



Reading Borough Council

GEORGE STREET, READING

Geo-Environmental Risk Assessment – Version 2





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VERSION 2, CONFIDENTIAL

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1. INTRODUCTION

1.1. TERMS OF REFERENCE

WSP UK Limited (WSP) was instructed by Saunders Architects on behalf of Reading Borough Council (the Client), to undertake a combined Geo-environmental and Geotechnical Phase 2 Risk Assessment of land at George Street, Reading, RG1 7NT (the Site). The work was undertaken in accordance with our proposal dated 31st October 2018, (ref. 70012984).

WSP understands that the Client is intending to redevelop the Site for a residential end use and planning permission has been granted for the development (Ref: 180798), subject to planning conditions. This Phase 2 Risk Assessment is required to confirm the ground conditions, investigate potential pollutant linkages as previously identified in the Phase 1 Preliminary Contaminated Land Risk Assessment (WSP, 2018) and to assess nature and extent of contamination in support of sign off of Planning Condition No. 10:

No development shall take place until an assessment of the nature and extent of contamination has been submitted to and approved in writing by the Local Planning Authority.

1.2. PROPOSED DEVELOPMENT

The Site location plan and Site layout plan are presented on Figures 001 and Figure 002 respectively. A Site plan showing the exploratory holes and service locations is detailed on Figure 003, with the proposed development layout shown on Figure 004 against the exploratory holes and service locations. All figures are contained within **Appendix A**.

The existing planning application submitted for the Site to Reading Borough Council (Ref. 180798) encompasses a two-storey building comprising four (2x1 & 2x2-bed) residential units in the east of the Site, with bin and cycle storage in the north, and a shared garden space in the west of the Site.

Specific information on proposed Site levels and proposals for re-use of materials were not known at the time of writing this report.

1.3. AIMS & OBJECTIVES

The key aims and objectives of this investigation were as follows:

- Confirm the current ground conditions;
- Investigate previously identified potential pollutant linkages;
- Undertake risk assessments to identify potential pollutant linkages and determine Site suitability for a residential end use; and
- Recommend geotechnical design parameters to inform the civil and structural design.

1.4. PROJECT SCOPE

The following scope of work has been completed:

- A review of desk-based information;
- The design and completion of a ground investigation comprising formation of boreholes and installation of groundwater and ground gas monitoring wells;
- The logging, screening and sampling of soil arisings;
- Laboratory analysis of soil samples;
- Presentation of encountered contamination, ground and groundwater conditions;
- Human health generic quantitative risk assessment (GQRA);
- Ground gas risk assessment;
- Controlled waters generic quantitative risk assessment;
- Risk appraisal & refine conceptual site model; and
- A preliminary geotechnical appraisal.

This preliminary report excludes an assessment of waste.

1.5. LEGISLATIVE CONTEXT AND GUIDANCE

The assessment was undertaken in the legislative context of:

- Part 2A of The Environmental Protection Act (1990); and
- The National Planning Policy Framework (2019).

The following good practice and statutory guidance was considered and the assessment was undertaken in general accordance with:

- Environment Agency 'Model Procedures for the Management of Land Contamination', CLR11 (2004);
- NHBC 'Guidance for the Safe Development of Housing on Land Affected by Contamination', R&D66 (2008);
- CIRIA 'Assessing Risks Posed by Hazardous Ground Gases to Buildings', C665 (2007);
- British Standard 'Investigation of Potentially Contaminated Sites – Code of Practice', BS EN 10175:2011+A2:2017;
- Defra 'Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance', PB13735 (2012);
- British Standard 'Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs)' BS 8576:2013;
- British Standard 'Code of Practice for Ground Investigations', BS 5930:2015;
- CIRIA C552 Contaminated Land Risk Assessment – A Guide to Good Practice; and
- UK Water Industry Research (UKWIR) (2010). Guidance for the selection of water supply pipe to be used in brownfield sites. Report Ref. No. 10/WM/03/21.

1.6. SOURCES OF INFORMATION

The following relevant sources of information were used in the production of this report:

Table 1-1 – Sources of Information

Source	Report
WSP Reports	WSP 'George Street, Reading, Phase 1 Contaminated Land Assessment' (March 2018), Report Reference: 70012984 Issue 2 (this report references all associated sources of information including third party information and public information where used), herein referred to as Phase 1 Report.

1.7. CONFIDENTIALITY AND LIMITATIONS

This report is addressed to and may be relied upon by Reading Borough Council. It may not be relied upon or transferred to any other parties without the express written agreement of WSP. The report should be read and used in full. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party. WSP cannot be held liable for third party information. Full details of the limitations and uncertainties are provided as **Appendix B**.

2. SITE SETTING

2.1. SITE DESCRIPTION AND CURRENT USE

A Site walkover was undertaken at the Site on 12th May 2017; a detailed description of the current land use is provided in the Phase 1 Report. In summary, the Site comprises a flat, irregular-shaped plot (366 m²) of undeveloped, heavily vegetated, vacant land, located to the north of 94 George Street. The Site was cleared of vegetation in early spring 2019, to facilitate the intrusive investigation. A concrete slab of a former Site building is present across the eastern portion of the Site.

Surrounding land use comprises a railway line to the north, a community centre and recreation ground to the east (on the other side of George Street), residential land to the south and an allotment to the west. A narrow strip of land runs along the northern Site boundary, which permits pedestrian access to the allotments.

2.2. SITE HISTORY AND ENVIRONMENTAL SETTING

A full description of the Site history and environmental setting is provided in the Phase 1 Report. A summary of the pertinent information is provided in Table 2-1 below.

Table 2-1 Summary of Environmental Setting

Feature	Detail
Site History	On-site: The Site was historically associated with residential land use, comprising two dwellings from circa 1932 to pre-1988. A single building was present on-site post 1988 to pre 2016; due to its size and shape, this could have been a commercial property or light industrial unit. Off-site: Since the late 19th Century railway land has occupied land to the north of the Site, comprising two tracks lying along an embankment. Residential land use predominantly occupied the surrounding land to the south, east and west since the late 19th century.
Geology	Published data indicates the Site to be underlain by superficial deposits of Alluvium (clay, silt, sand and gravel), underlain by Taplow Gravel (sand and gravel) and the solid geology of Seaford Chalk and Newhaven Chalk Formation (undifferentiated).
Hydrogeology	The superficial deposits are designated by the Environment Agency as Secondary A Aquifers, and the chalk is designated as a Principal Aquifer. The Site does not lie within a groundwater Source Protection Zone. However, there is a groundwater abstraction licence for potable water supply recorded 460 m northeast of the Site from the Chalk aquifer. None of the groundwater abstractions are related to the drift aquifer.
Hydrology	Drainage ditches are present to the north of the Site, at the base of the railway embankment. There are no surface water abstraction licenses recorded within 500 m of the Site. The closest rivers to the Site are the River Kennet and the River Thames which are both over 1 km from the Site to the southeast and northeast respectively. No surface water abstractions are located within 1 km of the Site.

Feature	Detail
Significant Regulatory Information	There is a Recorded Pollution Incident 80 m northeast of the Site. The incident occurred on 23 July 2007 and involved oils and fuel, resulting in a Significant (Category 2) impact on land and a Minor (Category 3) impact on water.
Contaminated Land	The allotment gardens (George Street Allotments) to the west of the Site (and associated access path adjacent to the northern Site boundary) were designated as Contaminated Land under Part 2A in September 2008 of the Environmental Protection act (1990), reportedly following the identification of benzo(a)pyrene (BAP) in Made Ground and compost. The source of BAP was thought likely to be associated with the application of soil improver used in the allotments, historical domestic ash disposal or railway run-off. Associated sampling of the ground undertaken as part of a ground investigation in 2008 indicated that concentrations of BAP were up to six times higher than the screening value of 1.5 mg/kg and up to sixteen times higher in the area of land that was known to have been impacted by railway run off. Reading Borough Council provided further documentation in the form of a Remediation Statement pertaining to this Site which is dated February 2011, detailing remediation works which were carried out in 2009. The Remediation Statement details the works carried out by Vertase FLI to render the Site suitable for continued use as allotments including excavation of Made Ground to the underlying natural deposits (between 0.4m and 1.6m), removal of 2026.5 tonnes of contaminated soil to a suitable waste management facility and subsequent import of uncontaminated topsoil to return the land to pre-remediation ground levels. Reading Borough Council rendered the Site suitable for continued use as allotments in February 2011. Although George Street allotments were determined as Contaminated Land under Part 2A due to the presence of BAP, the problem was initially brought to the attention of Reading Borough Council by an allotment holder who reported visual and olfactory evidence of hydrocarbon contamination, which prompted the initial Site investigations. The remediation overview produced by Vertase FLI stated that the allotment site was impacted by hydrocarbons emanating from an adjacent railway depot. The hydrocarbons entered the allotments via a drainage system and were traced to an accidental leak from bulk fuel storage tanks.

3. PRELIMINARY CONCEPTUAL SITE MODEL

3.1. SOURCES – PATHWAYS – RECEPTORS

A summary of the identified sources, pathways and receptors taken from the preliminary conceptual site model developed for the Phase 1 Report are provided below.

Potential Sources

On-Site

- Historical coal-fire ash disposal (polycyclic aromatic hydrocarbon compounds (PAHs) and heavy metals);
- Highway pavement and Made Ground associated with past development (organic and inorganic compounds including hydrocarbons, asbestos, heavy metals and metalloids);

Off-Site

- Contaminated Land determined under Part 2A to north and west: benzo(a)pyrene (BAP);
- Railway line to the north (including the leak from the bulk storage tank noted within the Part 2A remediation overview): TPH, PAHs, phenols, metals, PCBs, herbicides, glycols, asbestos;
- Recorded pollution incident 80 m to the east: hydrocarbon compounds.

Potential Receptors

Human Health

- Future Site users (residents, visitors and workers); and
- Off-site workers and adjacent Site users (residential, public and commercial).

Controlled Waters

- Groundwater within superficial deposits (Secondary A Aquifers) and chalk bedrock (Principal Aquifer); and
- Off-site surface water network (drainage ditches).

Other

- Future water supply pipes and buried concrete.

Potential Pathway(s)

The following Table 3-1 summarises the potential pathways associated with the proposed development.

Table 3-1 - Potential Contaminant Pathways

Receptor	Potentially Active Pathway
On-site: Human Health	Ingestion of contaminated soil and dust; Inhalation of vapour, gas and asbestos;

Receptor	Potentially Active Pathway
	Dermal contact with contaminated soil and/or groundwater; and Consumption of home-grown vegetables.
On-site: Controlled Waters	Leaching (dissolution) of contaminations in groundwater; and Vertical migration of contaminants in groundwater.
On-site: Property	Direct contact (potable water supply pipes), sulphate attack on concrete; and Gas migration and build up (asphyxiant and explosive risk).
Off-site: Human Health	Ingestion of contaminated soil and dust; Inhalation of vapour, gas and asbestos; and Dermal contact with contaminated soil and/or groundwater.
Off-site: Controlled Waters	Lateral migration of groundwater into off-site groundwater and surface water bodies; and Surface run-off into nearby surface water bodies.

3.2. PRELIMINARY CONCEPTUAL SITE MODEL

The identification of potential “pollutant linkages” (where a source, pathway and receptor have been identified) is a key aspect of the evaluation of potentially contaminated land. An approach based on the UK CIRIA report C552 (Contaminated Land Risk Assessment: A Guide to Good Practice, 2001) has been adopted within this report. For each of the identified pollutant linkages, an estimate is made on:

- The potential severity of the risk; and
- The likelihood of the risk occurring.

The approach is detailed in **Appendix J**.

The high level preliminary conceptual site model developed for the Phase 1 Report is included as Table 3-2 overleaf. The CSM risk matrix has been developed and revised following the site investigation and risk assessments and is included within the Risk Appraisal (Section 9).

Table 3-2: Preliminary Conceptual Site Model

Source(s)	Pathways	Receptor	Severity	Probability	Risk
On Site - Made Ground / Highway Pavement: Various substances including hydrocarbons, PAHs, asbestos, phenols, sulphates, sulphides, nitrates, nitrite, iron, possible volatile organic compounds	Direct Contact				
	Direct ingestion / inhalation	Future site users	Medium	Low Likelihood	Moderate / Low Risk
	Inhalation of hazardous ground gases	Future site users	Medium	Low Likelihood	Moderate / Low Risk
	Leaching of contaminants through the unsaturated zone and into groundwater	Groundwater resource (Secondary A Aquifer and Principal Aquifer)	Mild	Low Likelihood	Low Risk
	Subsequent migration into surface water course via baseflow	Local surface water receptors	Mild	Unlikely	Negligible Risk
On Site - Historical coal-fire ash disposal: Potential for elevated concentrations of metals and PAHs including BAP	Direct Contact				
	Direct ingestion / inhalation	Future site users	Severe	Likely	High Risk
	Leaching of contaminants through the unsaturated zone and into groundwater	Groundwater resource (Secondary A Aquifer and Principal Aquifer)	Mild	Low Likelihood	Low Risk
	Subsequent migration into surface water course via baseflow	Local surface water receptors	Mild	Unlikely	Negligible Risk
Off Site - Adjacent Allotments: Localised concentrations of Benzo(a)pyrene	Direct contact associated with previous wind-blown deposition to ground surface	Future site users	Mild	Low Likelihood	Low Risk
Off-Site – Adjacent Railway Land: Various substances including PAHs and hydrocarbon compounds, phenols, metals, PCBs, herbicides, glycols, wind-blown contaminants including asbestos	Direct contact, ingestion and inhalation of ground impacted by possible run-off/wind-blown deposition of contaminants	Future site users	Mild	Low Likelihood	Low Risk
	Leaching of contaminants through the unsaturated zone and into groundwater and subsequent migration	Groundwater and surface waters	Mild	Unlikely	Negligible Risk
Off Site – Former Pollution Incident: Hydrocarbons (fuels and oils)	Migration within underlying groundwater table	Groundwater resource (Secondary A Aquifer and Principal Aquifer)	Medium	Unlikely	Low Risk

4. SITE INVESTIGATION – METHODOLOGY

4.1. RATIONALE AND SCOPE OF WORKS

INTRODUCTION

Exploratory holes were positioned to consider the preliminary CSM, the layout of the proposed redevelopment, the location of existing utilities and to provide general coverage of the Site. The vertical extent of the ground investigation was designed such that the investigation would determine depth to competent strata whilst providing information on the shallower soil properties.

The ground investigation was designed and supervised by a qualified and experienced geo-environmental specialist from WSP.

GENERAL SCOPE OF WORKS

The main drilling phase of the ground investigation works was carried out on 20th March and between 1st to 5th April 2019. There was a stand down during the ground investigation works due to the discovery of asbestos on Site, which is detailed in the limitations of the works at the end of Section 4.1. Monitoring was undertaken throughout April and June 2019.

The scope of the intrusive assessment work was as follows:

- Clearance of all proposed exploratory hole locations by a specialist service tracing company using ground penetrating radar (GPR) and a CAT and Genny to locate all services on the Site;
- Setting out of all proposed ground investigation locations;
- Advancing seven hand-dug pits to 1.5 m bgl for service inspection;
- Advancing two rotary boreholes to 15 m bgl to prove intact chalk for geotechnical information. Groundwater monitoring wells to be installed within the chalk;
- Advancing up to five window sample boreholes up to 5 m bgl. Up to five installed as gas monitoring wells;
- Taking three surface soil samples (<0.05 m bgl) from prospective garden areas;
- Surveying co-ordinates and levelling in all window sample and borehole investigation locations (X,Y,Z);
- One return visit to purge all groundwater monitoring installations;
- Two return visits to undertake groundwater monitoring;
- Six return visits to undertake ground gas monitoring; and
- Laboratory analysis of recovered soil and groundwater samples.

The ground investigation was undertaken in accordance with techniques outlined in BS5930:2015 and BS1377:2016, as appropriate. An exploratory hole location plan, including statutory service locations, is presented as Figure 003 in **Appendix A**.

A summary of the rationale for each specific exploratory hole location is provided in Table 4-1 below.

Table 4-1- Rationale and Completed Scope of Works

Reference	Location	Completed Works	Installation
BH001	Located at the eastern end of the northern Site boundary. Located within proposed building footprint.	Drilled to 12.75 m bgl to prove competent chalk strata. In-situ SPT testing (1.5 m, 3.0 m, 4.5 m, 6.0 m, 7.5 m, 9.3 m, 10.8 m and 12.3 m) and collection of samples for laboratory testing.	Groundwater. Targeted strata - Chalk. Response zone 9.3 m – 12.3 m.
BH002	In the southeast corner of the Site. Located within proposed building footprint.	Drilled to 12.7 m bgl to prove competent chalk strata. In-situ PID testing (0.3m, 0.5m, 1.6m, 2.2m, 5.9m, 11.0m); In-situ SPT testing (1.5m, 2.1m, 4.5m, 6.0m, 7.5m, 9.0m, 11.2m, 12.7m) and collection of samples for laboratory testing.	Groundwater. Targeted strata - Chalk. Response zone 9.5m – 12.5m.
WS001	In western corner of the Site, to provide Site coverage. Nearest point to adjacent allotments. Located within proposed garden area.	In-situ PID testing (1.6m, 2.5m, 3.5m); In-situ SPT testing (2.0m, 3.0m, 4.0m and 5.0m) and collection of samples for laboratory testing.	Gas monitoring well. Targeting ground gas within Made Ground strata. Response zone 0.5m – 0.9m.
WS002	In west part of the Site, located to provide Site coverage. Located within proposed garden area.	In-situ PID testing (2.0m, 3.0m). In-situ SPT testing (2.0m, 3.0m, 4.0m and 5.0m) collection of samples for laboratory testing.	Groundwater and gas monitoring well. Response zone 1.6m – 5m. Targeted Strata – groundwater within the Alluvium (Gas within unsaturated Alluvium deposits and groundwater vapours)
WS003	Located towards the centre of the Site, located within the proposed building footprint. (Location moved to western extent of building footprint for sewer easement)	In-situ PID testing (1.7m, 3.0m, 3.8m); In-situ SPT testing (2.0m, 3.0m, 4.0m and 5.0m) and collection of samples for laboratory testing.	Groundwater and gas monitoring well. Response zone 1.6m – 3m. Targeted Strata – groundwater within the Alluvium (Gas within unsaturated Alluvium deposits and groundwater vapours)
WS004	In the centre of the Site. Located within the proposed building footprint.	Exploratory hole not drilled due to time constraints.	NA

Reference	Location	Completed Works	Installation
WS005	In the northeast corner of the Site. Located within the proposed building footprint.	In-situ PID testing (1.6m, 1.8m, 2.5m, 3.5m, 4.5m); In-situ SPT testing (1.6m, 2.0m, 3.0m, 4.0m and 5.0m) and collection of samples for laboratory testing.	Groundwater and gas monitoring well. Response zone 1.7m - 4m. Targeted Strata – groundwater within the Alluvium (Gas within unsaturated Alluvium deposits and groundwater vapours)
SS1, SS2, SS3	Located in the proposed garden area.	One sample taken at the surface for laboratory analysis.	N/A

LIMITATIONS & VARIATIONS

The extent of the ground investigation was limited due to the presence of the following:

- The intrusive works were temporally suspended and rescheduled due to suspected asbestos containing materials (ACMs) being identified in significant quantities at surface level and at shallow depths within the hand pit excavations across the Site. Site works were stopped until further risk mitigation procedures were put in place. The Client was notified and an asbestos contractor (appointed by the Client) attended Site to undertake handpicking of all visible asbestos at the surface. In accordance with WSP's internal asbestos policy, the Site was determined as 'Site Category 2', due to 'Major debris on the surface from previous demolition or removal works and/or fly tipping'. The WSP Risk Management Services (RMS) team were called to provide advice on how to proceed safely with the intrusive works, and attended Site to act as a watching brief during the hand excavation through the Made Ground.
- A foul sewer runs roughly northwest-southeast through the centre of the Site. WS003 was relocated further south and west than original proposals to ensure sufficient easement was in place.
- Up to a maximum of five window samples were scheduled. Due to time constraints, WS004 was not completed; this location was located within a former building footprint on a concrete slab. This location was determined as non-critical.
- Window sample locations were due to be installed for the monitoring of ground gases only. However, due to the presence of visual and olfactory evidence of contamination, the shallow groundwater and shallow Made Ground deposits, three window sample locations were installed into the alluvial deposits to monitor groundwater and obtain additional data on the shallow aquifer. These wells were also installed with a gas tap to enable monitoring of gases from the unsaturated alluvial deposits and from dissolved gases within the groundwater.
- A ground gas well targeting the Made Ground deposits was installed within WS001.

4.2. SITE WORKS

SOIL SAMPLING – METHODOLOGY

Soil samples, comprising disturbed samples were generally collected from each stratum at all intrusive locations. Where visual or olfactory evidence of contamination was observed, additional samples were obtained for laboratory analysis.

All samples for chemical laboratory testing were collected in appropriate containers stored in cool boxes (where appropriate) and sent to the laboratory.

IN-SITU AND FIELD TESTING

A hand-held Photo-Ionisation Detector (PID) fitted with a 10.6 eV lamp and calibrated against 100 ppm isobutylene standard gas was used in the field to provide a semi-quantitative indication of the presence of volatile organic compounds within soil samples. The readings are taken through headspace measurements and are used assist with sample selection for chemical analysis and type of analysis.

Standard Penetration Tests (SPT) were carried out at regular intervals in all locations to provide data on the in-situ density/strength of the strata.

The results of the PID testing and the SPT 'N values' are presented on the exploratory hole records (**Appendix C**).

LABORATORY ANALYSIS

All samples were collected in accordance with current industry best practice and on-site sampling procedures were designed to minimise the potential for cross-contamination. Samples were collected in labelled containers and sent directly to ALS Environmental under a digital chain of custody. The samples were suitably preserved and all testing was completed under relevant UKAS and MCERTS accreditations.

The chemical testing strategy was underpinned by the preliminary conceptual site model and by on-site observations. Selected soil samples were analysed for:

- Asbestos identification and quantification;
- Metals and metalloids including hexavalent chromium;
- Inorganics;
- Ammoniacal nitrogen;
- Cyanide;
- Phenols;
- Polyaromatic hydrocarbons (PAHs);
- Total petroleum hydrocarbons (TPHs);
- Polychlorinated biphenyls (PCBs); and
- Volatile organic compounds (VOCs) and semi-organic volatile compounds (SVOCs).

Selected groundwater samples for analysed for:

- Metals and metalloids including hexavalent chromium;
- Inorganics;
- Ammoniacal nitrogen;
- Cyanide;
- pH;

- Phenols;
- PAHs;
- TPHs; and
- VOCs and SVOCs.

GROUNDWATER AND GROUND GAS MONITORING

All groundwater installations were developed following the drilling works on 11th April. The well volumes were purged a total of three times, and collected within an intermediate bulk storage container (IBC) which was later collected for off-site disposal to a licenced facility.

Six rounds of ground gas monitoring were undertaken on all four window sample locations with response zones in the Made Ground and Alluvium on the following dates: 11th, 16th and 25th April, and 3rd, 9th and 16th May 2019. Initial and steady state concentrations of methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide were measured using a GFM435 gas analyser, along with the gas flow rate and atmospheric pressures at each monitoring location. A summary of the ground gas monitoring results is contained within the ground gas risk assessment in **Section 7**. Gas monitoring results are contained within **Appendix H**.

Two rounds of groundwater sampling were undertaken on the 17th April and 7th June 2019.

Groundwater levels and depth to base of the boreholes were recorded using an oil interface probe in all exploratory hole locations following the gas monitoring. Groundwater samples were taken from all exploratory hole locations and sent for laboratory analysis.

5. SITE INVESTIGATION - RESULTS

5.1. ENCOUNTERED GROUND CONDITIONS

Ground conditions encountered during the investigation are summarised in Table 5-1.

Table 5-1 – Summary of Encountered Ground Conditions

Stratum	Depth to Top (m bgl)	Thickness (m) *Depth not proven	Typical Description
Made Ground	0	0.85 – 1.7	Gravelly, silty SAND (with brick and concrete fragments) underlain by sandy, gravelly SILT.
Alluvium	0.85 – 1.7	0.4 – 1.55	Gravelly, sandy SILT and gravelly, silty SAND. Sandy CLAY encountered to around 2 m bgl in exploratory holes located in the east of the Site (WS005, BH002 and BH001).
Taplow Gravels	1.6 – 3.0	2* – 4.6 (unproven)	Coarse sandy GRAVEL and SAND and GRAVEL (fine to cobbles) of flint and quartz.
Seaford Chalk Formation and Newhaven Chalk Formation	4.1 – 7.0	0.9* – 6.45* (unproven)	Silty GRAVEL of chalk with frequent flint.

Ground Cover

A concrete slab from the former development is present in the central eastern portion of the Site, covering approximately 1/3 of the Site area. The remainder of the Site surface comprises Made Ground at the surface; no vegetation or topsoil is currently present on Site.

