RC2 SHEET: Sheet 5 of
	IENT: IGINEEI	R: E	Isam I	Engine	ering					CORE DIA GROUND I			DATE STARTED: 24/10/2005 DATE COMPLETED:27/10/2005		
cc	O-ORDIN	NATES	: 	<del></del>					1	INCLINATI FLUSH: A		grees):	DRILLED BY: Millennium LOGGED BY: IGSL		
DOWNHOLE DEPTH (m)	CORE RUN DEPTH (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Spaci	250		UCS (MPa)	POINT LOAD Is(50) MPa	SYMBOLICLOG	ELEVATION (mOD)	DЕРТН (m)	SPT (N value)	STANDPIPE DETAILS	GEOTECHNICAL DESCRIPTION
- 36															Hole opened by Shell & Auger
								j							•
- 37									}						
										o diod but		3	ner use	,-	
- 38											ses a fi	rany o			
20										tion pur	diffec				
·39									for in	ight our					
40							C	onsent	i cor			39.70			SYMETREX: OPEN HOLE DRILLING: Observed by driller as angular gravel size returns of limestone
41												;			
42	42.00		<del></del>		C							42.00			Strong, thin to thickly bedded, grey, fine grained LIMESTONE,
43		100	55	38											locally fossiliferous (48.0m-50.0m), fresh to locally moderately weathered, intersected by smooth, planar, tight to open, clay/gravel infilled (at 46.5m-46.9m) fractures of sub-horizontal & locally 90°
	43.50														(51.4m-52.0m) dip
		100	37	11											Continued next sheet
EM	ARKS:						-		Instal Depti	ALLATION lation Type to Respon to Respon	: ise Zoni				



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