Made Ground

Made Ground was identified in all locations, and found to generally comprise a gravelly, silty sand or a sandy, gravelly SILT with brick and concrete fragments, fragments of asbestos tile (BH001 to 0.4 m bgl), limestone aggregate (BH001 and BH002) and pieces of glass (WS001).

Superficial deposits - Alluvium

Alluvium typically comprising a gravelly, sandy silt or a gravelly, silty sand was encountered to a maximum depth of 3.0 m bgl in both WS002 and WS003, located in the southeast corner of the Site. Sandy clay bands were encountered to around 2 m bgl in exploratory holes located in the east of the Site (WS005, BH002 and BH001).

Superficial deposits – Taplow Gravels

Taplow Gravels, comprising coarse sandy gravel or a sand and gravel with fine to cobbles of flint and quartz, were encountered in all locations below the alluvium.

Bedrock – Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated)

Chalk bedrock was encountered at the shallowest depth in WS001 (4.1 m bgl) located in the west corner of the Site. Bedrock was also encountered in BH001 and BH002 at 7 m bgl and 5.85 m bgl, respectively.

VISUAL AND OLFACTORY EVIDENCE OF CONTAMINATION WITHIN SOILS

Visual and olfactory evidence of contamination was observed in the following exploratory locations:

- Hydrocarbon odour was noted in alluvium in BH001 between 1.9-2.4 m bgl;
- Black staining and a hydrocarbon odour was noted in WS001 between 1.6-2.7 m bgl, and again between 3.8-4.1m bgl;
- Black staining and a hydrocarbon odour was noted in WS002 between 2.0-2.2 m bgl; and
- Dark grey staining and a hydrocarbon odour was noted in WS005 1.7-3.4 m bgl, which became a slight hydrocarbon odour from 3.4 m bgl which was noted to the base of the hole at 5 m bgl.

With the exception of the contamination identified below the groundwater at WS001 and WS005, and the other occurrences of contamination were observed in soils at the head of the groundwater where water levels fluctuate in the groundwater 'smear zone'.

The highest recorded PID reading was 124ppm at WS002 at 2.0 m bgl, which is likely associated with the hydrocarbon staining at this depth.

5.2. GROUNDWATER

Groundwater strikes were recorded between 1.5-4.85 m bgl during the ground investigation works. Groundwater strikes are recorded on the exploratory hole logs contained in **Appendix C**.

Groundwater levels have been recorded during the six ground gas monitoring rounds, and on the two subsequent groundwater monitoring rounds. A summary of the groundwater levels (m AOD) are included within Table 5.3 below.

Groundwater within the chalk has been detected between 2.0 m bgl and 2.27 m bgl (36.38 m AOD and 36.62 m AOD). Water levels rise above the top of the Chalk layer indicating that groundwater within the Chalk is confined by the Alluvium deposits. Only two boreholes are installed within the Chalk therefore, it is not possible to triangulate the groundwater flow direction. However, based on the BGS Hydrogeological Maps¹ the regional groundwater flow within the Chalk is towards the south east.

Groundwater within the alluvium has been detected between 1.84 m bgl and 2.12 m bgl (36.40 m AOD and 36.51 m AOD). Groundwater levels within the alluvium show some variation however levels consistently indicate a groundwater flow direction towards the south east and away from the drain as shown in Figure 005.

A summary of the groundwater monitoring round undertaken on 17th April is detailed below in Table 5.2, including any visual and olfactory evidence of contamination observed during all monitoring rounds.

Table 5-2- Groundwater Levels

Reference	Response Zone (m bgl)	Response Strata	Groundwater Level* (m bgl)	Groundwater Level* (m AOD)	Observations
BH001	9.3-12.3	Chalk	2.04	36.43	Clear water column, no odour
BH002	9.5-12.5	Chalk	2.27	36.38	Clear water column, no odour
WS002	1.6-5.0	Alluvium / River Terrace Gravels	1.94	36.42	Clear water column, no odour
WS003	1.6-3.0	Alluvium	2.12	36.40	Clear water column, no odour
WS005	1.7-3.0	Alluvium	1.91	36.43	Slight sheen on water surface and slight hydrocarbon odour

¹ Sheet 7: Hydrogeological Map of the South West Chilterns and the Berkshire and Marlborough Downs (1:100,000) - 1978

5.3. LABORATORY RESULTS – SOIL & GROUNDWATER

The laboratory test certificates, associated with the soil and groundwater analysis, are presented in **Appendix D**.

The significance of the laboratory data is determined through generic risk assessments. The generic risk assessment associated with human health is presented in **Section 6** with supporting information contained within **Appendix E**. The generic risk assessment associated with controlled waters is presented in **Section 8** with supporting information contained within **Appendix G**.

5.4. GEOTECHNICAL LABORATORY TESTING

The following geotechnical laboratory testing was undertaken on 34 No. soil and rock samples collected throughout the fieldworks period to provide an overview of the engineering characteristics of the in-situ soils. The geotechnical samples were couriered to Geotechnical Engineering Ltd (GEL) for geotechnical testing for the parameters summarised in Table 5-3.

Table 5-3 – Geotechnical Tests of Samples

Determinand(s) / Test	No. of Samples Scheduled
Moisture Content	12
Plasticity Index (4 point)	2
Saturation Moisture Content	3
Particle size distribution (PSD) wet/dry sieve	5
Particle size distribution (Sedimentation)	4
BRE Reduced Suite	8

6. HUMAN HEALTH: GENERIC QUANTITATIVE RISK ASSESSMENT

6.1. INTRODUCTION

Following the tiered approach which is described in CLR11, this Section provides a Generic Quantitative Risk Assessment (GQRA) of those pollutant linkages that were determined to be plausible in the refined CSM.

6.2. GENERIC HUMAN HEALTH RISK ASSESSMENT

SOIL CONTAMINATION RISK EVALUATION

A human health GQRA has been undertaken that compares the recorded Site contaminant concentrations against Generic Assessment Criteria (GAC) protective of a residential end use. WSP has derived a set of GAC for the CLEA generic land use scenarios using the CLEA Workbook v1.071 Excel modelling tool. Further details on the assumptions and methodologies adopted by WSP are provided in **Appendix E**. However, the following describe a number of critical aspects in GAC selection:

- Soil chemical data has been screened against GAC derived for a residential scenario (without home grown produce); and
- GACs for hydrocarbon compounds are typically sensitive to the degree of organic matter present in the environment. In the absence of soil organic matter data for the Site, a conservative approach has been taken, and a GAC applicable to an SOM content of 1% have been used.

ASSESSMENT

The generic risk assessment shows that there are exceedances of the screening criteria for residential land use in some metals, poly-aromatic hydrocarbons, and petroleum hydrocarbons. All exceedances of the screening criteria were recorded within the Made Ground, with the exception of some petroleum hydrocarbons in WS005.

There were no recorded exceedances of human health criteria for vapours derived from groundwater.

A summary of the human health exceedances is presented in Table 6-1, and also provided in **Appendix F**.

Table 6-1 – Exceedances in Soil of Human Health Screening Criteria for Residential End Use

Determinand	Location, Depth, Strata	Criteria Exceeded (mg/kg)	Result (mg/kg)
Beryllium	WS001 0.15m Made Ground	1.70	3.35
Arsenic	WS001 0.15m Made Ground	35	43.7

Determinand	Location, Depth, Strata	Criteria Exceeded (mg/kg)	Result (mg/kg)
Lead	BH001 0-0.1m Made Ground	188	1,710
	BH001 0.2m Made Ground		1,170
	BH001 0.3-0.5m Made Ground		984
	BH001 0.5m Made Ground		294
	WS001 0.15m Made Ground		578
	WS002 0.1m Made Ground		390
	WS002 0.5m Made Ground		802
	WS003 0.15 Made Ground		4,580
	WS003 0.7m Made Ground		1,090
	WS005 0.1m Made Ground		397
	WS005 0.7m Made Ground		408
	SS1 0-0.05m Made Ground		354
Benzo(a)pyrene	BH001 0-0.1m Made Ground	1.70	6.53
	BH001 0.2m Made Ground		7.28
	BH001 0.3-0.5m Made Ground		8.07
	BH001 0.5m Made Ground		15.6
	BH002 0.3m Made Ground		167
	BH002 1.0m Made Ground		40.0
	WS001 0.15m Made Ground		6.71
	WS002 0.1m Made Ground		13.5
	WS002 0.5m Made Ground		9.02
	WS003 0.15m Made Ground		9.02
	WS003 0.7m Made Ground		18.3
	WS003 1.0m Made Ground		3.87
	WS005 0.1m Made Ground		27.7

Determinand	Location, Depth, Strata	Criteria Exceeded (mg/kg)	Result (mg/kg)
	WS005 0.7m Made Ground		11.2
	WS005 1.2m Made Ground		9.37
	SS1 0-0.05m Made Ground		5.12
	SS2 0-0.05m Made Ground		2.5
	SS3 0-0.05m Made Ground		2.86
Naphthalene	BH002 0.3m Made Ground	2.33	5.56
Aliphatic C08-10	WS005 2.5m Alluvium	26.8	61.2
Aliphatic C10-12	WS005 2.5m Alluvium	132.0	272
Aliphatic C12-16	WS005 2.5m Alluvium	1,035	2,470
Aromatic C8-10	WS005 2.5m Alluvium	47.1	40.8
Aromatic C10-12	WS005 2.5m Alluvium	248.5	182
Aromatic C16-21	WS005 2.5m Alluvium	1336	1,650

Metals

Various metals were recorded above the limit of detection (LOD) but below the GAC across all soil samples. In general, recorded concentrations appear to be lower in the underlying chalk bedrock than in the alluvium deposits. Concentrations of arsenic, barium, cadmium, copper, nickel, vanadium and zinc recorded in the natural strata are generally consistent and therefore considered likely to be representative of natural background concentrations.

Hexavalent chromium was recorded above the LOD in one sample (WS003 0.15 m bgl) from the Made Ground however, the recorded concentration (2.33 mg/kg) was not in exceedance of the screening criteria (4.5 mg/kg).

Metals detected at concentrations above the screening criteria include lead, arsenic and beryllium. The concentrations recorded in exceedance of the screening criteria for arsenic and beryllium were identified in one location only within the Made Ground and are all considered to be marginal. Lead was recorded at concentrations exceeding the screening criteria within Made Ground in all five exploratory hole locations, with some concentrations an order of magnitude above the threshold of 188mg/kg (BH001 and WS003). The presence of high lead concentrations may be associated with ash

deposits in the Made Ground material, possibly from the former residential or industrial use of the land.

Inorganics

Cyanide was recorded above the LOD in two locations: BH001 at 0.2 m bgl and WS003 at 0.15 m bgl, both within Made Ground, however the GAC was not exceeded. Ammoniacal nitrogen marginally exceeded the LOD in all samples tested across the Site.

PAHs

The polycyclic aromatic hydrocarbon compound, benzo(a)pyrene (BAP) was detected within the Made Ground in excess of the GAC of 1.6 mg/kg in all five exploratory hole locations and at the three surface sample locations. The highest concentration of 167 mg/kg was recorded in BH002 at 0.3 m bgl. During the Site investigation no notable observations were made which could be attributed to the high concentration of BAP.

Naphthalene was reported above the GAC in a single sample location (BH002, 0.3 m bgl).

The adjacent allotment land to the north and west of the Site was determined under Part 2A as Contaminated Land in 2008 following the identification of BAP in Made Ground and compost. The source of BAP is likely to be associated with the application of soil improver used in the allotments, historical domestic ash disposal and land known to have been impacted by railway run off. The neighbouring land has since been remediated, however it may be possible that concentrations of BAP on Site are not from an on-site source, are associated with the same source as that of the neighbouring land (for example railway run-off); however, the maximum concentration recorded on the neighbouring site was 25 mg/kg.

TPHs

Concentrations of some petroleum hydrocarbons were recorded in exceedance of the screening criteria within the saturated zone of the alluvium in WS005 at 1.8 m and 2.5 m bgl and in BH002 at 0.3 m bgl. Concentrations within the alluvium at WS005 predominantly comprised light to medium range bandings of aliphatics (C8-10 to C12-16) and aromatics (C8-10 to C16-21) and are likely associated with the dark grey staining and hydrocarbon odour observed from 1.7-3.4 m bgl in WS005. The concentration in exceedance of the screening criteria in BH002 was for aromatics C16-21, however no visual or olfactory evidence of hydrocarbons was noted in BH002.

Concentrations of various petroleum hydrocarbons above the LOD were also recorded in all other soil samples, from the Made Ground and natural ground, however all are below the selected screening criteria. Visual and olfactory evidence of hydrocarbon contamination was noted in four out of six locations at the Site in the alluvium from the head of the groundwater, and not from ground level; therefore, it is likely to be an off-site source. It is possible that the source of hydrocarbons is from the railway land to the north; the Site is down hydraulic gradient and tanks have been identified on the land. An alternative possible source of hydrocarbons is from the pollution incident which

occurred in 2007, 80m east of the Site which involved oils and fuels resulting; however, the Site is hydraulically up-gradient of the incident Site.

Phenols

Recorded concentrations of phenols were either below the LOD or marginal in all samples analysed.

PCBs

PBC congener 118 was recorded at concentrations marginally above the LOD (0.007mg/kg) in two of the three samples scheduled for testing; BH001 at 0.2 m bgl and WS002 at 0.1 m bgl. WS005 at 0.1 m bgl was also analysed for PCBs, and the recorded concentration was below the LOD. All samples tested were from the Made Ground.

VOCs

With the exception of n-butylbenzene recorded above the LOD in WS005 at 2.5 m bgl, all recordings of VOCs were below the LOD in all samples where analysed.

SVOCs

With the exception of dibenzofuran recorded above the LOD in WS005 at 1.8 and 2.5 m bgl, all other recordings of SVOCs were below the LOD.

Asbestos Containing Materials

Suspected asbestos containing materials were identified in the form of concrete sheeting fragments across the surface of the Site. A sample 'Asbestos (Bulk)' was tested to prove the material contained asbestos. The sample proved positive for white chrysotile asbestos. ACM on the Site surface was cleared by the Client's specialist asbestos contracts.

A total of 15 No. Made Ground samples were analysed for asbestos, two samples tested positive for asbestos fibres; BH001 (0.5 m bgl) and WS005 (0.1 m bgl). Both samples were found to contain chrysotile asbestos fibres, with quantification recorded as <0.001% wt/wt. The sample from WS005 comprised a trace concentration of chrysotile fibres. Both samples were taken from Made Ground, and the asbestos detections are likely associated with the demolition of the former buildings on-site.

SUMMARY

- Various metals, PAHs and TPHs were recorded in exceedance of the screening criteria for a residential end use in all exploratory hole locations across the Site. Apart from some TPHs recorded in the Alluvium in WS005, the contaminants recorded in exceedance of the screening criteria were limited to the Made Ground on-site.
- Metals recorded above the screening criteria included lead, arsenic, barium and beryllium. Recorded concentrations were either considered marginal or to be representative of natural background concentrations.
- BAP is considered as a marker indicator for polyaromatic hydrocarbons. Recorded concentrations of BAP exceeded the screening criteria in all exploratory hole locations, including the three surface soil samples. Naphthalene was also recorded

in exceedance of the screening criteria in Made Ground in one location (BH002). All exceedances of BAP were found in the Made Ground. The source of BAP could be associated with the adjacent allotment land to the north and west (from application of soil improver used in the allotments, historical domestic ash disposal and land known to have been impacted by railway run off) or from historic on-site activities (domestic ash or previous industrial Site uses).

- Various carbon bands of TPH were recorded in excess of their respective screening criteria in the Alluvium in WS005 (at 1.8 and 2.5 m bgl) where hydrocarbon stained soils were observed, and in Made Ground from BH002 at 0.3 m bgl. Concentrations within the alluvium of WS005 predominantly comprised low to medium range bandings of aliphatics (C8-10 to C12-16) and aromatics (C8-10 to C16-21). No known sources of hydrocarbons have been identified on Site in association with the Site's former use. Impacts of hydrocarbons were noted at the groundwater surface; no notable impact of hydrocarbons were noted from ground level or within the unsaturated zone above the groundwater. The potential sources of hydrocarbons could therefore be from an off-site source; from the railway land to the north of the Site, or associated with the historic pollution incident.
- Chrysotile asbestos fibres were identified in two (BH001 and WS005) out of 15 Made Ground soil samples analysed. Suspected ACMs were also noted in the form of cement sheeting at the surface of the Site. A bulk sample from the Site surface of the suspected ACM was taken and tested and proven to be asbestos cement containing chrysotile asbestos.

GROUNDWATER VAPOUR SOURCES

In addition to the soils assessment included above (which accounts for the potential for vapour generation from soil sources) the groundwater has also been screened against GAC derived for the protection of human health from the inhalation of groundwater-derived vapours within indoor air.

All groundwater analytical results have been screened against the relevant vapour screening criteria for a residential exposure scenario, assuming a sandy soil type (most conservative). The screening criteria and screening table are provided in **Appendix I**. All concentrations are presented in µg/l unless otherwise stated. Full laboratory certificates are presented in **Appendix D**.

No exceedances of the residential GAC were recorded from the available groundwater data obtained from the two monitoring rounds.

7. GROUND GAS RISK ASSESSMENT

7.1. GAS MONITORING DATA

A total of four shallow window sample locations (WS001, WS002, WS003 and WS005) were installed as soil gas monitoring locations. Following the completion of the intrusive investigation, six rounds of gas monitoring were undertaken. Monitoring works were completed during April and May 2019, to enable a preliminary assessment of the soil gas regime at the Site. Two of the monitoring rounds (11th April & 16th May) were undertaken in periods of falling atmospheric pressure which is therefore considered that worst-case conditions have been monitored at the Site.

Ground gas monitoring was undertaken using a multi-gas analyser (GA2000) for methane, carbon dioxide, oxygen, hydrogen sulphide, carbon monoxide, flow rate and atmospheric pressure.

A summary of the highest (and lowest in the case of oxygen) recorded gas monitoring results is also presented in Table 7.1 below.

Table 7-1 – Summary of Gas Monitoring Results

Reference	Response Zone (m bgl)	Response Strata	Max Flow Rate (l/hr)	Atmospheric Pressure Range	Methane (%) (steady)	Carbon Dioxide (%) (steady)	Oxygen (%) (steady)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
WS001	0.5-0.9	Made Ground	0.0	992-1022	0.0	2.3	18.6	1.0	0.0
WS002	1.6-5.0	Alluvium	0.7	992-1022	0.0	5.1	14.3	1.0	0.0
WS003	1.6-3.0	Alluvium	0.1	992-1022	0.0	2.1	17.8	1.0	0.0
WS005	1.7-3.0	Alluvium	0.2	992-1022	0.1	3.0	14.4	1.0	30

* Negative values are the result of 'live zeros' and have been interpreted as 0%

Methane concentrations were negligible at all locations on all monitoring rounds. Measurable concentration of carbon dioxide above atmospheric conditions and depleted oxygen levels were recorded at all locations on at least one occasion. Carbon monoxide was recorded on one occasion at 30ppm in WS005 where hydrocarbon impact was noted; no other detections of carbon monoxide were detected on any other occasion or in any other borehole. It is possible this could have been an erroneous detection. The highest flow rate of 0.7 l/hr was detected during a period of falling atmospheric pressure.

7.2. GROUND GAS RISK ASSESSMENT

Potential risks posed by hazardous ground gases at the Site have been assessed following the guidance contained within CIRIA C665 Report. This method requires use of both gas concentrations (carbon dioxide and methane) and standpipe flow rates to

calculate a gas screening value (GSV). The GSV is calculated by multiplying the maximum flow rate by the maximum methane or carbon dioxide concentration, whichever is the highest.

The Typical Maximum Concentrations and GSVs recorded during the ground gas monitoring programme at the Site are summarised in Table 7.2

Table 7-2 – Characterisation of Site Gassing Regime

	Maximum Flow Rate (l/hr)	Methane		Carbon Dioxide	
		Typical Maximum Concentrations (%)	Gas Screening Value A (l/hr)	Typical Maximum Concentrations (%)	Gas Screening Value A (l/hr)
Measured Concentration	+0.7	0.1	0.0007	5.1	0.0357

The gas risk assessment for the Site is driven by the concentrations of carbon dioxide. The GSV (0.0357 l/hr) and low flow rates recorded alone would characterise the Site as a Characteristic Situation 1. However, owing to the concentrations of carbon dioxide recorded in WS002 on one occasion at >5%, uncertainty in respect of carbon monoxide and occasional depleted oxygen the Site has been characterised as follows:

Situation A:

Characteristic Situation 2 (low risk).

2 levels of protection are required for a residential building.
Typical scope of protective measures:

a) Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft) with at least 1200 g DPM² and underfloor venting.

b) Beam and block or pre-cast concrete slab and minimum 2000 g DPM/reinforced gas membrane.

All joints and penetrations sealed.

The Site has been characterised as Characteristic Situation 2 (low risk) (equivalent to NHBC classification Green/Amber 1) based on the ground gas concentrations, where all new development requires gas protection measures to be installed. This characterisation is based upon recent gas monitoring data collected by WSP (April and May 2019) on six occasions, and driven by the concentrations of carbon dioxide recorded at >5% on one occasion.

It is noted that the barometric pressure was showing a decreasing trend during the second and sixth rounds of gas monitoring on 11th April and 16th May 2019. It is therefore considered that a range of varying atmospheric conditions have been monitored at the Site.

8. CONTROLLED WATERS: GENERIC QUANTITATIVE RISK ASSESSMENT

8.1. INTRODUCTION

The controlled waters risk assessment is conducted in accordance with the principles detailed in 'Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination' (EA 2006), the 'prevent and limit' approach of the Water Framework Directive (2000/60/EC) and the 'Groundwater protection guides covering: requirements, permissions, risk assessments and controls (previously covered in GP3)'. The methodology is detailed further in **Appendix G**.

The CSM identified the following potential controlled waters receptors for the Site:

- Groundwater from the Secondary A Aquifer, Alluvium deposits;
- Groundwater from the Principal Aquifer, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated);
- Future resource potential of the identified aquifers;
- Contemporary potable abstractions (closest 461 m NE); and
- Surface water features (closest being a drainage ditch located 2 m north of the Site).

It should be noted that the available groundwater data indicates that the groundwater flow direction within the Alluvium is towards the south east, away from the drains. However, given the proximity of the drains, they are still considered to be a potential receptor.

Environment Agency (EA) publications for the assessment of groundwater (RTM, CLR11) provides guidance on the appropriate compliance criteria to be used as GAC. This standard should be relevant to the current or intended use of the identified aquifer/surface water receptor.

Based on the identified receptors the following sources of GAC have been utilised:

- Annual Average Freshwater Environmental Quality Standards (AA-EQS) 2015, for surface water receptors (based on the risk to aquatic life in surface waters);
- UK Drinking Water Standards (UK DWS), for groundwater receptors, including current and future groundwater resource potential; and
- World Health Organization Standards (i.e. for MTBE and Xylene), in the absence of UK based criteria for groundwater receptors.

Groundwater quality data has therefore been screened against two sets of water standards: protective of the groundwater as a resource (DWS) and the surface waters (AA-EQS). Results of the screening assessment are included in the appended Table A.

With respect to petroleum hydrocarbons, we refer to the CL:AIRE 2017 guidance in order to derive alternative assessment criteria (CL:AIRE 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' v1.1 March 2017), which recommends the use of the following proxies:

- Aromatic EC5-EC7 benzene
- Aromatic >EC6-EC7 benzene

- Aromatic >EC6-EC8 benzene
- Aromatic >EC7-EC8 toluene
- Aromatic >EC8-EC10 ethylbenzene
- Aromatic >EC10-EC12 naphthalene
- Aromatic >EC12-EC16 naphthalene
- Aromatic >EC16-EC21 anthracene
- Aromatic >EC21-EC35 benzo(a)pyrene

In the specific case of fluoranthene and benzo(a)pyrene, the selected EQS values are based on the protection of the organisms living in the water column rather than protection of human health from consumption of fishery products.

8.2. RISK ASSESSMENT RESULTS – GROUNDWATER

Groundwater concentrations from all samples analysed (two groundwater sampling rounds) were screened against the EQS and DWS for the protection of the surface water and groundwater respectively. Details of the screening are included in Table A appended and a summary of the results is presented in Table 8-3.

Table 8-1 – Summary of Groundwater Exceedances

Determinand	GAC (ug/l)	Max Concentration (ug/l)	Number of exceedances and locations
EQS			
Nickel	4	15.6	9 (all locations)
Zinc	10.9	14.4	1 (BH002)
Aromatics >EC10-EC12	2 (naphthalene proxy)	67	3 (BH001, WS005)
Aromatics >EC12-EC16	2 (naphthalene proxy)	195	3 (BH001, WS005)
Aromatics >EC16-EC21	0.1 (anthracene proxy)	133	3 (BH001, WS005)
Aromatics >EC21-EC35	0.022 (benzo(a)pyrene proxy)	162	4 (BH001, BH002, WS003, WS005)
DWS			
Ammoniacal Nitrogen as NH ₄	500	1480	2 (WS005)
Arsenic	10	13.4	1 (WS005)
Nickel	20	22.8	1 (WS005)
Aromatics >EC12-EC16	90	195	1 (WS005)

Determinand	GAC (ug/l)	Max Concentration (ug/l)	Number of exceedances and locations
Aromatics >EC16-EC21	90	133	1 (WS005)
Aromatics >EC21-EC35	90	162	1 (WS003)
Benzo(a)pyrene	0.01	0.0187	3 (BH001, BH002, WS005)

Groundwater concentrations of eight and seven determinands were found in exceedance of the EQS and DWS respectively.

Risk to Surface Waters

Regarding the risk to the surface waters, concentrations of aromatics > C10 to C35 exceeded the selected EQS. No specific EQS exist for TPH compounds. In their absence and as per CL:AIRE 2017 Guidance EQS values of their proxies have been used. However, it should be noted that proxy compounds (naphthalene, anthracene and benzo(a) pyrene) do not exceed their EQS and for this reason, exceedances of aromatics >C10-C12, C12-C16, C16-C21 and C21-C35 are not considered very relevant.

Concentrations of nickel and zinc also exceeded the EQS. Nickel and zinc EQS are bioavailability dependent. Due to the lack of quality data from the surface water receptor the bioavailability of each determinand could not be calculated. Therefore, the EQS used for these determinands is very conservative as it assumes 100% bioavailability.

The zinc EQS exceedance relates to a single concentration detected in a sample taken from BH002 in April 2019. However, no exceedance was detected in the subsequent sample was taken at that location in June 2019. Given the limited exceedance and the conservatism of the EQS due to bioavailability, the zinc exceedance is not considered significant.

With regards to nickel, the BGS online tool (www.bgs.ac.uk) shows Normal Background Concentrations (NBCs) for nickel to be 42 mg/kg, and in the region of the site they vary between 46.9-74.7 mg/kg. For this reason and the conservatism of the EQS, the exceedances of nickel are not considered significant either.

Risk to Groundwater Resource

With regards to the risk to the groundwater resource, concentrations of ammoniacal nitrogen, nickel, arsenic, aromatics EC-16-EC35 and benzo(a)pyrene exceeded their respective DWS as follows:

- Relatively high concentrations of ammoniacal nitrogen were detected in the samples taken from WS005 screened within the alluvium;

- Marginal exceedances of nickel and arsenic DWS detected in a single sample taken from WS005;
- Marginal exceedances of aromatics > EC12-EC16 and EC16-EC21 DWS detected in a single sample taken from WS005;
- A single marginal exceedance of aromatics > EC21-EC35 detected in a sample taken from WS003 screened on the alluvium; and
- Benzo(a)pyrene concentrations detected in samples taken from BH001, BH002 and WS005 in a single occasion.

Alluvium

The majority of the DWS exceedances were related to concentrations detected within the alluvium (samples taken from WS005 and WS003). The sensitivity of the alluvium as a groundwater resource is considered low given the relatively low resource potential of the aquifer in comparison to the Chalk. This is reflected in the fact that all groundwater abstractions licenses in the surroundings of the Site are related to the Chalk aquifer. Vertical migration between the alluvium and the Chalk exists as concentrations have been detected within the Chalk aquifer. However, the majority of concentrations within the Chalk are low and do not exceed the DWS. For those reasons, concentrations detected within the alluvium that marginally exceed the DWS are considered to be very conservative.

Chalk

Two concentrations of benzo(a)pyrene detected in groundwater within the Chalk (BH001 and BH002) marginally exceeded the DWS. Groundwater concentrations are consistent with detected Site wide benzo(a)pyrene soil concentrations and potential off-site sources.

8.3. SUMMARY

The controlled waters generic risk assessment has highlighted groundwater concentrations in exceedance of the screening criteria for the protection of the surface waters and the groundwater resource.

The majority of the exceedances are considered very conservative for the following reasons:

- The drain located at the northwest boundary of the Site is unlikely to be a receptor based on the groundwater level data consistently indicating a groundwater flow towards the south east, therefore exceedances of the screening criteria for the protection of the surface waters are considered very conservative;
- Alluvium aquifer has a low resource potential, therefore marginal exceedances of the DWS from groundwater concentrations detected within the alluvium aquifer are considered conservative; and
- Concentrations have been screened against generic criteria which do not account for the attenuation along the groundwater vertical and horizontal pathway.

Nonetheless, regard should be taken regarding the following exceedances:

- Benzo(a)pyrene concentrations marginally detected above the GAC (maximum concentration 0.018 µg/l vs GAC of 0.01 µg/l) in samples taken from the Chalk (BH001 and BH002) during one of the two groundwater monitoring rounds, consistent with relatively high soil concentrations detected in the first metre (above the NCBs); and Can you add not detected in X other samples Plus what is an NCB?
- Concentrations of ammoniacal nitrogen detected in samples taken from the alluvium in WS005. The superficial deposits are designated by the Environment Agency as Secondary A Aquifers. However, none of the groundwater abstractions in the area have been reported to relate to the drift aquifer. Meanwhile ammoniacal nitrogen concentrations detected in the samples taken within the Chalk have been low or below their respective LOD and have not been reported to exceed the screening criteria. Although, it should be noted that boreholes screened within the Chalk have not been directly downgradient from WS005, hence, vertical migration and impact in the Chalk cannot be totally discounted.

It should be noted however, that this generic assessment has not accounted for the attenuation along the aquifer pathway. The observed contamination is presumed to be a passive input resulting from some previous activity that has now ceased i.e. has already entered the water environment and hence source terms should be depleting. Contaminant attenuation is also likely to take place within the groundwater because of retardation and biodegradation.

Part IIA of the Environmental Protection Act 1990 allows consideration of a Detailed Quantitative Risk Assessment (DQRA) should the available data suggest a potential hazard to the Water Environment. A DQRA would aim to make greater use of site-specific data to conduct a more accurate assessment of risk. Such a phased assessment of risk is compliant with the advice of CLR11 Model Procedures for Contaminated land. However, in accounting for dilution and dispersion alongside sorption and biodegradation within path lengths then it is likely that any further assessment would simply demonstrate that risks to the aquifer are low.

Furthermore, the proposed development will greatly reduce infiltration rates across ~75% of the Site owing to the construction of the housing and associated hard landscaping. This will presumably greatly reduce the leaching potential of contamination from on-site soils to the aquifer. In addition, it is likely that Made Ground soil will be removed in garden areas, and from foundation locations, which will further reduce the source term.

Part IIA seeks to provide assistance in relation to the definition of “significant” to assist in avoiding disproportionate regulation being applied to contaminated land causing only trivial amounts of pollution to the water environment. It is considered reasonable to conclude that the isolated risks from benzo(a)pyrene and ammoniacal nitrogen following the proposed development will reduce to an acceptable level, and that further level of assessment is not warranted.

9. RISK APPRAISAL

9.1. REFINED CONCEPTUAL SITE MODEL

A updated risk matrix is presented in Table 9-1 based on the CSM, findings of the site investigation and outcomes of the risk assessments. Potential geotechnical risks have not been included within this investigation, assessment or risk appraisal.

Groundworkers during redevelopment have been discounted from further assessment because there are legal requirements to ensure that suitable health and safety controls should be in place during works.

Table 9-1 – Risk Appraisal based on Future Residential End Use

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
Made Ground Asbestos. TPH, PAH and metals. Soil vapours and ground gases.	Inhalation of asbestos fibres	Human Health: Future residents Future Site maintenance workers	Medium	Likely	Moderate Risk	Although ACMs have been largely cleared from the Site surface, ACMs and asbestos fibres in Made Ground soil are present on Site and present a risk to future on-site human health receptors. Mitigation measures will therefore need to be implemented to render the Site suitable for a residential end use.
		Off-site human health receptors	Medium	Unlikely	Low Risk	Risks to off-site human health receptors have been classified as low due to the unlikely scenario of off-site receptors inhaling asbestos fibres from sources on-site. However, the mitigation measures implemented to render the Site suitable for residential end use will further reduce risks to off-site receptors.
	Ingestion, inhalation and dermal contact of soils and dust	Human Health: Future residents Future Site maintenance workers	Medium	Likely	Moderate Risk	Exceedances of the human health GAC for metals, TPH and PAHs have been encountered within Made Ground soils across the Site. A potential future exposure pathway is present within proposed garden areas/areas of soft standing. Therefore, mitigation measures will be required as per above.
		Off-site human health receptors	Mild	Unlikely	Negligible Risk	Risks to off-site human health receptors have been classified as negligible, however mitigation measures implemented to render the Site suitable for residential end use will further reduce risks to off-site receptors.

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
	Inhalation of soil vapours	Human Health: Future residents Future Site maintenance workers	Medium	Unlikely	Low Risk	Concentrations of TPHs and naphthalene in the soils exceed the selected assessment criteria. However, TPH exceedances for volatile and semi-volatile fractions are only noted within the alluvium at depths ranging from 1.8-2.5 m bgl. They are not considered to represent a significant vapour risk due to their depth, the marginal nature of the exceedances and the cohesive nature of the alluvium (human health GAC are based on a conservative sandy loam soil type).
		Off-site human health receptors	Mild	Unlikely	Negligible Risk	Reported soil concentrations of naphthalene and TPH are not considered likely to represent a viable vapour source to off-site human health receptors.
	Inhalation of ground gases	Human Health: Future residents Future Site maintenance workers	Minor	Likely	Low Risk	The ground gas risk assessment has characterised the Site as 'Characteristic Situation 2' where basic gas protection measures will be required.
		Off-site human health receptors	Medium	Low likelihood	Moderate / Low Risk	Risks to off-site human health receptors have been classified as moderate / low from ground gases and soil vapours. The ground gas risk assessment classified the Site in Characteristic Situation 2 where basic gas protection measure will be required for new dwellings. However, this was based on data from one of the six rounds where one borehole marginally crossed the threshold of 5% for carbon dioxide at a concentration of 5.1%.

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
	Vertical and lateral migration of leachable contaminants to groundwater.	Groundwater: Secondary A Aquifers (Alluvium & Taplow Gravels)	Mild	Likely	Moderate/ Low Risk	Contaminants within the groundwater are present in Made Ground soils; it is therefore likely these contaminants are leaching from an on-site source within the Made Ground. However, the low resource potential of the alluvium aquifer reduces its sensitivity. Nonetheless soil concentrations of ammoniacal nitrogen and benzo(a)pyrene are likely the source of groundwater concentrations detected in the Alluvium.
		Groundwater: Principal Aquifer (Seaford Chalk Formation and Newhaven Chalk Formation)	Medium	Low Likelihood	Moderate / Low Risk	Contaminants within the groundwater are present in Made Ground soils; it is therefore likely these contaminants are leaching from an on-site source within the Made Ground. However, due to the proposed development significantly reducing infiltration rates, and Made Ground soils being removed in garden areas, the likelihood of these contaminants leaching to the chalk aquifer will be reduced.
	Lateral migration of leachable contaminants in groundwater to surface waters.	Surface Water: Drainage ditch adjacent to north of Site	Medium	Low Likelihood	Moderate / Low Risk	Water quality of the drainage ditch has not been confirmed by sampling and analysis, however it is not considered likely that groundwater from the Site would impact the drainage ditch adjacent to the north as the inferred groundwater flow direction across the Site is to the south east, away from the drainage ditch. No other surface waters are present within 1 km of the Site.
	Surface water runoff and migration via drainage and discharge to surface water.	Surface Water: Drainage ditch adjacent to north of Site	Medium	Unlikely	Low Risk	No surface water drains are known to be present on Site.

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
	Direct contact with contaminated soil causing chemical attack.	Property Receptors: Site buildings and structures	Minor	Unlikely	Negligible Risk	Identified sulphate concentrations within the soils would not pose a risk of chemical attack to concrete foundations.
	Direction contact with contaminated soil	Underground drinking water supply pipes	Medium	Low Likelihood	Moderate / Low Risk	The use of alternative material for water supply pipes may be required in areas where Made Ground is present owing to the presence of hydrocarbon contamination (though this is generally at a lower depth than service pipes would be present). This would be subject to requirements of the local water authority.
	Migration of explosive ground gas.	Property Receptors: Site buildings and structures.	Medium	Unlikely	Low Risk	Results of the gas monitoring showed negligible concentrations of methane to be present on Site. Therefore, a low risk from explosive ground gas has been determined.
Contaminated Groundwater Containing elevated levels of ammoniacal nitrogen, PAHs & metals above	Lateral and vertical migration of groundwater	Groundwater: Secondary A Aquifers (Alluvium & Taplow Gravels)	Mild	Likely	Moderate / Low Risk	Groundwater concentration detected within the shallow groundwater in the alluvium (Secondary A Aquifer) exceeded relevant screening criteria. Lateral migration of these contaminants could spread to the wider Secondary A Aquifer. However, the low resource potential of the shallow aquifer reduces its sensitivity and overall risk.

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
the relevant screening criteria		Groundwater: Principal Aquifer (Seaford Chalk Formation and Newhaven Chalk Formation)	Medium	Low Likelihood	Moderate / Low Risk	Groundwater concentrations of benzo(a)pyrene detected within the Chalk aquifer exceeded the drinking water standards. It should be noted however that the screening criteria is generic and does not account for attenuation along the pathway. In addition, due to the proposed development significantly reducing infiltration rates, and Made Ground soils being removed in garden areas, the likelihood of these contaminants leaching to the chalk aquifer will be reduced.
	Lateral migration contaminants in groundwater to surface waters.	Surface Water: Drainage ditch adjacent to north of Site	Medium	Low Likelihood	Moderate / Low Risk	Water quality of the drainage ditch has not been confirmed by sampling and analysis, however it is not considered likely that groundwater from the Site would impact the drainage ditch adjacent to the north as the inferred groundwater flow direction across the Site is to the south east, away from the drainage ditch. No rivers are present within 1km of the Site. In addition, exceedances of the AA-EQS detected are not considered significant because there are either limited, associated to background concentrations or very conservative screening criteria.
	Inhalation of hazardous groundwater vapours.	Human Health: Future residents Future Site maintenance workers Off-site human health receptors	Medium	Unlikely	Low Risk	No exceedances of the human health groundwater vapour assessment criteria were detected.

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
	Direct contact with contaminated groundwater causing chemical attack.	Property Receptors: Site buildings and structures	Minor	Unlikely	Negligible Risk	Identified sulphate concentrations within groundwater would not pose a risk of chemical attack to concrete foundations.
Natural Ground Hydrocarbon impact in the natural ground. Gases within Alluvium	Inhalation of hazardous ground gases.	Human Health: Future residents Future Site maintenance workers	Minor	Likely	Low Risk	The ground gas risk assessment has characterised the Site as 'Characteristic Situation 2' where basic gas protection measures will be required.
	Lateral and vertical migration of leachable contaminants in groundwater to surface water receptors	Surface Water: Drainage ditch adjacent to north of Site	Medium	Unlikely	Low Risk	Water quality of the drainage ditch has not been confirmed by sampling and analysis, however it is not considered likely that groundwater from the Site would impact the drainage ditch adjacent to the north as the inferred groundwater flow direction across the Site is to the south east, away from the drainage ditch. No other surface waters are present within 1 km of the Site. In addition, exceedances of the AA-EQS detected are not considered significant because there are either limited, associated to background concentrations or very conservative screening criteria.

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
	Lateral and vertical migration of leachable contaminants to groundwater	Groundwater: Secondary A Aquifers (Alluvium & Taplow Gravels)	Mild	Likely	Moderate/ Low Risk	Contaminants within the groundwater are present in Made Ground soils; it is therefore likely these contaminants are leaching from an on-site source within the Made Ground. However, the low resource potential of the alluvium aquifer reduces its sensitivity. Nonetheless soil concentrations of ammoniacal nitrogen and benzo(a)pyrene are likely the source of groundwater concentrations detected in the Alluvium.
		Groundwater: Principal Aquifer (Seaford Chalk Formation and Newhaven Chalk Formation)	Medium	Low Likely	Moderate / Low Risk	Contaminants within the groundwater are present in Made Ground soils; it is therefore likely these contaminants are leaching from an on-site source within the Made Ground. However, due to the proposed development significantly reducing infiltration rates, and Made Ground soils being removed in garden areas, the likelihood of these contaminants leaching to the chalk aquifer will be reduced.

10. GEOTECHNICAL TEST RESULTS AND MATERIAL PROPERTIES

The ground conditions are given in the exploratory hole logs presented in **Appendix C**. The proven thickness of each stratum is summarised in Chapter 5. Where appropriate, geotechnical characteristic values are reported. These values have been selected based on test results, or from derived values obtained from appropriate literature, empirical relationships and/or correlations.

10.1. MADE GROUND

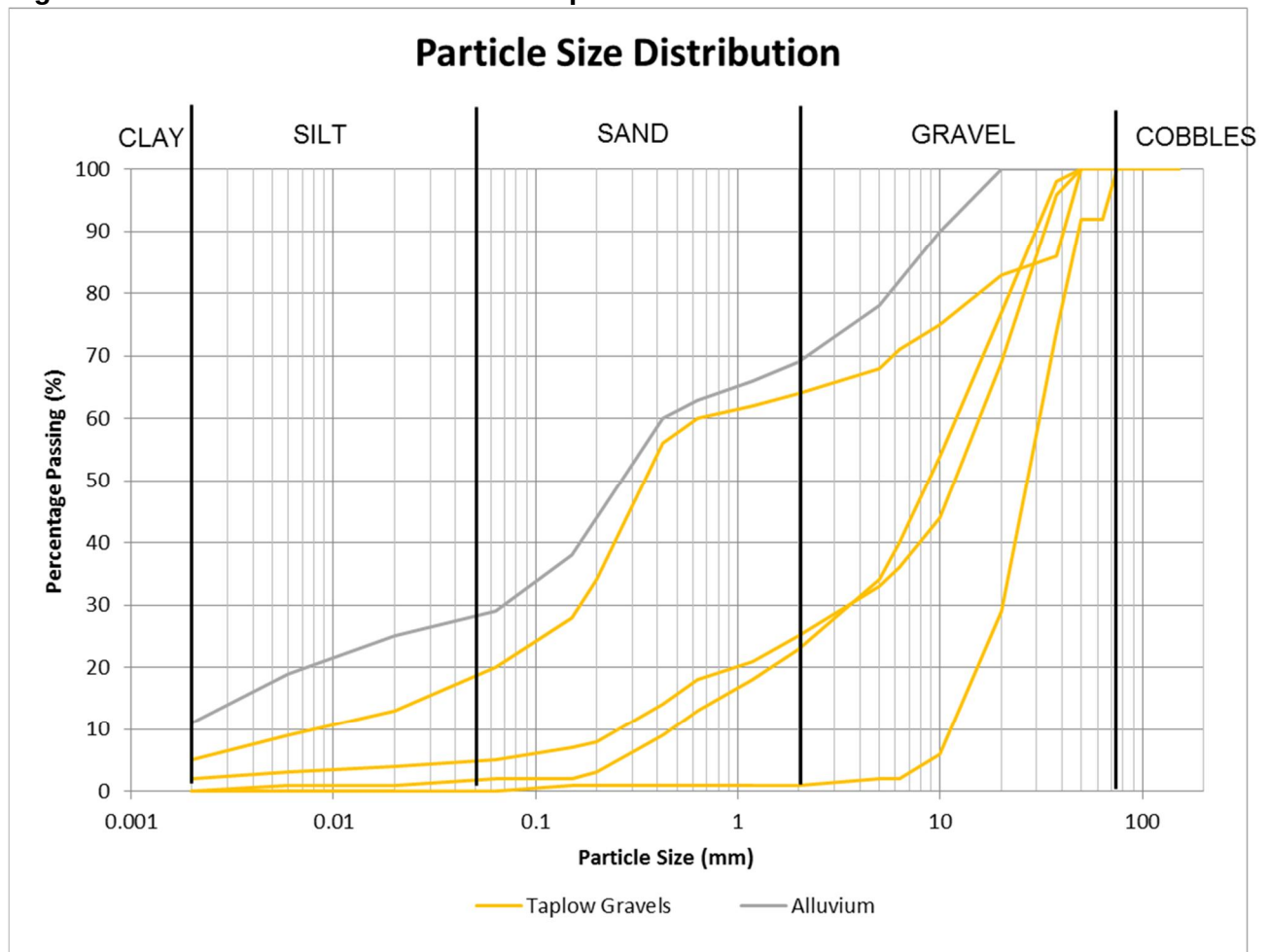
No geotechnical testing was undertaken in the Made Ground at the Site and due to the high variability of the ground, no material parameters have been selected for this material.

10.2. ALLUVIUM

PARTICLE SIZE DISTRIBUTION

One Particle Size Distribution tests (PSD) were carried out on a single sample of the Alluvium. The grading curves are presented in **Figure 10-1**.

Figure 10-1 - PSD for Alluvium and the Taplow Gravels.

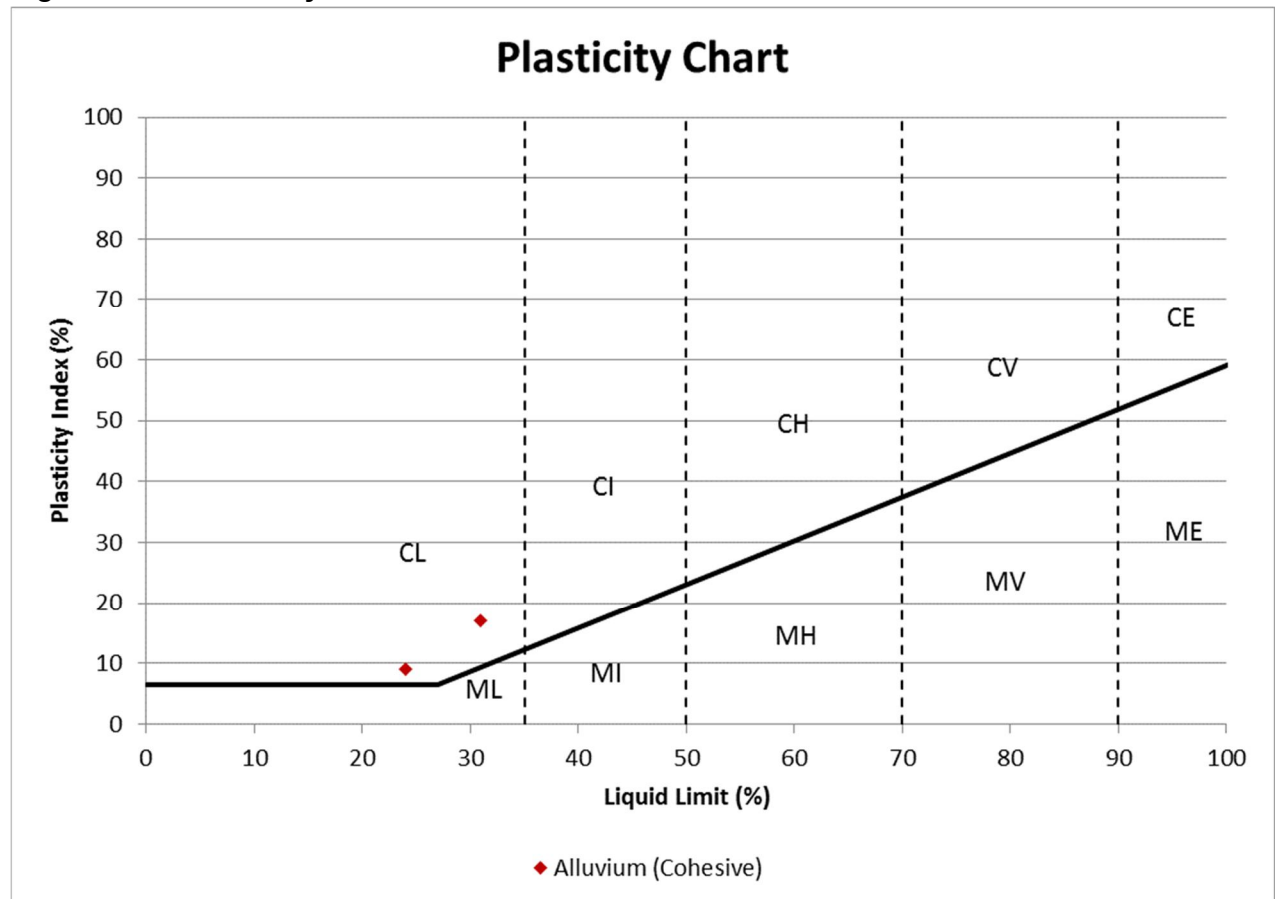


Based on the PSD tests, the granular Alluvium was found to consist of silty very gravelly SAND.

ATTERBERG LIMITS AND MOISTURE CONTENT

Atterberg limits testing showed a plastic limit between 14 and 15 and the plasticity index (PI = PL – LL) was found to vary between 9 and 17. **Figure 10-2** shows the results of this testing, indicating the cohesive Alluvium to be classified as a low plasticity CLAY (CL), as defined in BS5930 ([1]).

Figure 10-2 - Plasticity chart for cohesive Alluvium.

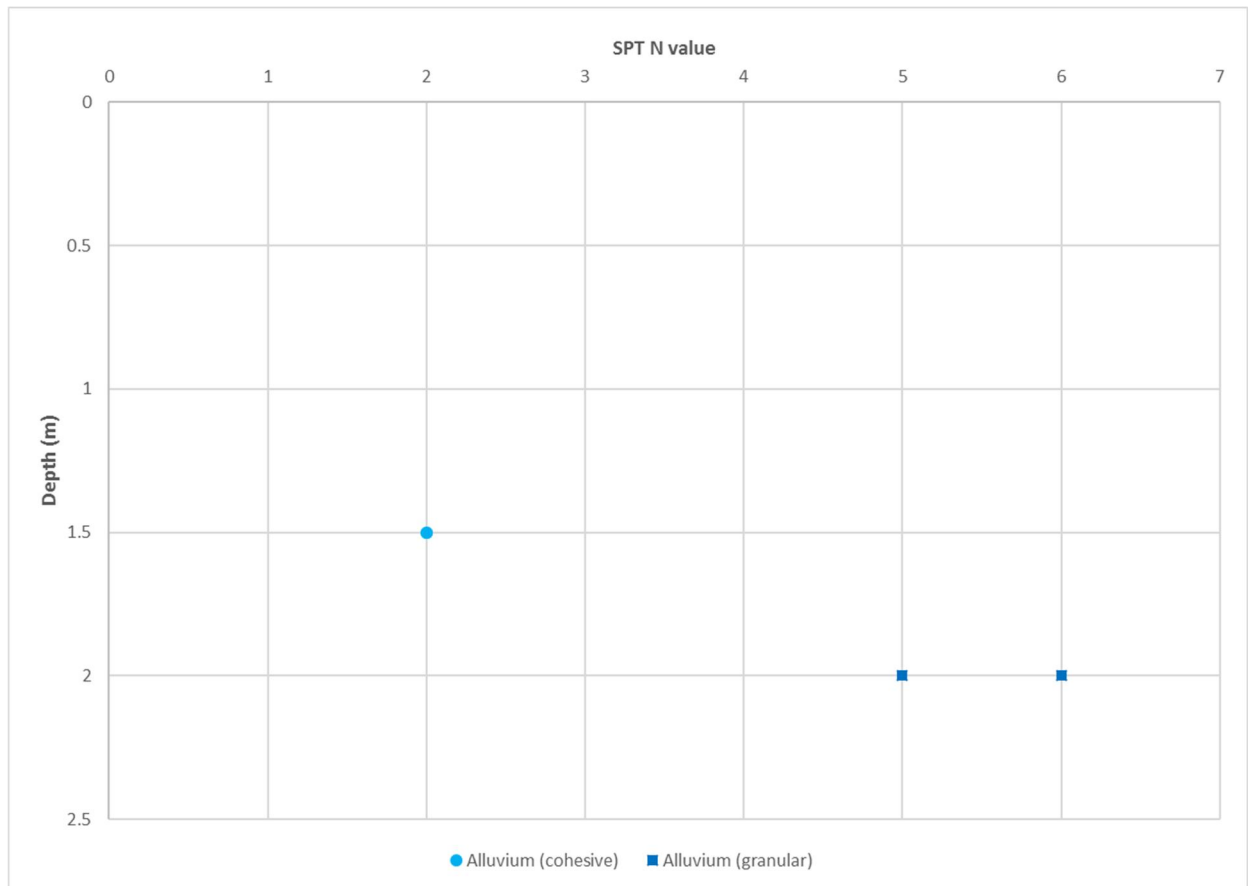


Two samples of the Alluvium were tested for Moisture Content. The results ranged between 19.6% to 28%.

SPT 'N' VALUES

Figure 10-3 shows uncorrected SPT N values vs depth below ground level profile for the Alluvium. Uncorrected SPT N values range from 2 to 6.

Figure 10-3 - SPT chart for Alluvium.



UNDRAINED SHEAR STRENGTH

Using Stroud's (1974) Ref [2] relationship ($c_u = f_1 N$ (kN/m²)) between uncorrected SPT N value and undrained shear strength, applying a correlation factor of 7 gives an undrained shear strength value of 14 for the Cohesive Alluvium.

BRE TESTING

One sample of the Alluvium was tested for buried concrete according to BRE Special Digest 1 [3] and found that buried concrete should be designed to Design Class 1 (DS-1), Aggressive Chemical Environment Classification 1 (AC1).

10.3. TAPLOW GRAVELS

PARTICLE SIZE DISTRIBUTION

One sample from the Taplow Gravels was tested for Particle Size Distribution. The results are presented in **Figure 10-1** above and indicates that this material consists of predominantly sandy Gravel.

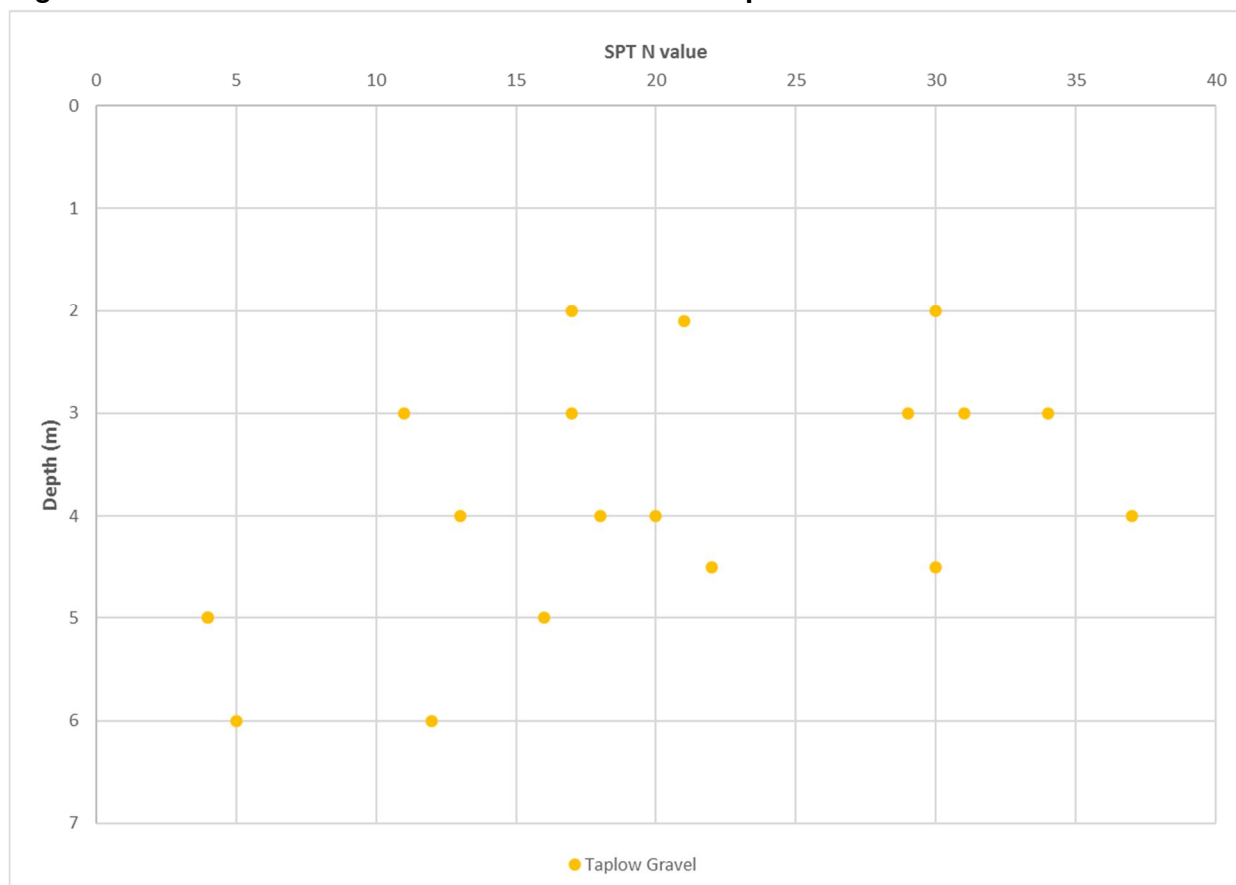
MOISTURE CONTENT

Four samples of the Taplow Gravel were tested for natural moisture content with values ranging from 7.4% to 20.2%.

STANDARD PENETRATION TESTS

Nineteen standard penetration test results were obtained within the Taplow Gravels. These ranged from 4 to 37, indicating a loose to very dense Gravel. The results are presented in **Figure 10-4**.

Figure 10-4 - Uncorrected SPT N values within the Taplow Gravels.



BRE TESTING

Four samples of the Taplow Gravels were tested for buried concrete according to BRE Special Digest 1 [3] and found that buried concrete should be designed to Design Class 1 (DS-1), Aggressive Chemical Environment Classification 1 (AC1).

10.4. STRUCTURELESS UPPER CHALK

SATURATED MOISTURE CONTENT & DRY/BULK DENSITY

Three tests were undertaken within the upper Chalk with results for saturated moisture content ranging between 25 and 26. The Bulk Density results were very consistent, ranging from 20.0 to 20.1 kN/m³. Dry density results were also very consistent, ranging from 16.0 to 16.1 kN/m³. The results for porosity were found to be 41%.

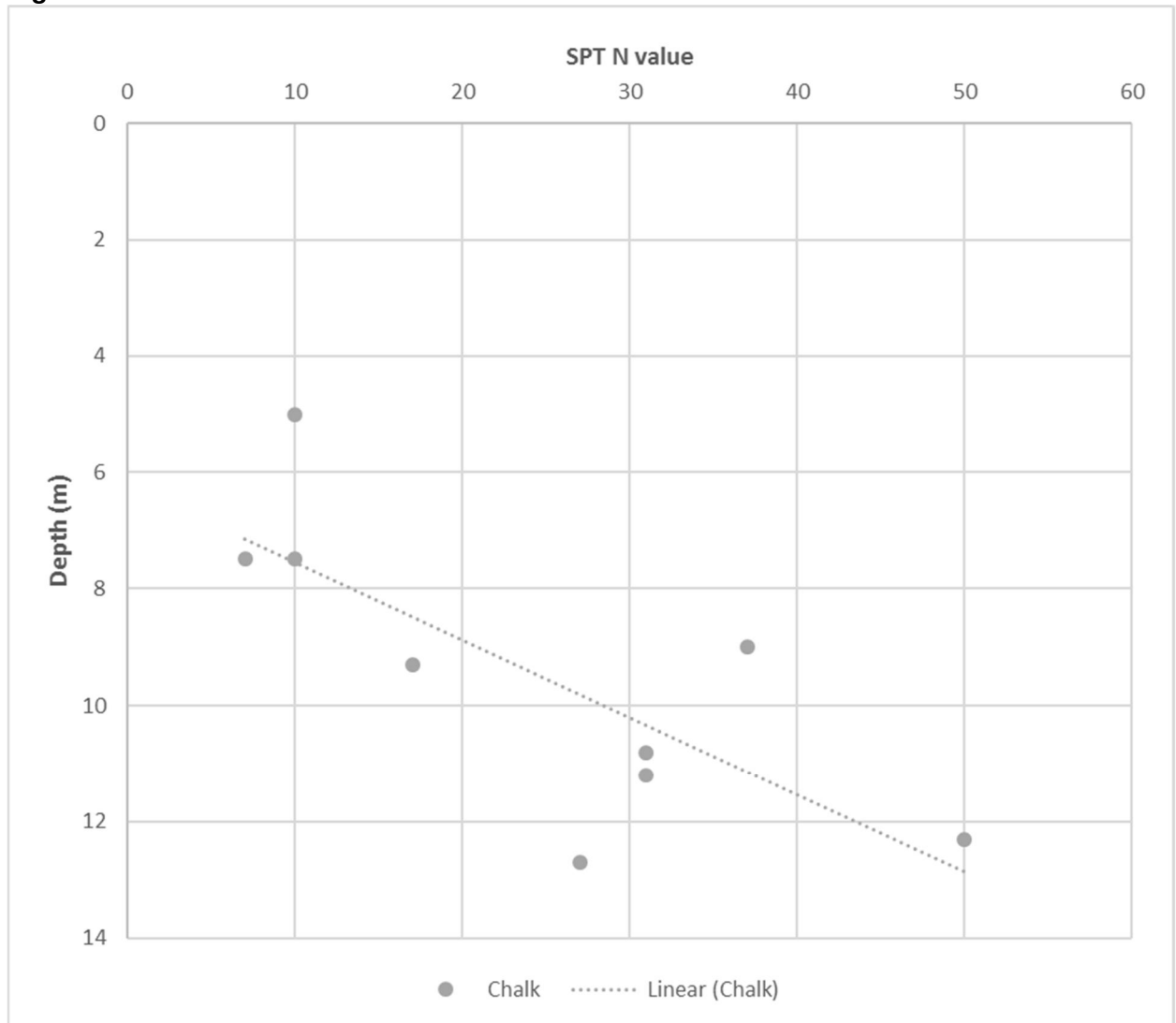
Based on these results the structureless Chalk can be classified as medium density. (Figure 5.5 Ciria 574 [4]).

STANDARD PENETRATION TESTS

Nine Standard Penetration tests were undertaken within the Structureless Chalk, as presented in **Figure 10-5**. These ranged between 7 and 50, with generally an increase in N value with depth.

Based on experience of similar rocks, it is considered likely that the high N values are due to the presence of “clasts” and “flints” within the chalk matrix.

Figure 10-5 - SPT N values within the Structureless Chalk.



BRE TESTING

Three samples of the Upper Chalk were tested for buried concrete according to BRE Special Digest 1 [3] and found that buried concrete should be designed to Design Class 1 (DS-1), Aggressive Chemical Environment Classification 1 (AC1).

10.5. SUMMARY OF CHARACTERISTIC GEOTECHNICAL PARAMETERS

	Material Parameter	Characteristic Value	Rationale
Made Ground	Unit weight (γ)	No geotechnical testing undertaken within Made Ground.	
	Internal Angle of Friction (ϕ'_{cv}) ($^\circ$)		
	Effective Cohesion (c')		
	Undrained shear strength (c_u)		
Alluvium	Unit weight (γ)	18 kN/m ³	Figure 1 from BS8002:2015 [5].
	Undrained shear strength (c_u)	22 kN/m ²	Correlations from Stroud's relationship between SPT N value Ref [2].
Taplow Gravels	Unit weight (γ)	18 kN/m ²	Figure 1 from BS8002:2015 [5].
	Undrained shear strength (c_u)	-	-
Structureless Chalk	Bulk Density (kN/m ³)	20 kN/m ²	From Saturated Moisture Content testing.
	Dry Density (kN/m ³)	16 kN/m ³	
	Saturated Moisture Content (W_s)	25%	From Site testing.

11. PRELIMINARY GEOTECHNICAL ASSESSMENT

This Section of the report provides a high level, preliminary geotechnical engineering assessment in relation to the proposed works. WSP understands that the Client would like to redevelop the land for residential purposes. The current development plans are expected to comprise a 2-storey residential building with bin and cycle storage in the north, and a shared garden space in the west of the Site.

At present, information pertaining to proposed structural loads, foundation levels and settlement tolerances are yet to be provided. From geotechnical testing of the superficial deposits, it was found that foundations must not be founded in Made Ground or soft Alluvial deposits due to their low strength, the potential for settlement (including differential settlement) and the presence of high groundwater (depths ranging between 1.8 and 2.4 m bgl).

Considering the ground conditions, it is recommended that either ground improvement by vibro stone columns founded onto the Taplow Gravel or piling into the Seafood Chalk Formation and Newhaven Chalk Formation is to be undertaken as the founding solution for the proposed development.

11.1. GROUND IMPROVEMENT BY VIBRO STONE COLUMNS

The technique is generally used to improve a wide range of fill and weak natural soils to provide an economic foundation solution such as strip and pad foundations. The technique comprises a vibrating 'poker' penetrating the ground and displacing the soils to produce a cavity to a design depth through loose or weak ground onto a competent bearing stratum, in this case the Taplow Gravel. The poker is then withdrawn and at the same time the cavity filled with hard inert graded stone. The stone is introduced in successive layers compacted by the vibrating poker at each layer forming a column of stone that is tightly interlocked with the surrounding ground.

The reinforcing action of the stone columns serves to significantly improve the load bearing characteristics of the ground. A specialist contractor normally undertakes the design of the stone columns. It is likely that a bearing pressure of typically around 125kN/m² will be achieved using this technique, although higher values can be achieved if desired.

The foundations could be constructed at a shallow depth using conventional pad or strip foundations constructed off the improved soil. The settlement of pad foundations constructed off the vibro improved soil will be dependent on the layout of the columns beneath the footings.

It is noted that the Made Ground and Alluvium is very soft in places with SPT N values as low as N=2. The vibro replacement stone column contractor may wish to excavate additional trial pits at the Site to inspect the organic content of the alluvial deposits and confirm its suitability for treatment.

If vibro replacement stone columns are to be adopted then it is essential that any voids arising from the demolition works are backfilled with suitable materials and any general "turning over" of the Site is carefully controlled, particularly in areas where Made Ground materials are cohesive. The use of unsuitable backfill and/or poor control of

the works may have a significant and adverse effect on the performance of stone columns and it is strongly recommended that the advice of a ground improvement specialist is obtained prior to any demolition works.

It is understood that there is a possibility that a foul sewer is to be retained through the Site and the proposed building will be constructed over the sewer. If this is the case, the use of vibro stone columns should be revisited. It may be that the asset owner (Thames Water) will restrict foundations within close proximity to the sewer or will restrict the type of construction technique, such as vibratory methods. If this is the case a piled foundation may be the most appropriate.

11.2. FLOOR SLABS

Should the vibro stone columns be extended across the footprint of the building, ground bearing floor slabs are suitable. However, given the proposed development proposals comprising low rise residential units, most modern houses are built with a beam and block floor, for speed and quality control during construction, which is a form of suspended slab.

11.3. PRELIMINARY INDICATIVE PILE DESIGN

A preliminary pile design was undertaken following receipt of ground investigation testing & information. It was found that 450mm diameter piles to approximately 12m depth may be suitable assuming design actions of 450 kN. Table 11-1 presents the results from this indicative pile design.

- The design has assumed the following:
- Use of 450mm Continuous Flight Augering (CFA) piles
- No lateral loads applied
- No allowance for negative skin friction

Table 11-1 – Table presenting results from the preliminary pile design following general methodology from CIRIA 574 Engineering in Chalk [6].

Pile Toe Depth (m bgl)	Design Capacity DA1 C2 (kN)
6	154
7	185
8	235
9	262
10	348
11	379
12	525

11.4. CALIFORNIAN BEARING RATIO – MADE GROUND

Any pavement construction associated with the proposed building are expected to be constructed on top of the Made Ground. The Made Ground is described as gravelly silty SAND, and sandy slightly gravelly SILT with occasional cobbles.

At present, no CBR testing was undertaken at the Site. A conservative estimate for a CBR value within the granular Made Ground would be 5% [7]. If, during construction the formation level encounters the clays or silts of the Made Ground or Alluvium then a CBR value of 2% is recommended. In addition, if localised soft spots are encountered during construction these should be excavated out and replaced with granular fill and compacted.

11.5. SOAKAWAY

Any soakaway drainage is not considered feasible due to the high groundwater (up to 1.8 m bgl).

11.6. GEOTECHNICAL CONSTRAINTS

The following constraints have the potential to influence future construction and design works.

Geotechnical Constraints	Comments
Lateral changes in shallow geology	The Made Ground thickness was recorded to be variable, ranging from 0.9 to 1.7 m bgl. The Alluvium has been recorded in all exploratory holes with thicknesses ranging from 1.7 and 3.8m.
Structureless chalk on-site	The reviewed information indicates the chalk stratum across the Site generally comprises structureless chalk (Grade Dc/Dm) at the top of the unit. No structured Chalk has been penetrated as part of the ground investigation to date. The chalk is typically medium dense.
Foul Sewer	A foul sewer drain is present running across the Site. From preliminary surveys it is believed to be between 2.5 and 3.5 m depth. It is understood that the loads from the proposed development will require to be transferred to the underlying ground without any impact on these sewers. Foundation methods such as Vibro Stones columns may be too detrimental to the integrity of this sewer due to the use of vibrational techniques.
Dissolution features and cavities in Chalk	Although, the risk of ground dissolution at the Site was estimated to be very low in the Groundsure report [8], this same report recorded 27 natural cavities over 500m away from the Site. These cavities recorded have been found within the Taplow Gravel & Chalk Group and could be an explanation of the low SPT values encountered within these strata during the Ground Investigation undertaken at this Site.
Ground dissolution / mining	Due to the presence of Chalk, ground dissolution is a risk at the Site.

Loose/Compressible Ground	The Made Ground and Alluvium soils are considered to be potentially compressible.
Excavations	Any Made Ground or superficial soils present have been identified as variable, with the potential to be soft and/or loose and therefore unstable in excavations. Any deep excavations will require support.
Material re-use	It is anticipated that the arisings from deep excavations could be selectively re-used beneath the Site, subject to testing.
Shallow Groundwater	Based on a limited number of groundwater monitoring visits, groundwater is understood to be present between 1.88 and 2.24 m bgl. Any excavation below this will require dewatering.
Non-recovery of material during GI	The ground investigation to date has found a number of non-recovery of samples within the structureless chalk. Piling contractors are to be aware of this voiding and this risk needs to be managed by the presence of a competent piling Contractor on Site.
Insufficient ground information for design	The ground investigation to date proves the ground down to 12.75 m bgl. If any high-rise building is expected to be built this is considered insufficient for appropriate pile design. A competent piling Contractor will be required during any piling works to ensure this risk is managed.

12. CONCLUSIONS AND RECOMMENDATIONS

12.1. SITE INVESTIGATION SUMMARY

An intrusive ground investigation has been carried out at George Street, Reading, in relation to the proposed residential redevelopment of the Site in order to assess risks from soil, groundwater and ground gas to the identified receptors, and to provide an overview of potential geotechnical constraints.

ACMs were identified (and subsequently proven through laboratory analysis) on the surface of the Site. Loose asbestos fragments were removed by the Client's specialist asbestos contractor.

Ground conditions comprise Made Ground (to a maximum depth of 1.7 m bgl), underlain by superficial deposits of Alluvium and Taplow Gravels. Bedrock geology comprises Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated), the head of which was encountered between 4.1 and 7.0 m bgl. Groundwater strikes were recorded between 1.50 - 4.85 m during the drilling works. Resting groundwater at the Site is between 1.84-2.27 m bgl.

Visual and olfactory evidence of hydrocarbon contamination was noted at the groundwater level in the Alluvium in four of the six exploratory locations during drilling works. Evidence was first noted between 1.6-2.0 m bgl at the groundwater level smear zone, and extended to depths between 2.2-5.0 m bgl. During the groundwater monitoring, visual and olfactory contamination impact was noted in one location in the northeast of the Site (WS005). No visual or olfactory evidence of contamination was noted in the southeast of the Site. Soil and groundwater samples were analysed for a suite of determinands and ground gas monitoring was carried out at the Site.

Standard Penetration Tests have found that the granular Alluvium ranges from very soft cohesive material to medium dense granular, the Taplow Gravel from loose to Dense, and saturated moisture content tests indicate the Upper Chalk to be of medium density, although SPT results within the Upper Chalk indicate SPT N values between 7 and 50. Overall, results from in-situ and laboratory testing indicate a high degree of variability in strength within the various materials encountered on Site. No geotechnical laboratory or Site testing was undertaken within the Made Ground due to its inherent variability.

12.2. RISK ASSESSMENT & EVALUATION

Results of the human health GQRA showed that soil concentrations exceeded the assessment criteria derived for a residential end use with plant uptake for various metals, PAHs and TPHs. All exceedances were found in the Made Ground, with the exception of TPHs identified in the upper Alluvium in WS005 where evidence of hydrocarbon staining was identified.

Potential unacceptable risks (i.e. moderate / low risk or higher) have been determined to human health receptors from:

- Asbestos, TPH, PAH and metals within the Made Ground; and

- Ground gas (carbon dioxide).

Ground workers would be at risk of exposure, and suitable control measures would be required to protect construction/ground workers, therefore they have not been considered as part of this risk assessment.

A risk from direct contact of contaminated soil within the Made Ground to drinking water supply pipes has also been identified.

The results of the controlled waters GQRA showed that groundwaters exceeded the assessment criteria for various metals, PAHs and ammoniacal nitrogen. Exceedances of the criteria for the protection of the surface waters was considered very conservative given that the adjacent drain is not likely to be a receptor.

Potential unacceptable risks (i.e. moderate / low risk or higher) to the identified aquifers (Secondary A Aquifer, Principal Aquifer) are considered to be associated with the identification of ammoniacal nitrogen and benzo(a)pyrene in exceedance of the DWS.

12.3. ENVIRONMENTAL RECOMMENDATIONS

The following recommendations in relation to the contamination identified on Site will render the Site suitable for the proposed residential use.

Planning Requirements

This Phase 2 Assessment will satisfy Planning Condition No. 10. A Remediation Scheme which is required to fulfil Planning Condition No. 11, which should include remediation objectives, remediation criteria, appraisal of remediation options, proposal of the preferred option, a timetable of the works and Site management procedures.

Planning Condition No. 12 will be satisfied by the implementation of the remediation works detailed in the remediation scheme, and the production of a validation report which demonstrates the effectiveness of the remediation carried out.

Human Health - Soils

Mitigation measures will need to be implemented to reduce risks posed by contaminants within the Made Ground and ground gas to render the Site suitable for a residential end use. Contaminants identified within the Made Ground below the proposed building footprint will not pose a risk to human health receptors as there is no viable pathway for the contaminants. Therefore, mitigation and remediation measures are only required in garden areas where a potential pathway exists based on the proposed development and a residential end use.

It is recommended that 600 mm of Made Ground soils are removed from garden areas (i.e. where a pathway exists) and provision of 600mm of clean capping layer is imported (assuming Site levels are to remain as per predevelopment level). This approach was in line with the BRE guidance document 'Cover Systems for Land Regeneration' which considers that soil disturbance or intermixing of the soil is unlikely to occur at depths of greater than 600 mm.

Any earthworks on-site would need to be undertaken within an asbestos management plan (AMP). It should be noted that contaminants such as asbestos can be present in

soil in discrete pockets and any sampling frequency cannot guarantee the absence of contaminants of this nature in areas between sample locations. The Client should ensure that suitable precautions, controls and monitoring are in place during earthworks activities and suspicious materials should be managed through procedures defined by the Client, and in accordance with the Control of Asbestos Regulations 2012, the presence of asbestos within the Made Ground should be recorded within the post remediation/development AMP, to ensure the health and safety of all workers and future Site users, and to protect the environment from contamination.

Where Made Ground remains *in-situ* below the proposed development footprint, the use of alternative material for water supply pipes may be required in areas where Made Ground is present and in areas where hydrocarbon impact is present (i.e. from 1.6 m bgl) in the natural ground (however, it is unlikely that any services would be laid at this depth). This would be subject to requirements of the local water authority.

Human Health - Ground Gas & Vapours

The ground gas risk assessment has characterised the Site as 'Characteristic Situation 2' where basic gas protection measures will be required.

Controlled Waters

The GQRA identified potential risk to the aquifers from ammoniacal nitrogen and benzo(a)pyrene, however all detected exceedances are generic and they do not account for dilution or attenuation along the aquifer pathway.

Both contaminants have also been detected within the first meter of Made Ground. The observed contamination is presumed to be a passive input resulting from some previous activity that has now ceased i.e. has already entered the water environment and hence source terms should be depleting. Contaminant attenuation is also likely to take place within the groundwater because of retardation and biodegradation.

The proposed development will greatly reduce infiltration rates across ~75% of the Site owing to the construction of the housing and associated hard landscaping. This will presumably greatly reduce leaching potential of contamination from on-site soils to the aquifer. In addition, it is likely that Made Ground soil will be removed in garden areas, and from foundation locations, which will further reduce the source term.

Part 2A seeks to provide assistance in relation to the definition of "significant" to assist in avoiding disproportionate regulation being applied to contaminated land causing only trivial amounts of pollution to the water environment. It is considered reasonable to conclude that the isolated risks from benzo(a)pyrene and ammoniacal nitrogen following the proposed development will reduce to an acceptable level and that further level of assessment is not warranted.

Foundation Works Risk Assessment

A foundation risk assessment will be required to assess potential risks the aquifer from piled foundations.

12.4. PRE-CONSTRUCTION RECOMMENDATIONS

A summary of the pre-construction recommendations in relation to contamination discussed above are summarised as follows:

- Conduct a foundation risk assessment to assess potential risks the aquifer from piled foundations;
- Produce a 'Detailed Remediation Scheme' (Planning Condition No. 11);
- Provide an Asbestos Management Plan (AMP) prior to any earthworks on-site; and
- Consultation with local water authority for the requirement for alternative drinking water supply pipes.

12.5. GEOTECHNICAL RECOMMENDATIONS

From the ground investigation undertaken and associated in-situ and laboratory geotechnical testing it was determined that vibro stone columns is likely to be the most suitable and practical foundation method for the proposed residential development. However, due to the presence of the Foul Sewer below the proposed developments, the piling solution may be more suitable and less disruptive of this structure.

The preliminary pile design has found that 450mm Continuous Flight Augering (CFA) piles would be appropriate to a depth of approximately 12 m bgl, subject to detailed pile design by a competent piling Contractor.

12.6. DEVELOPMENT CONSTRAINTS

Based on the findings of the Site investigation and Phase 2 risk assessment, a number of geo-environmental and geo-technical risks and potential development constraints exist at the Site. These potential constraints are listed below and summarised within the accompanying preliminary geotechnical and contaminated land risk register in Table 12-1 overleaf.

Table 12-1: Preliminary Geotechnical and Contaminated Land Risk Register

	Design / construction risk	Consequence	Qualitative Risk Level (High / Medium / Low)	Possible Mitigation(s)
1	Asbestos containing materials (ACMs) fibres identified within soils across the site.	Risk to human life.	Medium to high	Incorporation of suitable thickness of clean cover / hard-standing to break exposure pathway to human health. Mitigation measures to be agreed with reading borough council. Asbestos management plan will be required (can form part of remedial strategy). Asbestos control measures will be required during any breaking of ground. Competent subcontractor to be appointed.
2	Shallow groundwater (1.13 m bgl) is recorded within alluvium beneath the site.	Inundation and instability of excavations. Impact to drainage solution. Reduced bearing capacities. Increased costs.	Medium to high	Allowance for dewatering during development with potential for contaminated groundwater. Use of plastic attenuation tanks as opposed to soakaways subject to agreement with key stakeholders.

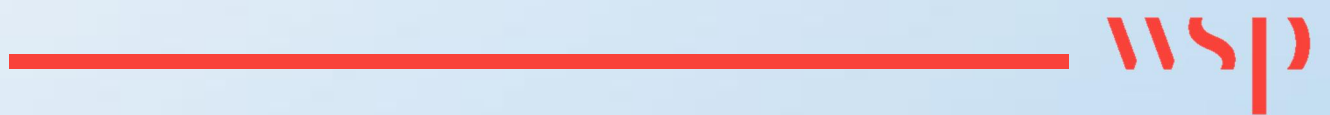
	Design / construction risk	Consequence	Qualitative Risk Level (High / Medium / Low)	Possible Mitigation(s)
3	Presence of contaminated soil and groundwater. Heavy metals, PAH's, hydrocarbons have been identified on-site within made ground, natural ground and groundwater.	Risk to human health and controlled water receptors. Generation of ground gas. Costs for disposal of unsuitable material. Financial and programme implications.	Medium to high	Completion of detailed quantitative controlled waters risk assessment (dqra) to confirm level of risks posed to the controlled waters environment. Should risk assessments confirm an unacceptable risk, excavation of impacted soil may be required. In worst case scenario, localised treatment of impacted groundwater may also be required. Incorporation of suitable thickness of clean cover / hard-standing to break exposure pathway to human health. Mitigation measures to be agreed with reading borough council. Incorporation of appropriate ground gas protection. Installation of appropriate level of water supply pipes and clean service corridors. A foundation risk assessment will be required to assess potential risks the aquifer from piled foundations. A waste management plan will be required for material requiring off-site disposal, including the disposal of contaminated piling arising.
4	Presence of made ground, relict foundations, shallow groundwater may result in variable and reduced bearing capacities and potential differential settlement.	Long term performance risk of buildings / infrastructure. Financial and programme implications.	High	Completion of a piling foundation risk assessment and piling specification. Suspended floor slab. Grubbing out / removal of relict foundations and / or filling of voids.
5	Sulphate attack on buried concrete.	Structural damage. Cost of repairs. Long term performance.	Low	Identified sulphate concentrations within soils and groundwater would not pose a risk of chemical attack to concrete foundations

	Design / construction risk	Consequence	Qualitative Risk Level (High / Medium / Low)	Possible Mitigation(s)
6	Unidentified contamination, over and above level of contamination identified to date	Risk to human health, controlled waters and structures. Requirement for soil, gas and groundwater remediation. Financial and programme implications.	Medium	Completion of additional soil and groundwater testing and assessment to confirm potential additional remediation requirements. Should controlled waters or human health risk assessment confirm an unacceptable risk, excavation of impacted soil should be undertaken, along with removal/treatment of impacted groundwater.
7	Buried services and utilities.	Structural damage. Reputational damage. Financial and programme implications.	Medium	Service clearance to be undertaken to identify buried services and utilities prior to any intrusive works. Risk assessments and permit to dig issued before intrusive works.
8	Unauthorised entry to work area by third party.	Risk to human life. Structural damage. Financial and programme implications. Reputational damage.	Medium	Work area to be safely secured/fenced to prevent unauthorised entry. Personnel to remain vigilant. Best working practice to be followed.
9	Construction sequence. Large vehicles/plant movement.	Risk to human life. Structural damage. Reputational damage.	Medium	Best working practice to be followed. Banksman to be used. Personal protective equipment to be worn. Personnel to remain vigilant. Construction activities to consider school hours.
10	Radon	The Groundsure report indicates that the site does not lie within a radon affected area, as defined by the Health Protection Agency (HPA). Less than 1% properties are above the action level and no radon protective measures are considered necessary for new properties	Low	Na

REFERENCES

- [1] BSI Standards Publication, "Code of practice for ground investigations," *BS 5930*, 2015.
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- [6] L. e. al., "Engineering in Chalk," *CIRIA 574*, 2002.
- [7] I. A. N. 7. Rev01, "Design guidance for road pavement Foundations," 2009.
- [8] Groundsure, "Geo Insight - GS-3842110," 2017.

Tables



<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

						BH001	BH002	WS002	WS003	WS005	BH001	BH002	WS002	WS003	WS005
George Street Reading						17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019
Test	Units	LOD	Max	EQS	DWS										
Inorganics															
pH	pH Units	<1	8.08	-	-	7.72	7.81	8.08	8.01	7.76	7.43	7.74	7.54	7.43	7
Ammoniacal Nitrogen as NH4	µg/l	<300	2560.00	-	500	<300.000	<300.000	<300.000	<300.000	1450	330	<300.000	<300.000	<300.000	2560
Ammoniacal Nitrogen as N	µg/l	<200	1990.00	-	-						257	<200.000	<200.000	<200.000	1990
Ammoniacal Nitrogen as N - Calculated	µg/l		1127.78	-	-	<233.333	<233.333	<233.333	<233.333	1127.8					
free ammonia (calculated)	µg/l		3.24	200	-	<0.470	<0.470	<0.380	<0.380	1.835	0.518	0.403	0.325	0.325	3.238
Cyanide, Total	µg/l	<50	50.00	-	-	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000
Cyanide, Free	µg/l	<50	50.00	1	-	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000
Cyanide, Complex	µg/l	<50	50.00	-	-	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000	<50.000
Sulphate as %SO4	%	<0.0002	0.02	-	-	0.00984	0.0082	0.00792	0.00819	0.0208	0.00869	0.0086	0.00685	0.0073	0.0152
Nitrate as N	µg/l	<20	6240.00	-	-	5950	6050	4760	4960	910	1500	5140	6240	5300	<20.000
Filtered (Dissolved) Metals															
Chromium, Hexavalent	µg/l	<30	30.00	3.4	-	<30.000	<30.000	<30.000	<30.000	<30.000	<30.000	<30.000	<30.000	<30.000	<30.000
Mercury (diss.filt)	µg/l	<0.01	0.02	0.07	1	<0.010	0.0163	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (diss.filt)	µg/l	<0.5	13.40	50	10	0.648	<0.500	<0.500	<0.500	5.22	0.634	<0.500	<0.500	<0.500	13.4
Barium (diss.filt)	µg/l	<0.2	149.00	-	700	69	52.9	53	51.8	95.4	118	57.2	46.5	52.2	149
Beryllium (diss.filt)	µg/l	<0.1	0.10	-	12	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Boron (diss.filt)	µg/l	<10	472.00	2000	1000	214	203	179	184	375	237	206	163	170	472
Cadmium (diss.filt)	µg/l	<0.08	0.08	0.08	5	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080
Chromium (diss.filt)	µg/l	<1	15.70	-	50	4.51	3.72	7.68	6.34	<1.000	1.65	5.72	15.7	7.86	<1.000
Copper (diss.filt)	µg/l	<0.3	0.88	1	2000	<0.300	<0.300	<0.300	<0.300	<0.300	0.551	0.881	0.412	<0.300	<0.300
Lead (diss.filt)	µg/l	<0.2	0.29	1.2	10	<0.200	0.294	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel (diss.filt)	µg/l	<0.4	22.80	4	20	11.8	7.98	6.97	4.31	15.6	8.46	6.78	3.8	5.08	22.8
Selenium (diss.filt)	µg/l	<1	2.45	-	10	<1.000	<1.000	<1.000	2.43	2.45	<1.000	<1.000	1.29	1.13	1.13
Vanadium (diss.filt)	µg/l	<1	1.00	20	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Zinc (diss.filt)	µg/l	<1	14.40	10.9	-	7.18	14.4	4.72	1.65	2.75	4.64	3.72	2.65	3.15	9.81
Hardness, Total as CaCO3	µg/l	<650	573000.00	-	-	409000	401000	405000	384000	555000	371000	389000	373000	358000	573000
Phenols															
Resorcinol (low level)	µg/l	<0.5	4.87	-	-	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	4.87
Catechol (low level)	µg/l	<0.5	0.50	-	-	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Phenol (low level)	µg/l	<0.5	0.81	-	-	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	0.81
Cresols (low level)	µg/l	<0.5	0.50	-	-	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Xylenols (low level)	µg/l	<0.5	6.20	-	-	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	6.2
1-Naphthol (low level)	µg/l	<0.5	1.86	-	-	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.86
2,3,5-Trimethylphenol (low level)	µg/l	<0.5	1.69	-	-	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	1.69
2-Isopropylphenol (low level)	µg/l	<0.5	7.72	-	-	<0.500	<0.500	<0.500	<0.500	1.77	<0.500	<0.500	<0.500	<0.500	7.72

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

						BH001	BH002	WS002	WS003	WS005	BH001	BH002	WS002	WS003	WS005
George Street Reading						17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019
Test	Units	LOD	Max	EQS	DWS										
TPH Criteria Working Group (TPH CWG)															
GRO Surrogate % recovery**	%		106.00	-	-	106	100	101	105	97	90	94	103	97	92
GRO >C5-C12	µg/l	<50	202.00	-	-	<50.000	<50.000	<50.000	<50.000	202	109	<50.000	<50.000	<50.000	117
Aliphatics >C5-C6	µg/l	<10	10.00	-	15000	<10.000	<10.000	<10.000	<10.000	<10.000	10	<10.000	<10.000	<10.000	10
Aliphatics >C6-C8	µg/l	<10	26.00	-	15000	<10.000	<10.000	<10.000	<10.000	<10.000	26	<10.000	<10.000	<10.000	22
Aliphatics >C8-C10	µg/l	<10	16.00	-	300	<10.000	<10.000	<10.000	<10.000	14	16	<10.000	<10.000	<10.000	12
Aliphatics >C10-C12	µg/l	<10	100.00	-	300	<10.000	<10.000	<10.000	<10.000	100	28	<10.000	<10.000	<10.000	39
Aliphatics >C12-C16 (aq)	µg/l	<10	141.00	-	300	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	141
Aliphatics >C16-C21 (aq)	µg/l	<10	208.00	-	-	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	208
Aliphatics >C21-C35 (aq)	µg/l	<10	116.00	-	-	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	116
Total Aliphatics >C12-C35 (aq)	µg/l	<10	465.00	-	-	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	465
Aromatics >EC5-EC7	µg/l	<10	10.00	10	1	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000
Aromatics >EC7-EC8	µg/l	<10	10.00	74	700	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000	<10.000
Aromatics >EC8-EC10	µg/l	<10	11.00	20	500	<10.000	<10.000	<10.000	<10.000	<10.000	11	<10.000	<10.000	<10.000	<10.000
Aromatics >EC10-EC12	µg/l	<10	67.00	2	90	<10.000	<10.000	<10.000	<10.000	57	18	<10.000	<10.000	<10.000	26
Aromatics >EC12-EC16 (aq)	µg/l	<10	195.00	2	90	<10.000	<10.000	<10.000	<10.000	35	46	<10.000	<10.000	<10.000	195
Aromatics >EC16-EC21 (aq)	µg/l	<10	133.00	0.1	90	<10.000	<10.000	<10.000	<10.000	30	22	<10.000	<10.000	<10.000	133
Aromatics >EC21-EC35 (aq)	µg/l	<10	162.00	0.022	90	<10.000	<10.000	<10.000	<10.000	<10.000	23	19	<10.000	162	47
Total Aromatics >EC12-EC35 (aq)	µg/l	<10	375.00	-	-	<10.000	<10.000	<10.000	<10.000	65	91	19	<10.000	162	375
Total Aliphatics & Aromatics >C5-35 (aq)	µg/l	<10	957.00	-	-	<10.000	<10.000	<10.000	<10.000	268	200	19	<10.000	162	957
Polyaromatic Hydrocarbons (PAHs)															
Naphthalene (aq)	µg/l	<0.01	0.10	2	-	<0.010	<0.010	0.0123	0.0284	0.0653	0.0286	<0.010	<0.010	<0.010	0.0995
Acenaphthene (aq)	µg/l	<0.005	1.52	-	-	<0.005	<0.005	<0.005	<0.005	0.0303	0.412	<0.005	<0.005	<0.005	1.52
Acenaphthylene (aq)	µg/l	<0.005	0.17	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.0358	<0.005	<0.005	<0.005	0.173
Fluoranthene (aq)	µg/l	<0.005	0.10	0.12	-	<0.005	0.0118	<0.005	0.0118	<0.005	0.038	0.0201	<0.005	0.0135	0.103
Anthracene (aq)	µg/l	<0.005	0.09	0.1	-	<0.005	0.00622	<0.005	<0.005	<0.005	0.00705	<0.005	<0.005	<0.005	0.0945
Phenanthrene (aq)	µg/l	<0.005	0.41	-	-	<0.005	<0.005	<0.005	0.00846	<0.005	0.091	<0.005	<0.005	<0.005	0.412
Fluorene (aq)	µg/l	<0.005	2.51	-	-	<0.005	<0.005	<0.005	<0.005	0.0249	0.634	<0.005	<0.005	<0.005	2.51
Chrysene (aq)	µg/l	<0.005	0.03	-	-	<0.005	0.00629	<0.005	<0.005	<0.005	0.0148	0.0107	<0.005	<0.005	0.0266
Pyrene (aq)	µg/l	<0.005	0.20	-	-	<0.005	0.0121	<0.005	0.0128	0.00982	0.0488	0.0201	0.00548	0.0192	0.197
Benzo(a)anthracene (aq)	µg/l	<0.005	0.03	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00624	<0.005	<0.005	0.0252
Benzo(b)fluoranthene (aq)	µg/l	<0.005	0.03	-	-	<0.005	0.0114	<0.005	0.0126	<0.005	0.0314	0.0245	<0.005	0.0143	0.026
Benzo(k)fluoranthene (aq)	µg/l	<0.005	0.01	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.0135	0.0129	<0.005	0.00687	0.00937
Benzo(a)pyrene (aq)	µg/l	<0.002	0.0187	0.022	0.01	<0.002	0.00674	<0.002	0.00714	<0.002	0.0187	0.018	<0.002	0.00972	0.0172
Dibenzo(a,h)anthracene (aq)	µg/l	<0.005	0.01	-	-	<0.005	0.00672	<0.005	0.00932	<0.005	0.00525	<0.005	<0.005	<0.005	<0.005
Benzo(g,h,i)perylene (aq)	µg/l	<0.005	0.02	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.00548	<0.005	<0.005	<0.005	0.0174
Indeno(1,2,3-cd)pyrene (aq)	µg/l	<0.005	0.01	-	-	<0.005	0.0102	<0.005	0.0123	<0.005	0.0135	0.0103	<0.005	0.00822	0.0108
PAH sum of 4 (calculated)			0.06	-	0.1	<0.020	0.0316	<0.020	0.0349	<0.020	0.06388	0.0527	<0.020	0.03439	0.06357
PAH, Total Detected USEPA 16 (aq)	µg/l	<0.082	5.24	-	-	<0.082	<0.082	<0.082	0.103	0.13	1.4	0.123	<0.082	<0.082	5.24
Semi-Volatile Organic Compounds (SVOCs)															
1,2,4-Trichlorobenzene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2-Dichlorobenzene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,3-Dichlorobenzene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,4-Dichlorobenzene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2,4,5-Trichlorophenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2,4,6-Trichlorophenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2,4-Dichlorophenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2,4-Dimethylphenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2,4-Dinitrotoluene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2,6-Dinitrotoluene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2-Chloronaphthalene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2-Chlorophenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

						BH001	BH002	WS002	WS003	WS005	BH001	BH002	WS002	WS003	WS005
George Street Reading						17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019
Test	Units	LOD	Max	EQS	DWS										
2-Methylnaphthalene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2-Methylphenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2-Nitroaniline (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2-Nitrophenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
3-Nitroaniline (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Bromophenylphenylether (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Chloro-3-methylphenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Chloroaniline (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Chlorophenylphenylether (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Methylphenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Nitroaniline (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Nitrophenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Azobenzene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Acenaphthylene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Acenaphthene (aq)	µg/l	<1	1.30	-	-	<1.000		<1.000		1.3	<1.000	<1.000	<1.000	<1.000	1.14
Anthracene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
bis(2-Chloroethyl)ether (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
bis(2-Chloroethoxy)methane (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
bis(2-Ethylhexyl) phthalate (aq)	µg/l	<2	15.70	-	-	<2.000		<2.000		<2.000	2.66	<2.000	<2.000	15.7	3.57
Butylbenzyl phthalate (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Benzo(a)anthracene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Benzo(b)fluoranthene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Benzo(k)fluoranthene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Benzo(a)pyrene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Benzo(g,h,i)perylene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Carbazole (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Chrysene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Dibenzofuran (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
n-Dibutyl phthalate (aq)	µg/l	<1	1.32	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	1.32
Diethyl phthalate (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Dibenzo(a,h)anthracene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Dimethyl phthalate (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
n-Dioctyl phthalate (aq)	µg/l	<5	5.00	-	-	<5.000		<5.000		<5.000	<5.000	<5.000	<5.000	<5.000	<5.000
Fluoranthene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Fluorene (aq)	µg/l	<1	1.14	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	1.14
Hexachlorobenzene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Hexachlorobutadiene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Pentachlorophenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Phenol (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
n-Nitroso-n-dipropylamine (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Hexachloroethane (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Nitrobenzene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Naphthalene (aq)	µg/l	<1	1.03	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	1.03
Isophorone (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Hexachlorocyclopentadiene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Phenanthrene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Indeno(1,2,3-cd)pyrene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Pyrene (aq)	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Volatile Organic Compounds (VOCs)															
Dibromofluoromethane**	%		116.00	-	-	109		110		111	111	113	109	110	116
Toluene-d8**	%		101.00	-	-	101		101		100	97.7	98.7	99.8	98.7	97.7
4-Bromofluorobenzene**	%		98.40	-	-	97.8		97.1		96.5	96.6	97.2	97.2	98.4	95.8

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

						BH001	BH002	WS002	WS003	WS005	BH001	BH002	WS002	WS003	WS005
George Street Reading						17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019
Test	Units	LOD	Max	EQS	DWS										
Dichlorodifluoromethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Chloromethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Vinyl chloride	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Bromomethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Chloroethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Trichlorofluoromethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,1-Dichloroethene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Carbon disulphide	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Dichloromethane	µg/l	<3	3.00	-	-	<3.000		<3.000		<3.000	<3.000	<3.000	<3.000	<3.000	<3.000
Methyl tertiary butyl ether (MTBE)	µg/l	<1	1.00	-	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
trans-1,2-Dichloroethene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,1-Dichloroethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
cis-1,2-Dichloroethene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2,2-Dichloropropane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Bromochloromethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Chloroform	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,1,1-Trichloroethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,1-Dichloropropene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Carbontetrachloride	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2-Dichloroethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Benzene	µg/l	<1	1.00	-	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Trichloroethene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2-Dichloropropane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Dibromomethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Bromodichloromethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
cis-1,3-Dichloropropene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Toluene	µg/l	<1	1.00	-	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
trans-1,3-Dichloropropene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,1,2-Trichloroethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,3-Dichloropropane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Tetrachloroethene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Dibromochloromethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2-Dibromoethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Chlorobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,1,1,2-Tetrachloroethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Ethylbenzene	µg/l	<1	1.00	-	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
m,p-Xylene	µg/l	<1	1.00	-	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
o-Xylene	µg/l	<1	1.00	-	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Styrene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Bromoform	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Isopropylbenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,1,2,2-Tetrachloroethane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2,3-Trichloropropane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Bromobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Propylbenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
2-Chlorotoluene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,3,5-Trimethylbenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-Chlorotoluene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
tert-Butylbenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2,4-Trimethylbenzene	µg/l	<1	3.12	-	-	<1.000		<1.000		<1.000	3.12	<1.000	<1.000	<1.000	<1.000
sec-Butylbenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
4-iso-Propyltoluene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

						BH001	BH002	WS002	WS003	WS005	BH001	BH002	WS002	WS003	WS005
George Street Reading						17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019
Test	Units	LOD	Max	EQS	DWS										
1,3-Dichlorobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,4-Dichlorobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
n-Butylbenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2-Dichlorobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2-Dibromo-3-chloropropane	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2,4-Trichlorobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Hexachlorobutadiene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
tert-Amyl methyl ether (TAME)	µg/l	<1	1.00	-	-	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Naphthalene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,2,3-Trichlorobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
1,3,5-Trichlorobenzene	µg/l	<1	1.00	-	-	<1.000		<1.000		<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Sum of detected Xylenes	µg/l	<2	2.00	-	-	<2.000	<2.000	<2.000	<2.000	<2.000	<2.000	<2.000	<2.000	<2.000	<2.000

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

George Street Reading					
Test	Units	LOD	Max	EQS	DWS
Inorganics					
pH	pH Units	<1	8.08	-	-
Ammoniacal Nitrogen as NH4	µg/l	<300	2560.00	-	500
Ammoniacal Nitrogen as N	µg/l	<200	1990.00	-	-
Ammoniacal Nitrogen as N - Calculated	µg/l		1127.78	-	-
free ammonia (calculated)	µg/l		3.24	200	-
Cyanide, Total	µg/l	<50	50.00	-	-
Cyanide, Free	µg/l	<50	50.00	1	-
Cyanide, Complex	µg/l	<50	50.00	-	-
Sulphate as %SO4	%	<0.0002	0.02	-	-
Nitrate as N	µg/l	<20	6240.00	-	-
Filtered (Dissolved) Metals					
Chromium, Hexavalent	µg/l	<30	30.00	3.4	-
Mercury (diss.filt)	µg/l	<0.01	0.02	0.07	1
Arsenic (diss.filt)	µg/l	<0.5	13.40	50	10
Barium (diss.filt)	µg/l	<0.2	149.00	-	700
Beryllium (diss.filt)	µg/l	<0.1	0.10	-	12
Boron (diss.filt)	µg/l	<10	472.00	2000	1000
Cadmium (diss.filt)	µg/l	<0.08	0.08	0.08	5
Chromium (diss.filt)	µg/l	<1	15.70	-	50
Copper (diss.filt)	µg/l	<0.3	0.88	1	2000
Lead (diss.filt)	µg/l	<0.2	0.29	1.2	10
Nickel (diss.filt)	µg/l	<0.4	22.80	4	20
Selenium (diss.filt)	µg/l	<1	2.45	-	10
Vanadium (diss.filt)	µg/l	<1	1.00	20	-
Zinc (diss.filt)	µg/l	<1	14.40	10.9	-
Hardness, Total as CaCO3	µg/l	<650	573000.00	-	-
Phenols					
Resorcinol (low level)	µg/l	<0.5	4.87	-	-
Catechol (low level)	µg/l	<0.5	0.50	-	-
Phenol (low level)	µg/l	<0.5	0.81	-	-
Cresols (low level)	µg/l	<0.5	0.50	-	-
Xylenols (low level)	µg/l	<0.5	6.20	-	-
1-Naphthol (low level)	µg/l	<0.5	1.86	-	-
2,3,5-Trimethylphenol (low level)	µg/l	<0.5	1.69	-	-
2-Isopropylphenol (low level)	µg/l	<0.5	7.72	-	-

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

George Street Reading					
Test	Units	LOD	Max	EQS	DWS
TPH Criteria Working Group (TPH CWG)					
GRO Surrogate % recovery**	%		106.00	-	-
GRO >C5-C12	µg/l	<50	202.00	-	-
Aliphatics >C5-C6	µg/l	<10	10.00	-	15000
Aliphatics >C6-C8	µg/l	<10	26.00	-	15000
Aliphatics >C8-C10	µg/l	<10	16.00	-	300
Aliphatics >C10-C12	µg/l	<10	100.00	-	300
Aliphatics >C12-C16 (aq)	µg/l	<10	141.00	-	300
Aliphatics >C16-C21 (aq)	µg/l	<10	208.00	-	-
Aliphatics >C21-C35 (aq)	µg/l	<10	116.00	-	-
Total Aliphatics >C12-C35 (aq)	µg/l	<10	465.00	-	-
Aromatics >EC5-EC7	µg/l	<10	10.00	10	1
Aromatics >EC7-EC8	µg/l	<10	10.00	74	700
Aromatics >EC8-EC10	µg/l	<10	11.00	20	500
Aromatics >EC10-EC12	µg/l	<10	67.00	2	90
Aromatics >EC12-EC16 (aq)	µg/l	<10	195.00	2	90
Aromatics >EC16-EC21 (aq)	µg/l	<10	133.00	0.1	90
Aromatics >EC21-EC35 (aq)	µg/l	<10	162.00	0.022	90
Total Aromatics >EC12-EC35 (aq)	µg/l	<10	375.00	-	-
Total Aliphatics & Aromatics >C5-35 (aq)	µg/l	<10	957.00	-	-
Polyaromatic Hydrocarbons (PAHs)					
Naphthalene (aq)	µg/l	<0.01	0.10	2	-
Acenaphthene (aq)	µg/l	<0.005	1.52	-	-
Acenaphthylene (aq)	µg/l	<0.005	0.17	-	-
Fluoranthene (aq)	µg/l	<0.005	0.10	0.12	-
Anthracene (aq)	µg/l	<0.005	0.09	0.1	-
Phenanthrene (aq)	µg/l	<0.005	0.41	-	-
Fluorene (aq)	µg/l	<0.005	2.51	-	-
Chrysene (aq)	µg/l	<0.005	0.03	-	-
Pyrene (aq)	µg/l	<0.005	0.20	-	-
Benzo(a)anthracene (aq)	µg/l	<0.005	0.03	-	-
Benzo(b)fluoranthene (aq)	µg/l	<0.005	0.03	-	-
Benzo(k)fluoranthene (aq)	µg/l	<0.005	0.01	-	-
Benzo(a)pyrene (aq)	µg/l	<0.002	0.0187	0.022	0.01
Dibenzo(a,h)anthracene (aq)	µg/l	<0.005	0.01	-	-
Benzo(g,h,i)perylene (aq)	µg/l	<0.005	0.02	-	-
Indeno(1,2,3-cd)pyrene (aq)	µg/l	<0.005	0.01	-	-
PAH sum of 4 (calculated)			0.06	-	0.1
PAH, Total Detected USEPA 16 (aq)	µg/l	<0.082	5.24	-	-
Semi-Volatile Organic Compounds (SVOCs)					
1,2,4-Trichlorobenzene (aq)	µg/l	<1	1.00	-	-
1,2-Dichlorobenzene (aq)	µg/l	<1	1.00	-	-
1,3-Dichlorobenzene (aq)	µg/l	<1	1.00	-	-
1,4-Dichlorobenzene (aq)	µg/l	<1	1.00	-	-
2,4,5-Trichlorophenol (aq)	µg/l	<1	1.00	-	-
2,4,6-Trichlorophenol (aq)	µg/l	<1	1.00	-	-
2,4-Dichlorophenol (aq)	µg/l	<1	1.00	-	-
2,4-Dimethylphenol (aq)	µg/l	<1	1.00	-	-
2,4-Dinitrotoluene (aq)	µg/l	<1	1.00	-	-
2,6-Dinitrotoluene (aq)	µg/l	<1	1.00	-	-
2-Chloronaphthalene (aq)	µg/l	<1	1.00	-	-
2-Chlorophenol (aq)	µg/l	<1	1.00	-	-

George Street, Reading
September 2019

Table A: Screening of Groundwater Laboratory Data Against EQS and DWS

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

George Street Reading					
Test	Units	LOD	Max	EQS	DWS
2-Methylnaphthalene (aq)	µg/l	<1	1.00	-	-
2-Methylphenol (aq)	µg/l	<1	1.00	-	-
2-Nitroaniline (aq)	µg/l	<1	1.00	-	-
2-Nitrophenol (aq)	µg/l	<1	1.00	-	-
3-Nitroaniline (aq)	µg/l	<1	1.00	-	-
4-Bromophenylphenylether (aq)	µg/l	<1	1.00	-	-
4-Chloro-3-methylphenol (aq)	µg/l	<1	1.00	-	-
4-Chloroaniline (aq)	µg/l	<1	1.00	-	-
4-Chlorophenylphenylether (aq)	µg/l	<1	1.00	-	-
4-Methylphenol (aq)	µg/l	<1	1.00	-	-
4-Nitroaniline (aq)	µg/l	<1	1.00	-	-
4-Nitrophenol (aq)	µg/l	<1	1.00	-	-
Azobenzene (aq)	µg/l	<1	1.00	-	-
Acenaphthylene (aq)	µg/l	<1	1.00	-	-
Acenaphthene (aq)	µg/l	<1	1.30	-	-
Anthracene (aq)	µg/l	<1	1.00	-	-
bis(2-Chloroethyl)ether (aq)	µg/l	<1	1.00	-	-
bis(2-Chloroethoxy)methane (aq)	µg/l	<1	1.00	-	-
bis(2-Ethylhexyl) phthalate (aq)	µg/l	<2	15.70	-	-
Butylbenzyl phthalate (aq)	µg/l	<1	1.00	-	-
Benzo(a)anthracene (aq)	µg/l	<1	1.00	-	-
Benzo(b)fluoranthene (aq)	µg/l	<1	1.00	-	-
Benzo(k)fluoranthene (aq)	µg/l	<1	1.00	-	-
Benzo(a)pyrene (aq)	µg/l	<1	1.00	-	-
Benzo(g,h,i)perylene (aq)	µg/l	<1	1.00	-	-
Carbazole (aq)	µg/l	<1	1.00	-	-
Chrysene (aq)	µg/l	<1	1.00	-	-
Dibenzofuran (aq)	µg/l	<1	1.00	-	-
n-Dibutyl phthalate (aq)	µg/l	<1	1.32	-	-
Diethyl phthalate (aq)	µg/l	<1	1.00	-	-
Dibenzo(a,h)anthracene (aq)	µg/l	<1	1.00	-	-
Dimethyl phthalate (aq)	µg/l	<1	1.00	-	-
n-Dioctyl phthalate (aq)	µg/l	<5	5.00	-	-
Fluoranthene (aq)	µg/l	<1	1.00	-	-
Fluorene (aq)	µg/l	<1	1.14	-	-
Hexachlorobenzene (aq)	µg/l	<1	1.00	-	-
Hexachlorobutadiene (aq)	µg/l	<1	1.00	-	-
Pentachlorophenol (aq)	µg/l	<1	1.00	-	-
Phenol (aq)	µg/l	<1	1.00	-	-
n-Nitroso-n-dipropylamine (aq)	µg/l	<1	1.00	-	-
Hexachloroethane (aq)	µg/l	<1	1.00	-	-
Nitrobenzene (aq)	µg/l	<1	1.00	-	-
Naphthalene (aq)	µg/l	<1	1.03	-	-
Isophorone (aq)	µg/l	<1	1.00	-	-
Hexachlorocyclopentadiene (aq)	µg/l	<1	1.00	-	-
Phenanthrene (aq)	µg/l	<1	1.00	-	-
Indeno(1,2,3-cd)pyrene (aq)	µg/l	<1	1.00	-	-
Pyrene (aq)	µg/l	<1	1.00	-	-
Volatile Organic Compounds (VOCs)					
Dibromofluoromethane**	%		116.00	-	-
Toluene-d8**	%		101.00	-	-
4-Bromofluorobenzene**	%		98.40	-	-

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

George Street Reading					
Test	Units	LOD	Max	EQS	DWS
Dichlorodifluoromethane	µg/l	<1	1.00	-	-
Chloromethane	µg/l	<1	1.00	-	-
Vinyl chloride	µg/l	<1	1.00	-	-
Bromomethane	µg/l	<1	1.00	-	-
Chloroethane	µg/l	<1	1.00	-	-
Trichlorofluoromethane	µg/l	<1	1.00	-	-
1,1-Dichloroethene	µg/l	<1	1.00	-	-
Carbon disulphide	µg/l	<1	1.00	-	-
Dichloromethane	µg/l	<3	3.00	-	-
Methyl tertiary butyl ether (MTBE)	µg/l	<1	1.00	-	-
trans-1,2-Dichloroethene	µg/l	<1	1.00	-	-
1,1-Dichloroethane	µg/l	<1	1.00	-	-
cis-1,2-Dichloroethene	µg/l	<1	1.00	-	-
2,2-Dichloropropane	µg/l	<1	1.00	-	-
Bromochloromethane	µg/l	<1	1.00	-	-
Chloroform	µg/l	<1	1.00	-	-
1,1,1-Trichloroethane	µg/l	<1	1.00	-	-
1,1-Dichloropropene	µg/l	<1	1.00	-	-
Carbontetrachloride	µg/l	<1	1.00	-	-
1,2-Dichloroethane	µg/l	<1	1.00	-	-
Benzene	µg/l	<1	1.00	-	-
Trichloroethene	µg/l	<1	1.00	-	-
1,2-Dichloropropane	µg/l	<1	1.00	-	-
Dibromomethane	µg/l	<1	1.00	-	-
Bromodichloromethane	µg/l	<1	1.00	-	-
cis-1,3-Dichloropropene	µg/l	<1	1.00	-	-
Toluene	µg/l	<1	1.00	-	-
trans-1,3-Dichloropropene	µg/l	<1	1.00	-	-
1,1,2-Trichloroethane	µg/l	<1	1.00	-	-
1,3-Dichloropropane	µg/l	<1	1.00	-	-
Tetrachloroethene	µg/l	<1	1.00	-	-
Dibromochloromethane	µg/l	<1	1.00	-	-
1,2-Dibromoethane	µg/l	<1	1.00	-	-
Chlorobenzene	µg/l	<1	1.00	-	-
1,1,1,2-Tetrachloroethane	µg/l	<1	1.00	-	-
Ethylbenzene	µg/l	<1	1.00	-	-
m,p-Xylene	µg/l	<1	1.00	-	-
o-Xylene	µg/l	<1	1.00	-	-
Styrene	µg/l	<1	1.00	-	-
Bromoform	µg/l	<1	1.00	-	-
Isopropylbenzene	µg/l	<1	1.00	-	-
1,1,2,2-Tetrachloroethane	µg/l	<1	1.00	-	-
1,2,3-Trichloropropane	µg/l	<1	1.00	-	-
Bromobenzene	µg/l	<1	1.00	-	-
Propylbenzene	µg/l	<1	1.00	-	-
2-Chlorotoluene	µg/l	<1	1.00	-	-
1,3,5-Trimethylbenzene	µg/l	<1	1.00	-	-
4-Chlorotoluene	µg/l	<1	1.00	-	-
tert-Butylbenzene	µg/l	<1	1.00	-	-
1,2,4-Trimethylbenzene	µg/l	<1	3.12	-	-
sec-Butylbenzene	µg/l	<1	1.00	-	-
4-iso-Propyltoluene	µg/l	<1	1.00	-	-

George Street, Reading
September 2019

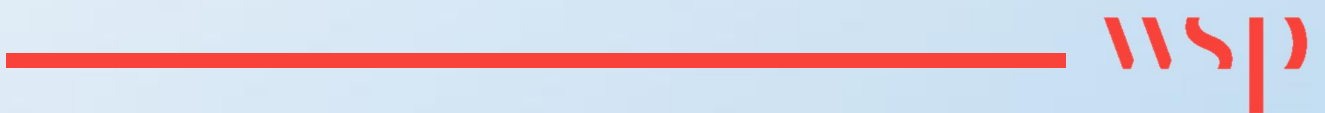
Table A: Screening of Groundwater Laboratory Data Against EQS and DWS

<0.000	Concentration below LOD
0.000	Concentration in exceedance of EQS
0.000	Concentration in exceedance of DWS

George Street Reading					
Test	Units	LOD	Max	EQS	DWS
1,3-Dichlorobenzene	µg/l	<1	1.00	-	-
1,4-Dichlorobenzene	µg/l	<1	1.00	-	-
n-Butylbenzene	µg/l	<1	1.00	-	-
1,2-Dichlorobenzene	µg/l	<1	1.00	-	-
1,2-Dibromo-3-chloropropane	µg/l	<1	1.00	-	-
1,2,4-Trichlorobenzene	µg/l	<1	1.00	-	-
Hexachlorobutadiene	µg/l	<1	1.00	-	-
tert-Amyl methyl ether (TAME)	µg/l	<1	1.00	-	-
Naphthalene	µg/l	<1	1.00	-	-
1,2,3-Trichlorobenzene	µg/l	<1	1.00	-	-
1,3,5-Trichlorobenzene	µg/l	<1	1.00	-	-
Sum of detected Xylenes	µg/l	<2	2.00	-	-

Appendix A

FIGURES





Key

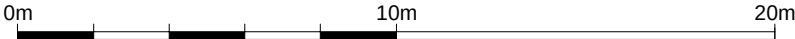
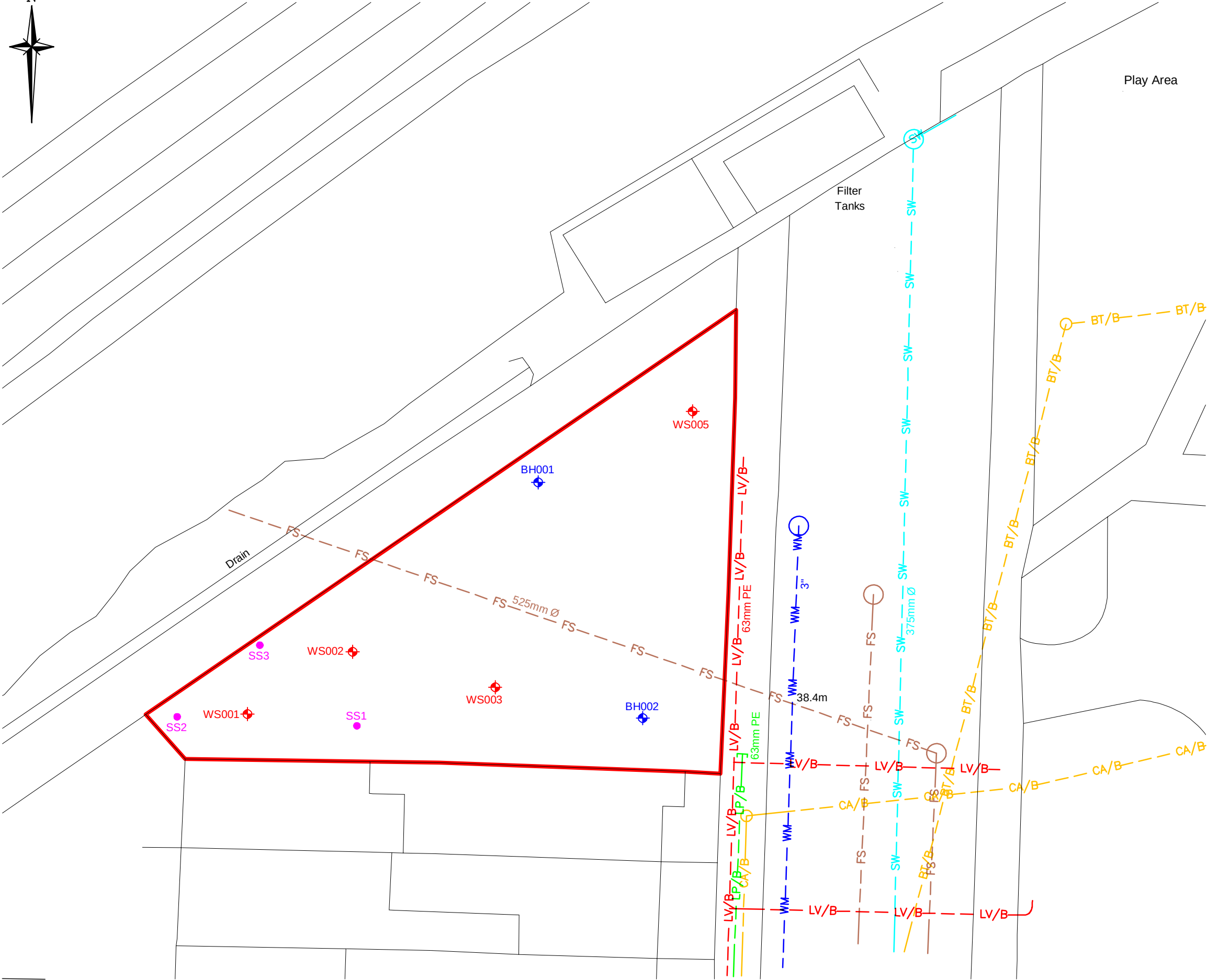
Site Boundary

wsp

TITLE:
70044279 - George Street,
Reading

FIGURE No:
Figure 001 - Site Location





KEY

—

SITE BOUNDARY

BH

DEEP GROUNDWATER BOREHOLE

WS

SHALLOW GAS / GROUNDWATER BOREHOLE

SS

SURFACE SAMPLE LOCATION

KEY TO SERVICES

—

FS

FOUL SEWER

—

SW

SURFACE WATER SEWER

—

WM

WATER MAIN

—

LV/B

LV ELECTRIC (BELOW GROUND)

—

LP/B

LP GAS MAIN (BELOW GROUND)

—

BT/B

TELECOM

—

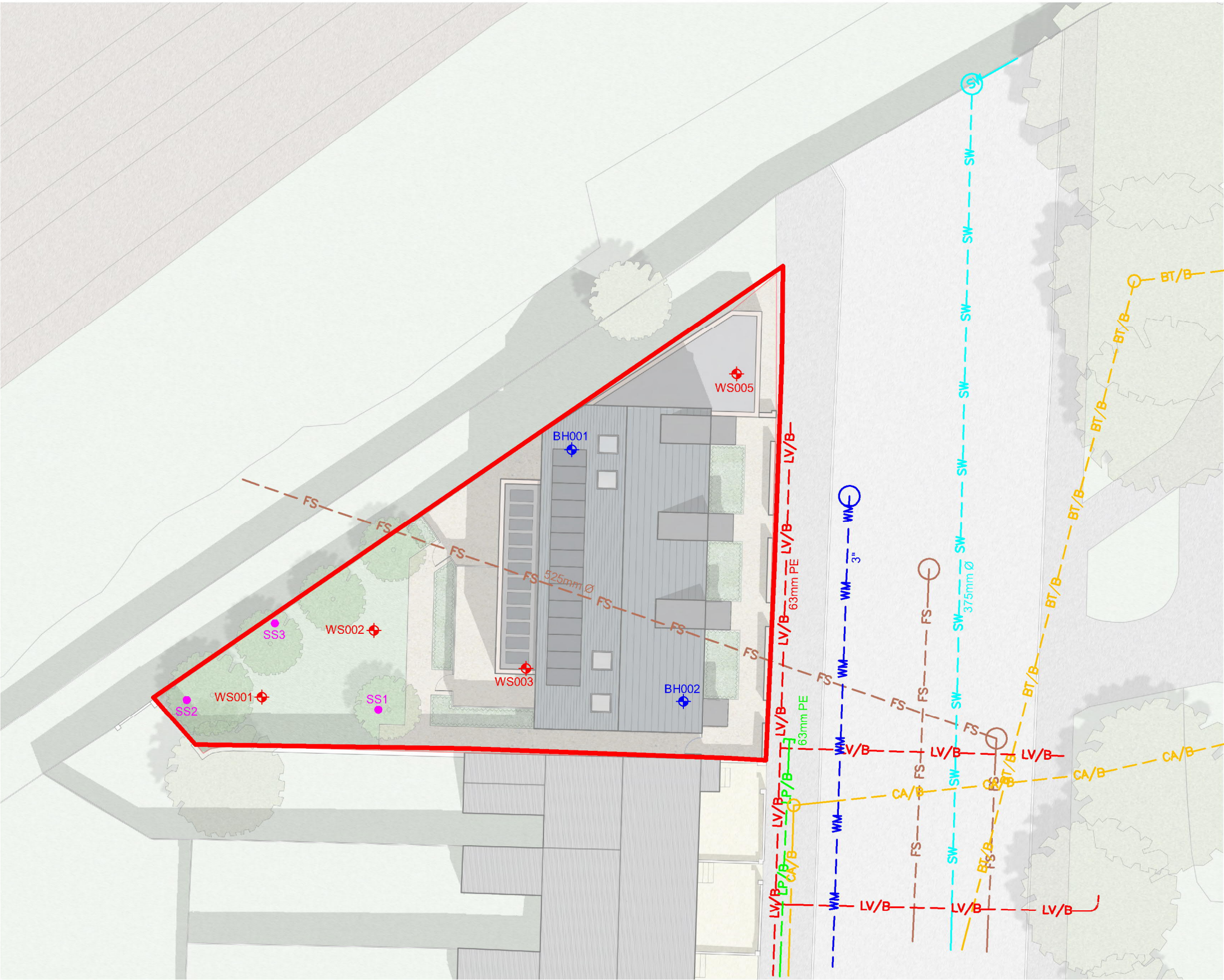
CA/B

VIRGIN MEDIA (BELOW GROUND)

NOTES

1. SERVICE LOCATIONS ARE APPROXIMATE ONLY AND BASED ON STATUTORY SERVICE PROVIDER PLANS. WSP ACCEPT NO RESPONSIBILITY FOR THE ACCURACY OF THIS INFORMATION. WHEN LOCATING SERVICES ON SITE REFER TO STATUTORY SERVICE PROVIDER PLANS.

Rev	Date	Description	By	Chk	App
wsp Kings Orchard 1 Queen Street Bristol BS2 0HQ Tel: 44-(0)1179-306200					
Client: READING BOROUGH COUNCIL					
Site/Project: GEORGE ST. READING					
Title: SITE PLAN SHOWING EXPLORATORY HOLE AND SERVICE LOCATIONS					
Drawn: CEW			Checked: EW		
Designed: EW			Approved:		
Date: 15/05/2019	Scale: 1:200	A3	Sheet:		
Project Number:		Drawing Number:		Revision:	
70044279		003			
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KEY

SITE BOUNDARY

BH

DEEP GROUNDWATER BOREHOLE

WS

SHALLOW GAS / GROUNDWATER BOREHOLE

SS

SURFACE SAMPLE LOCATION

KEY TO SERVICES

FS

FOUL SEWER

SW

SURFACE WATER SEWER

WM

WATER MAIN

LV/B

LV ELECTRIC (BELOW GROUND)

LP/B

LP GAS MAIN (BELOW GROUND)

BT/B

TELECOM

CA/B

VIRGIN MEDIA (BELOW GROUND)

NOTES

1. SERVICE LOCATIONS ARE APPROXIMATE ONLY AND BASED ON STATUTORY SERVICE PROVIDER PLANS. WSP ACCEPT NO RESPONSIBILITY FOR THE ACCURACY OF THIS INFORMATION. WHEN LOCATING SERVICES ON SITE REFER TO STATUTORY SERVICE PROVIDER PLANS.

Rev	Date	Description	By	Chk	App
wsp Kings Orchard 1 Queen Street Bristol BS2 0HQ Tel: 44-(0)1179-306200 Client: READING BOROUGH COUNCIL Site/Project: GEORGE ST. READING Title: SITE PLAN SHOWING PROPOSED DEVELOPMENT, EXPLORATORY HOLE AND SERVICE LOCATIONS Drawn: CEW Checked: EW Designed: EW Approved: Date: 14/05/2019 Scale: 1:200 A3 Sheet: Project Number: 70044279 Drawing Number: 004 Revision: © Crown Copyright and database rights 2019 OS 100019980 © Copyright WSP					



KEY

SITE BOUNDARY

BH

WS

SS

36.43

36.42

36.42

DEEP GROUNDWATER BOREHOLE

SHALLOW GAS / GROUNDWATER BOREHOLE

SURFACE SAMPLE LOCATION

GROUNDWATER LEVEL WITHIN CHALK (mAOD)

GROUNDWATER LEVEL WITHIN ALLUVIUM (mAOD)

GROUNDWATER CONTOURS WITHIN ALLUVIUM (mAOD)

DIRECTION OF GROUNDWATER FLOW WITHIN THE ALLUVIUM AQUIFER

Rev	Date	Description	By	Chk	App
wsp Kings Orchard 1 Queen Street Bristol BS2 0HQ Tel: 44-(0)1179-306200					
Client: READING BOROUGH COUNCIL					
Site/Project: GEORGE ST. READING					
Title: GROUNDWATER CONFIGURATION 17/5/2019					
Drawn: CEW		Checked: EW			
Designed: EW		Approved:			
Date: 24/07/2019	Scale: 1:200	A3	Sheet:		
Project Number: 70044279		Drawing Number: 005		Revision:	
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Appendix B

REPORT LIMITATIONS



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.
2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.
3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.
4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.
6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.
7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.
8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:
 - i. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
 - ii. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.
10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.
13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.
14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.
16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.
19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.
20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.
22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

- 24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
- 25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

- 26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

- 27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.
- 28. The data is presented and will be compared with assessment criteria.

Appendix C

EXPLORATORY HOLE LOGS



 WSP 1 Queen Street Bristol BS2 0HQ Telephone: 0117 930 6200	BOREHOLE LOG		Hole No. BH001	
	Project George Street, Reading		Sheet 1 of 3	
Job No 70044279	Client Reading Borough Council		Date 03-04-19 04-04-19	
Contractor / Driller Geotechnical Engineering	Method/Plant Used Pioneer Rig	Logged By DC	Co-Ordinates (NGR) E 470550.993 N 173751.687	Ground Level (m AOD) 38.465

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
0.00-0.10	ES								Made Ground: comprising of soft consistency dark brown sandy gravelly Silt with low cobble content. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of brick fragments, limestone aggregate and concrete fragments. Occasional fragments of Asbestos tile.		MG	
0.20	ES						38.07	0.40			MG	
0.30-0.50	ES											
0.50	ES						37.62	0.85	Made Ground: comprising of soft consistency dark brown mottled orange brown sandy slightly gravelly Silt. Sand is fine to medium grained. Gravel is angular to subrounded fine to coarse of brick fragments, limestone aggregate and quartzite.		ALV	
1.20	ES							(1.05)				
1.50-1.95	SPT	1.0.0 1.0.1 N=2(S)					36.57	1.90	Soft consistency orange brown sandy slightly gravelly CLAY. Sand is fine to medium grained. Gravel is subangular to rounded fine to medium grained of flint. (Alluvium)		ALV	
2.20	ES						36.07	(0.50) 2.40	Soft consistency dark grey sandy slightly gravelly CLAY. Sand is fine to medium grained. Gravel is subangular to subrounded fine to medium of flint. Hydrocarbon Odour. (Alluvium)		ALV	
2.90	D							(0.90)	Grey brown sandy silty GRAVEL. Gravel is subanglar to rounded fine to medium of flint and quartzite. Sand is fine to coarse grained. Hydrocarbon odour. (Taplow Gravels)		TG	
3.00-3.45	SPT	1.4.7 7.7.8 N=29(S)					35.17	3.30	Light brown sandy GRAVEL. Gravel is subangular to rounded, fine to medium grained of flint and quartz. Sand is medium to coarse. (Taplow Gravels)		TG	
4.30	D											
4.50-4.95	SPT	2.3.7 7.5.3 N=22(S)										
5.10	D							(3.70)			TG	
6.00	SPT	1.0.1 2.1.1 N=5(S)										
							31.47	7.00				
								(0.50)	Recovered as clayey silty GRAVEL of CHALK. Chalk is considered weak. Frequent scattered flint. (Seaford Chalk Formation and Newhaven Chalk Formation, recovered as grade Dc)		SECK	
7.50	SPT	1.3.3 2.2.3 N=10(S)					30.97	7.50				
							30.67	7.80	No recovery		SECK	
8.00	ES								Recovered as: clayey silty GRAVEL of CHALK. Chalk is considered weak. Frequent scattered flint. (Seaford Chalk Formation and Newhaven Chalk Formation, recovered as Grade Dc)			
9.00	D											
9.30-9.75	SPT	3.2.2 5.4.6 N=17(S)										

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
						03-04-19	09.00	1.50	20	1.40	1.40
Chiselling				Water Added		General Remarks Hole terminated at 12.75m. Dynamic Sampling method of recovery.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 23/5/19

 WSP 1 Queen Street Bristol BS2 0HQ Telephone: 0117 930 6200	BOREHOLE LOG			Hole No. BH001	
	Project George Street, Reading			Sheet 2 of 3	
Job No 70044279		Client Reading Borough Council			Date 03-04-19 04-04-19
Contractor / Driller Geotechnical Engineering		Method/Plant Used Pioneer Rig	Logged By DC	Co-Ordinates (NGR) E 470550.993 N 173751.687	Ground Level (m AOD) 38.465

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
10.30	D							(5.25)	Recovered as: clayey silty GRAVEL of CHALK. Chalk is considered weak. Frequent scattered flint. (Seaford Chalk Formation and Newhaven Chalk Formation, recovered as Grade Dc) <i>(continued)</i>			
10.80-11.25	SPT	5,11,8 8,7,8 N=31(S)										
11.00	ES											
12.00	D											
12.30-12.75	SPT	6,7,8 12,15,15 N=50(S)										
							25.72	12.75				

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
Chiselling				Water Added		General Remarks Hole terminated at 12.75m. Dynamic Sampling method of recovery.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 23/5/19

 WSP 1 Queen Street Bristol BS2 0HQ Telephone: 0117 930 6200	BOREHOLE LOG		Hole No. BH002
	Project George Street, Reading		Sheet 1 of 3
Job No 70044279	Client Reading Borough Council		Date 04-04-19 05-04-19
Contractor / Driller Geotechnical Engineering	Method/Plant Used Pioneer Rig	Logged By DC	Co-Ordinates (NGR) E 470556.279 N 173739.756
		Ground Level (m AOD) 38.647	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. mm
0.30	ES		67						Made Ground: comprising of dark brown gravelly silty fine to coarse grained Sand. Gravel is angular to subangular fine to coarse of brick, concrete, limestone aggregate and flint.		MG	
0.50	ES		32					(1.40)				
1.00-1.00	ES						37.25	1.40				
1.50	SPT	1.0,0 1.0,1 N=2(S)	17					(0.70)	Soft to very soft consistency interlaminated light brown/red brown/grey brown very sandy SILT/CLAY. Lamination are fine, extremely closely spaced of fine to medium grained Sand. Occasional scattered subangular fine to coarse flint. (Alluvium)		ALV	
1.70	D						36.55	2.10				
1.70-1.80	ES							(0.70)	Light brown clayey silty slightly gravelly SAND. Sand is fine to coarse grained. Gravel is rounded to subangular fine to coarse of flint (Alluvium)		ALV	
2.10	SPT	3.3,6 4.5,6 N=21(S)	16					(0.70)				
2.30-2.80	B						35.85	2.80				
2.50	ES							(0.90)	Recovered as GRAVEL with medium cobble content. Gravel is grey, black, white, brown of subrounded flint. Cobbles of flint. (Taplow Gravels)		TG	
3.00-3.70	B						34.95	3.70				
								(0.70)	Pale, light brown clayey gravelly silty Sand. Sand is fine to coarse grained. Gravel is subangular to subrounded fine to coarse of flint. (Taplow Gravels)		TG	
4.00	D						34.25	4.40				
4.50	SPT	4.4,6 6.7,11 N=30(S)						(0.80)	No recovery (Taplow Gravels)		TG	
							33.45	5.20				
							33.05	5.60	Recovered as GRAVEL with medium cobble content. Gravel is grey, black, white, brown of subrounded flint. Cobbles of flint. (Taplow Gravels)		TG	
							32.80	5.85	Brown gravelly SAND. Sand is fine to coarse grained. (Taplow Gravels)		TG	
5.90	D		8					(0.55)	Recovered as: White silty GRAVEL of CHALK. Gravel is considered weak to very weak medium density. (Seaford Chalk Formation and Newhaven Chalk Formation, recovered as Grade Dc)		SECK	
6.00	ES						32.25	6.40	No recovery		SECK	
6.00	SPT	1.6,5 2.3,2 N=12(S)						(1.10)	6.40 m bgl . Large cobble flint in liner		SECK	
7.50	SPT	1.1,2 2.1,2 N=7(S)					31.15	7.50	Recovered as: White silty GRAVEL of CHALK. Gravel is considered very weak medium density. Occasional weathering such as black speckling on chalk surfaces and orange brown staining. (Seaford Chalk Formation and Newhaven Chalk Formation, recovered as Grade Dc)		SECK	
8.50-8.80	B											
9.00	SPT	2.4,4 4.17,12 N=37(S)							9.00 m bgl Flint		SECK	
									9.70 - 9.80 m bgl Flint band		SECK	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
Chiselling				Water Added		General Remarks Hole terminated at 12.55m. Dynamic Sampling method of recovery.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 23/5/19

 WSP 1 Queen Street Bristol BS2 0HQ Telephone: 0117 930 6200	BOREHOLE LOG		Hole No. BH002
	Project George Street, Reading		Sheet 2 of 3
Job No 70044279	Client Reading Borough Council		Date 04-04-19 05-04-19
Contractor / Driller Geotechnical Engineering	Method/Plant Used Pioneer Rig	Logged By DC	Co-Ordinates (NGR) E 470556.279 N 173739.756
		Ground Level (m AOD) 38.647	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thick-ness)	Description	Legend	Geology	Dia. mm
10.00-10.50	B							(5.05)	Recovered as: White silty GRAVEL of CHALK. Gravel is considered very weak medium density. Occasional weathering such as black speckling on chalk surfaces and orange brown staining. (Seaford Chalk Formation and Newhaven Chalk Formation, recovered as Grade Dc) <i>(continued)</i>			
11.00-11.20	ES		7						10.30 - 10.35 m bgl Flint band			
11.20	SPT	5,5,5 5,9,12 N=31(S)							10.45 - 10.48 m bgl Flint		SECK	
12.00-12.50	B								10.80 - 10.83 m bgl Scattered flint			
									11.20 - 11.25 m bgl Scattered flint			
12.70	SPT	6,5,5 5,6,11 N=27(S)					26.10	12.55	12.50 - 12.55 m bgl Flint. Black rinded shattered flint cobbles and gravels.			

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
Chiselling				Water Added		General Remarks Hole terminated at 12.55m. Dynamic Sampling method of recovery.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 23/5/19

 WSP Telephone:	BOREHOLE LOG			Hole No. WS001	
	Project George Street, Reading			Sheet 1 of 2	
Job No 70044279		Client Reading Borough Council			Date 08-04-19 08-04-19
Contractor / Driller Geotechnical Engineering		Method/Plant Used Terrier Rig	Logged By DC	Co-Ordinates (NGR) E 470536.301 N 173739.960	Ground Level (m AOD) 38.429

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
0.15-0.15	ES						38.03	0.40	Made Ground: comprising of dark brown gravelly very silty Sand. Sand is fine to medium grained. Gravel is angular to subangular fine to coarse of brick, concrete fragments and flint. Occasional glass fragments.		MG	
0.50-0.50	ES						37.53	0.90	Made Ground: comprising of Orange brown and brown gravelly very silty fine to medium grained Sand. Gravel is angular to subangular fine to coarse of brick and concrete fragments and flints.		MG	
1.10-1.10	ES						36.83	1.60	Soft consistency orange brown slightly gravelly sandy SILT. Sand is fine to medium. Gravel is subangular to rounded fine to medium of flint and quartzite. (Alluvium)		ALV	
1.50-1.60	D		55									
1.60-1.70	ES											
2.00	SPT	2.5.9 9.6.6 N=30(S)	29					(1.90)	Stiff cream/light brown/pale brown very sandy gravelly clayey SILT. Sand is fine to coarse. Gravel is subrounded fine to coarse of scattered chalk clasts. Frequent flint. Notable dark grey/black staining on surfaces with hydrocarbon odour. Occasional brown sandy lenses up to 100mm. (Taplow Gravels)		TG	
2.50-2.60	ES								1.60 - 2.70 m bgl extent of hydrocarbon staining on surfaces.			
2.60-3.00	B											
2.70	D											
3.00	SPT	3.3.6 8.8.9 N=31(S)	11				34.93	3.50				
3.50-3.60	ES						34.63	3.80	Brown very gravelly SAND with medium cobble content. Sand is fine to coarse. Gravel is subrounded fine to coarse of flint. Cobbles of flint. (Taplow Gravels)		TG	
4.00	SPT	3.2.2 3.9.4 N=18(S)					34.33	4.10			TG	
4.50-4.60	D							(0.90)	Firm consistency to stiff cream/light brown/pale brown very sandy gravelly clayey SILT. Sand is fine to coarse. Gravel is subrounded fine to coarse of scattered chalk clasts. Frequent flint. Notable dark grey/black staining on surfaces with hydrocarbon odour. Occasional brown sandy lenses up to 100mm. (Taplow Gravels)		SECK	
5.00	SPT	2.2.1 3.3.3 N=10(S)					33.43	5.00	Recovered as: White gravelly SILT of CHALK. Chalk gravels are weak to very weak. Frequent scattered flint notable at 4.50m and 4.75m. Frequent orange weathering staining on surfaces. (Seaford Chalk Formation and Newhaven Chalk Formation, recovered as Grade Dm)			

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
08-04-19	00.00	5.00	5.00	128	4.85	08-04-19	12.00	4.85	20	4.70	5.00
Chiselling				Water Added		General Remarks Hole terminated at 5.0m. Hole installed as gas monitoring well.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 24/5/19

 WSP 1 Queen Street Bristol BS2 0HQ Telephone: 0117 930 6200	BOREHOLE LOG		Hole No. WS002	
	Project George Street, Reading		Sheet 1 of 2	
Job No 70044279		Client Reading Borough Council		Date 09-04-19 08-04-19
Contractor / Driller Geotechnical Engineering	Method/Plant Used Terrier Rig	Logged By DC	Co-Ordinates (NGR) E 470541.615 N 173743.108	Ground Level (m AOD) 38.360

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
0.10-0.10	ES								Made Ground: comprising of dark brown gravelly silty fine to medium Sand. Gravel is angular to subangular fine to coarse of brick, concrete fragments and flint.		MG	
0.50-0.50	ES						37.56	0.80				
1.10-1.10	ES							(0.80)	Made Ground: comprising of soft consistency dark orange brown and brown sandy slightly gravelly Silt. Sand is fine to medium. Gravel is angular to subrounded fine to medium of flint and brick fragments.		MG	
1.50-1.60	D						36.76	1.60				
2.00	SPT	1,1,1 1,2,2 N=6(S)	124				36.56	1.80	Buff/light brown/slightly pale yellow brown/cream very sandy gravelly SILT or gravelly very silty SAND. Sand is fine to coarse. Gravel is fine to medium of scattered chalk clasts and frequent fine to medium flint.(Alluvium)		ALV	
2.00	ES							(1.20)	Light brown/orange brown/cream/buff gravelly very silty slightly clayey fine to coarse SAND. (Alluvium)		ALV	
2.50-3.00	B						35.36	3.00	2.00 - 2.20 m bgl . Dark grey/black staining on silt with hydrocarbon odour.			
3.00	SPT	1,3,5 4,5,3 N=17(S)	17						Brown silty very gravelly SAND with high cobble content. Sand is fine to coarse. Gravel is rounded to subangular fine to coarse of flint. Cobbles of flint. Occasional scattered chalk. (Taplow Gravels).		TG	
3.00	ES						34.36	4.00				
3.50-4.00	B							(1.00)	Very little recovery (Taplow Gravels)		TG	
4.00	SPT	3,3,6 6,12,13 N=37(S)					33.36	5.00				
5.00	SPT	4,4,1 1,1,1 N=4(S)										

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
08-04-19	10.30	5.00	5.00	128	2.89	08-04-19	10.00	3.60	20	1.88	4.00
Chiselling				Water Added		General Remarks Hole terminated at 5.0m.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 23/5/19

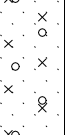
 WSP 1 Queen Street Bristol BS2 0HQ Telephone: 0117 930 6200	BOREHOLE LOG		Hole No. WS003
	Project George Street, Reading		Sheet 1 of 2
Job No 70044279	Client Reading Borough Council		Date 09-04-19 08-04-19
Contractor / Driller Geotechnical Engineering	Method/Plant Used Terrier Rig	Logged By DC	Co-Ordinates (NGR) E 470548.815 N 173741.322
		Ground Level (m AOD) 38.517	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
0.15-0.15	ES							(0.90)	Made Ground: comprising of dark brown gravelly silty fine to medium Sand. Gravel is angular to subangular fine to coarse of brick, concrete fragments and flint.		MG	
0.70-0.70	ES						37.62	0.90				
1.00-1.00	ES						36.97	1.55	Made Ground: comprising of soft consistency dark orange brown and brown sandy slightly gravelly Silt. Sand is fine to medium. Gravel is angular to subrounded fine to medium of flint and brick fragments.		MG	
1.70	ES		10				36.42	(0.55)	Slightly reddish brown/brown/orange brown fine to coarse SAND with frequent flint gravel. (Alluvium)		ALV	
2.00	SPT	1,1,1 1,1,2 N=5(S)						(0.55)	Light brown/cream/buff/slightly pale yellow brown very silty gravelly SAND. Sand is fine to medium. Gravel is fine to medium of scattered chalk and fine to coarse frequent flint. (Alluvium)		ALV	
2.00	D						35.87	2.65				
2.80-3.00	D						35.52	3.00	Light brown/cream/buff/slightly pale yellow brown gravelly very sandy SILT. Sand is fine to medium. Gravel is fine to medium of scattered chalk and fine to coarse frequent flint. (Alluvium)		ALV	
3.00	SPT	2,3,2 3,3,3 N=11(S)	6				34.92	(0.60)	No recovery/ Large flint in liner (Taplow Gravels)		TG	
3.80-4.00	D		7				34.52	4.00	Light brown with frequent cream/pale yellow brown very gravelly silty SAND. Sand is fine to coarse. Gravel is fine to medium frequent coarse of flint and scattered chalk. (Taplow Gravels)		TG	
4.00	SPT	4,6,5 5,5,5 N=20(S)					33.82	(0.70)	No recovery (Taplow Gravels)		TG	
5.00	SPT	1,1,1 1,1,1 N=4(S)					33.52	5.00	Recovered as light brown very gravelly SAND or SAND and GRAVEL (Taplow Gravels)		TG	

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
08-04-19	15.00	5.00	5.00	128	3.10	08-04-19	15.30	3.10	20	3.10	3.00
Chiselling			Water Added			General Remarks Hole terminated at 5.0m.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 23/5/19

 WSP 1 Queen Street Bristol BS2 0HQ Telephone: 0117 930 6200	BOREHOLE LOG		Hole No. WS005	
	Project George Street, Reading		Sheet 1 of 2	
Job No 70044279	Client Reading Borough Council		Date 08-04-19 08-04-19	
Contractor / Driller Geotechnical Engineering	Method/Plant Used Terrier Rig	Logged By DC	Co-Ordinates (NGR) E 470558.801 N 173755.276	Ground Level (m AOD) 38.352

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. mm
0.10-0.10	ES							(0.90)	Made Ground: comprising of dark brown gravelly silty fine to medium Sand. Gravel is angular to subangular fine to coarse of brick, concrete fragments and flint.		MG	
0.70-0.70	ES						37.45	0.90	Made Ground: comprising of soft consistency dark orange brown and brown sandy slightly gravelly Silt. Sand is fine to medium. Gravel is angular to subrounded fine to medium of flint and brick fragments.		MG	
1.20-1.20	ES						36.65	1.70				
1.60	SPT		14									
1.80	ES		23									
2.00	SPT	1,3,1 4,5,7 N=17(S)					36.25	2.10	Brown/dark brown/dark greenish brown with dark grey mottling sandy CLAY/SILT. Abundant dark grey staining with hydrocarbon odour.		ALV	
2.50	ES		53					(1.30)	Brown/pale brown/light brown/dark brown silty slight gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. Abundant dark grey staining on sand with hydrocarbon odour. Occasional scattering of chalk and occasional silt bands/laminations. (Taplow Gravels)		TG	
3.00	SPT	4,6,7 8,8,11 N=34(C)					34.95	3.40				
3.50-3.60	ES		44						Brown/dark brown SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. Slight hydrocarbon odour and darkening of deposit. (Taplow Gravels)			
4.00	SPT	1,1,2 4,3,4 N=13(C)						(1.60)	4.00 - 5.00 m bgl . Light brown colour. Less discolouristaion.		TG	
4.50-5.00	B		72									
5.00	SPT	1,3,3 5,4,4 N=16(C)					33.35	5.00				

Boring Progress						Water Strikes					
Date	Time	Depth	Casing Dpt	Dia. (mm)	Water Dpt	Date	Time	Strike	Minutes	Standing	Casing
08-04-19	17.00	5.00	5.00	128	1.80	08-04-19	16.00	3.10	20	3.10	3.00
Chiselling				Water Added		General Remarks Hole terminated at 5.0m.					
From	To	Hours	Tool	From	To						
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

17 WSP BH LOG 70044279 - GEORGE STREET, READING.GPJ WSPTEMPLATE7.00.GDT 23/5/19

Appendix D

LABORATORY CERTIFICATES





Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US

Tel: (01244) 528700

Fax: (01244) 528701

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

WSP PB BBC
3rd Floor, Kings Orchard,
1 Queen Street
Bristol
Gloucestershire
BS2 0HQ

Attention: Emma Waite

CERTIFICATE OF ANALYSIS

Date of report Generation: 01 April 2019
Customer: H_WSP_BRI
Sample Delivery Group (SDG): 190322-11
Your Reference: 70044279
Location: George Street Reading
Report No: 499219

This report has been revised and directly supersedes 499214 in its entirety.

We received 3 samples on Friday March 22, 2019 and 3 of these samples were scheduled for analysis which was completed on Monday April 01, 2019. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
19600440	Asbestos (Bulk)	ES	0.00 - 0.00	20/03/2019
19600430	BH001	ES	0.00 - 0.10	20/03/2019
19600435	BH001	ES	0.30 - 0.50	20/03/2019

Maximum Sample/Coolbox Temperature (°C) : 9.6

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 190322-11
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 499219
Superseded Report: 499214

Results Legend



Test



No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

	Lab Sample No(s)		19600440	19600430	19600435
	Customer Sample Reference		Asbestos (Bulk)	BH001	BH001
	AGS Reference		ES	ES	ES
	Depth (m)		0.00 - 0.00	0.00 - 0.10	0.30 - 0.50
	Container		1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)
	Sample Type		S	S	S
			S	S	S
Ammoniacal N as NH4 in 2:1 extract	All	NDPs: 0 Tests: 2		X	X
Anions by ion Chromatography	All	NDPs: 0 Tests: 2		X	X
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 2	X		X
Asbestos Identification	All	NDPs: 0 Tests: 1	X		
Boron Water Soluble	All	NDPs: 0 Tests: 2		X	X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 2		X	X
Easily Liberated Sulphide	All	NDPs: 0 Tests: 2		X	X
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 2		X	X
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 2		X	X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 2		X	X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 2		X	X
Metals in solid samples by OES	All	NDPs: 0 Tests: 2		X	X
NO3, NO2 and TON by KONE (s)	All	NDPs: 0 Tests: 2		X	X
PAH by GCMS	All	NDPs: 0 Tests: 2		X	X
pH	All	NDPs: 0 Tests: 2		X	X



CERTIFICATE OF ANALYSIS

Validated

SDG: 190322-11 Client Reference: 70044279 Report Number: 499219
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 499214

Results Legend



Test



No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Results Legend	Lab Sample No(s)		19600440	19600430	19600435
	Customer Sample Reference		Asbestos (Bulk)	BH001	BH001
	AGS Reference		ES	ES	ES
	Depth (m)		0.00 - 0.00	0.00 - 0.10	0.30 - 0.50
	Container		1kg TUB	250g Amber Jar (ALE210)	60g VOC (ALE215)
	Sample Type		S	S	S
			S	S	S
Sample description	All	NDPs: 0 Tests: 2		X	X
Total Sulphate	All	NDPs: 0 Tests: 2		X	X
TPH CWG GC (S)	All	NDPs: 0 Tests: 2		X	X
VOC MS (S)	All	NDPs: 0 Tests: 2		X	X



CERTIFICATE OF ANALYSIS

Validated

SDG: 190322-11 **Client Reference:** 70044279 **Report Number:** 499219
Location: George Street Reading **Order Number:** 70044279-008 **Superseded Report:** 499214

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
Lab Sample No(s)	Customer Sample Ref.		Depth (m)	Colour	Description	Inclusions	Inclusions 2		
19600430	BH001		0.00 - 0.10	Dark Brown	Sandy Loam	Vegetation	Stones		
19600435	BH001		0.30 - 0.50	Dark Brown	Sandy Loam	N/A	Stones		

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

Validated

SDG: 190322-11 **Client Reference:** 70044279 **Report Number:** 499219
Location: George Street Reading **Order Number:** 70044279-008 **Superseded Report:** 499214

Asbestos Identification - Bulk

Results Legend

ISO17025 accredited.
M mCERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&#\$@ Sample deviation (see appendix)

		Date of Analysis	Analysed by	Comments	Actinolite, Fibrous	Anthophyllite, Fibrous	Asbestos, Amosite (brown)	Asbestos, Chrysotile (white)	Asbestos, Crocidolite (blue)	Non-asbestos fibre	Tremolite, Fibrous
Cust. Sample Ref.	Asbestos (Bulk)ES	27/03/2019	Marcin Magdziarek	Material typical of asbestos cement	Not Detected (#)	Not Detected (#)	Not Detected (#)	Detected (#)	Not Detected (#)	Not Detected	Not Detected (#)
Depth (m)	0.00 - 0.00										
Sample Type	SOLID										
Date Sampled	20/03/2019 00:00:00										
Date Received	22/03/2019 06:01:00										
SDG	190322-11										
Original Sample	19600440										
Method Number	TM048										

Asbestos Identification - Solid Samples

Results Legend

ISO17025 accredited.
M mCERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&#\$@ Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref.	BH001ES	28/03/19	Andrzej Fernecki	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Depth (m)	0.00 - 0.10										
Sample Type	SOLID										
Date Sampled	20/03/2019 00:00:00										
Date Received	22/03/2019 06:01:00										
SDG	190322-11										
Original Sample	19600430										
Method Number	TM048										
Cust. Sample Ref.	BH001ES	28/03/19	Andrzej Fernecki	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Depth (m)	0.30 - 0.50										
Sample Type	SOLID										
Date Sampled	20/03/2019 00:00:00										
Date Received	22/03/2019 06:01:00										
SDG	190322-11										
Original Sample	19600435										
Method Number	TM048										



CERTIFICATE OF ANALYSIS

Validated

SDG: 190322-11 **Client Reference:** 70044279 **Report Number:** 499219
Location: George Street Reading **Order Number:** 70044279-008 **Superseded Report:** 499214

Table of Results - Appendix

Method No	Reference	Description
PM001		Preparation of Samples for Metals Analysis
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM019	Modified: US EPA Method 9056	Determination of Anions in Soils using Ion Chromatography
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer
TM243		Mixed Anions In Soils By Kone
TM248	In-House Method	Determination of Ammonium BRE (2:1 Extract) on solids

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).



CERTIFICATE OF ANALYSIS

Validated

SDG: 190322-11
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 499219
Superseded Report: 499214

Test Completion Dates

Lab Sample No(s)	19600440	19600430	19600435
Customer Sample Ref.	Asbestos (Bulk)	BH001	BH001
AGS Ref.	ES	ES	ES
Depth	0.00 - 0.00	0.00 - 0.10	0.30 - 0.50
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Ammoniacal N as NH4 in 2:1 extract		28-Mar-2019	28-Mar-2019
Anions by ion Chromatography		26-Mar-2019	26-Mar-2019
Asbestos ID in Solid Samples		28-Mar-2019	28-Mar-2019
Asbestos Identification	27-Mar-2019		
Boron Water Soluble		27-Mar-2019	27-Mar-2019
Cyanide Comp/Free/Total/Thiocyanate		28-Mar-2019	28-Mar-2019
Easily Liberated Sulphide		27-Mar-2019	27-Mar-2019
EPH CWG (Aliphatic) GC (S)		28-Mar-2019	28-Mar-2019
EPH CWG (Aromatic) GC (S)		28-Mar-2019	28-Mar-2019
GRO by GC-FID (S)		26-Mar-2019	26-Mar-2019
Hexavalent Chromium (s)		27-Mar-2019	27-Mar-2019
Metals in solid samples by OES		28-Mar-2019	27-Mar-2019
NO3, NO2 and TON by KONE (s)		01-Apr-2019	01-Apr-2019
PAH by GCMS		27-Mar-2019	27-Mar-2019
pH		29-Mar-2019	29-Mar-2019
Sample description		22-Mar-2019	22-Mar-2019
Total Sulphate		29-Mar-2019	27-Mar-2019
TPH CWG GC (S)		28-Mar-2019	28-Mar-2019
VOC MS (S)		27-Mar-2019	27-Mar-2019



CERTIFICATE OF ANALYSIS

Validated

SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Chromatogram

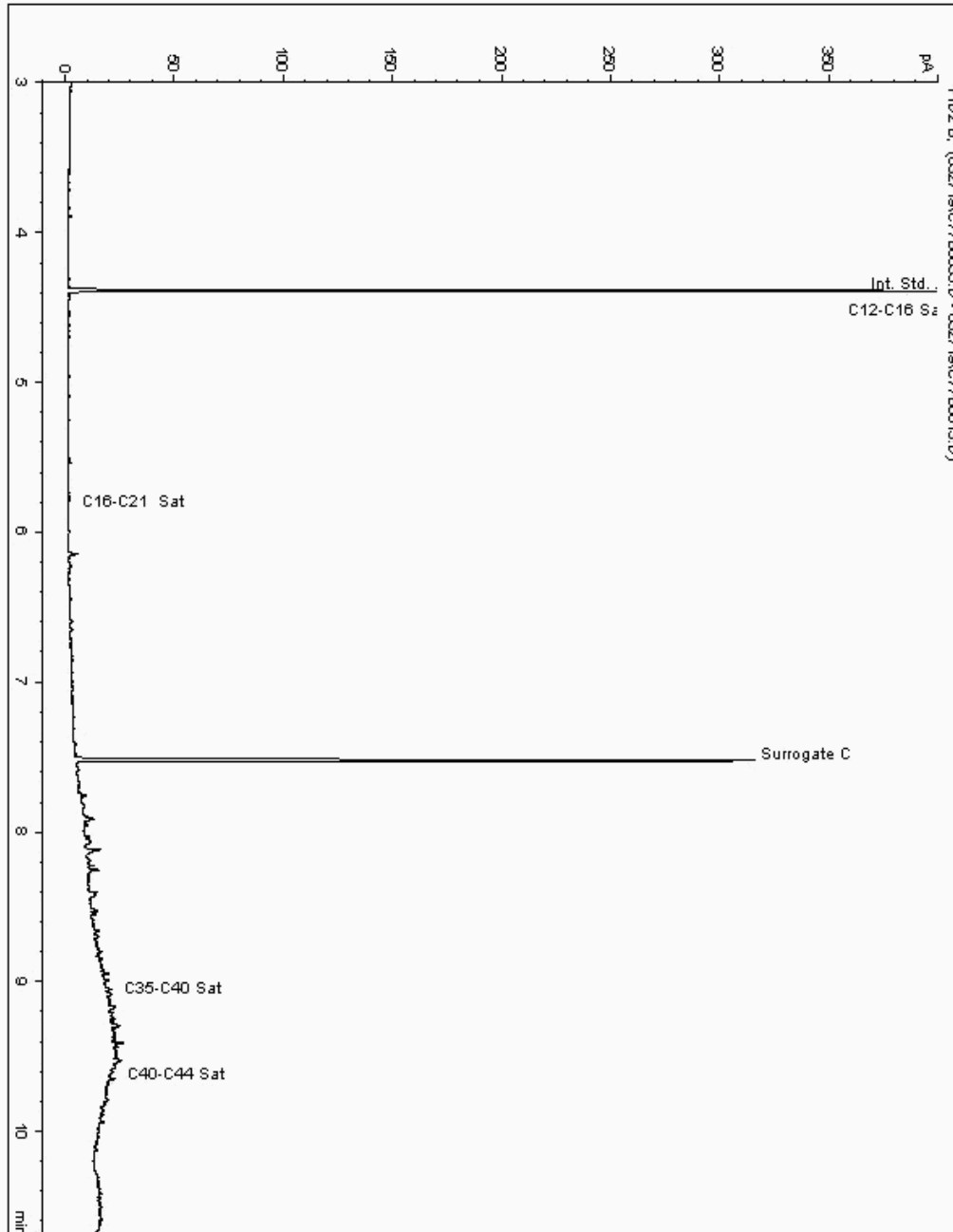
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19601287
Sample ID : BH001

Depth : 0.00 - 0.10

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18416783-
Date Acquired : 27/03/2019 18:56:19 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Chromatogram

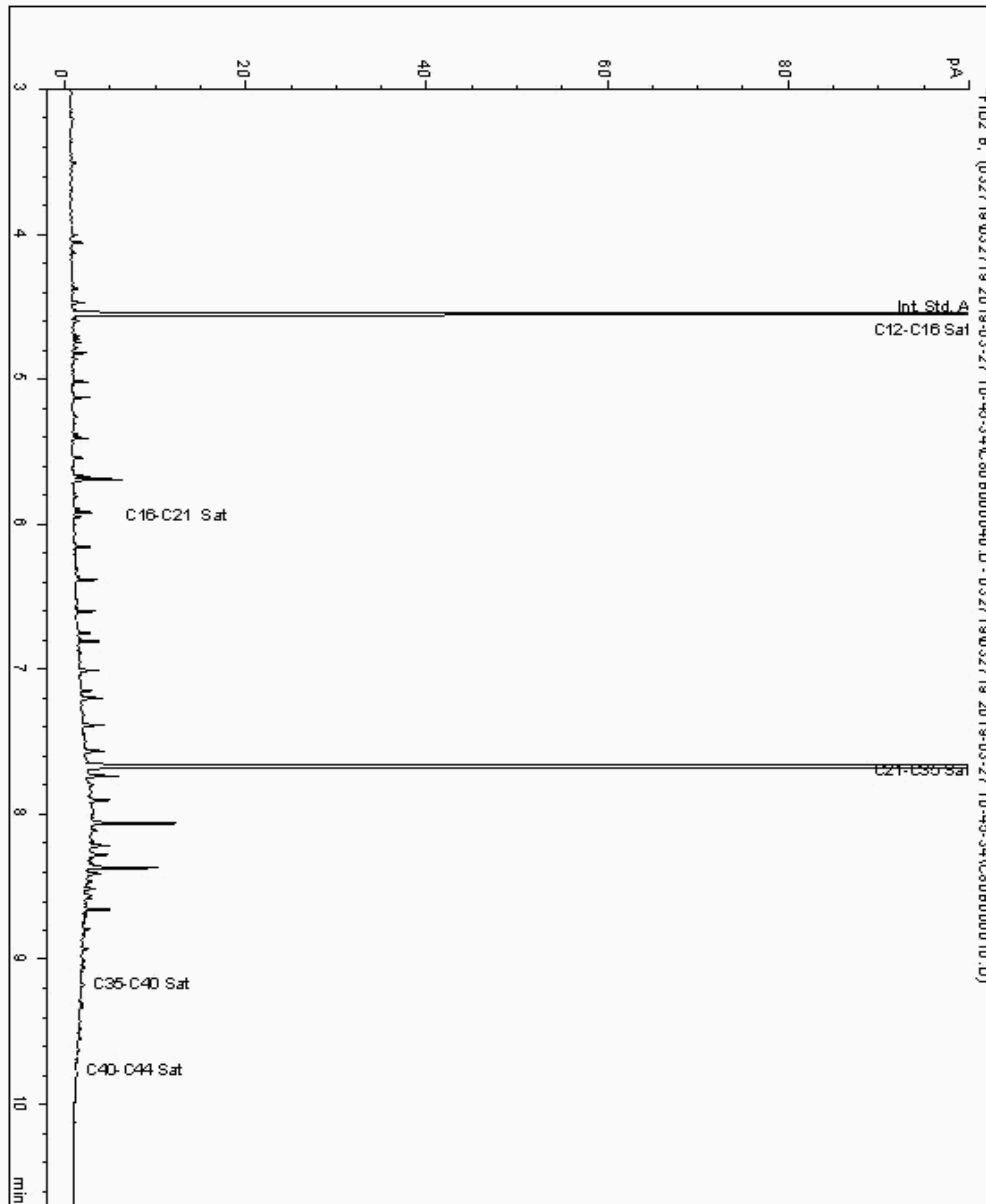
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19601522
Sample ID : BH001

Depth : 0.30 - 0.50

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18416806-
Date Acquired : 27/03/19 21:39:41
Units : ppb
Dilution :
CF : 1
Multiplier : 0.950





CERTIFICATE OF ANALYSIS

Validated

SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Chromatogram

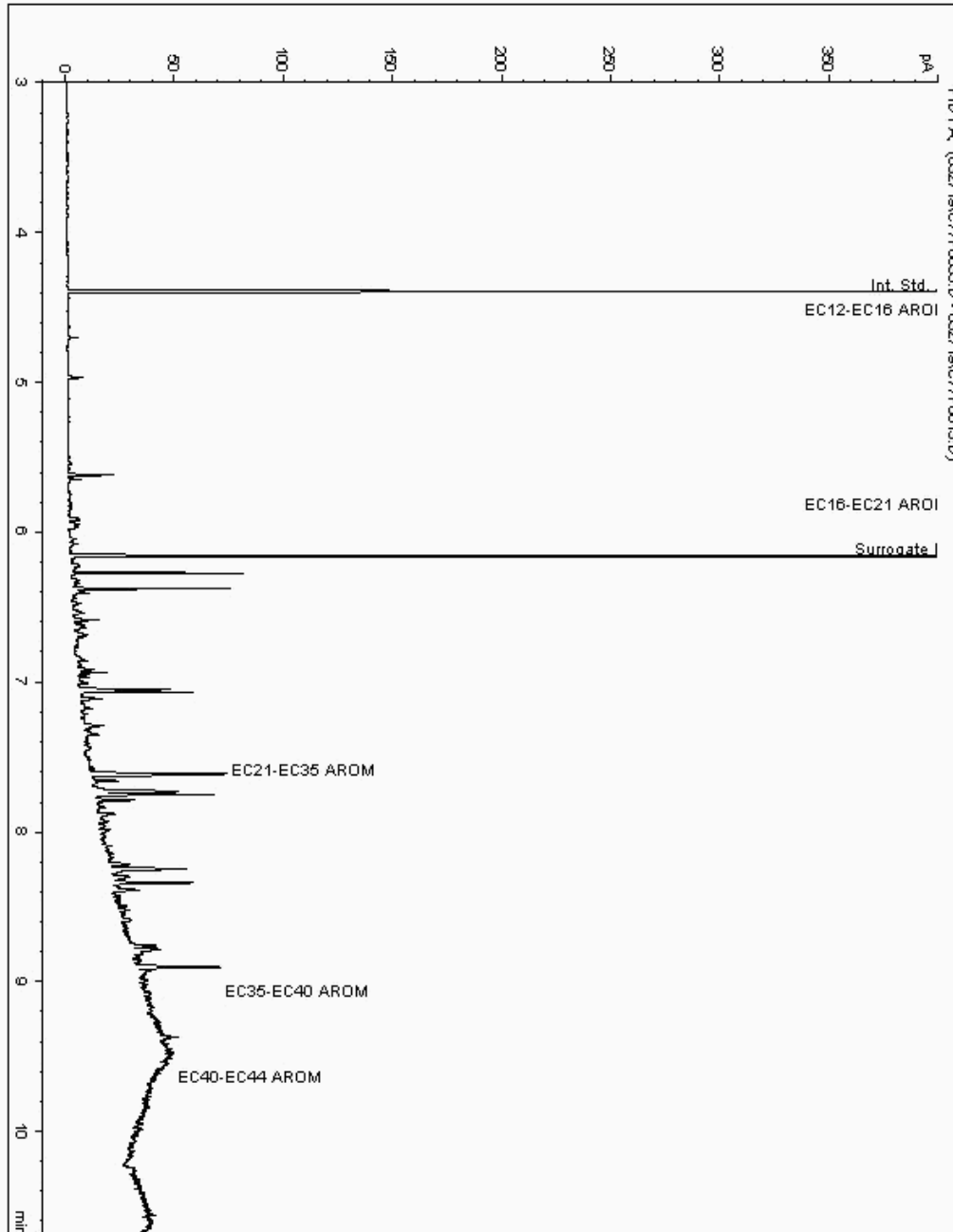
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19601287
Sample ID : BH001

Depth : 0.00 - 0.10

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18416784-
Date Acquired : 27/03/2019 18:56:19 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Chromatogram

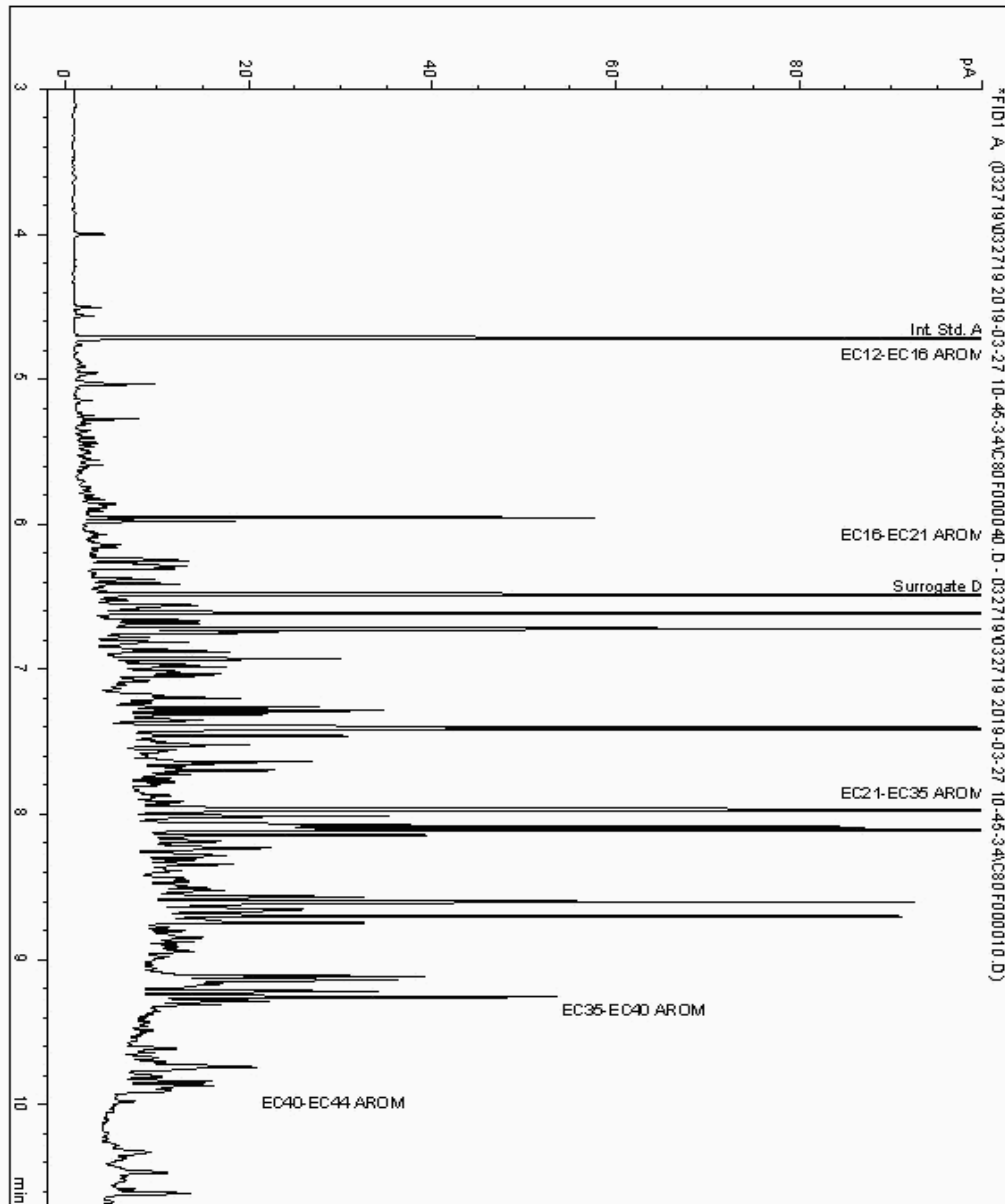
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19601522
Sample ID : BH001

Depth : 0.30 - 0.50

Speciated TPH - AROMS (C12 - C44)

Sample Identity: 18416807-
Date Acquired : 27/03/19 21:39:41
Units : ppb
Dilution :
CF : 1
Multiplier : 0.950





CERTIFICATE OF ANALYSIS

Validated

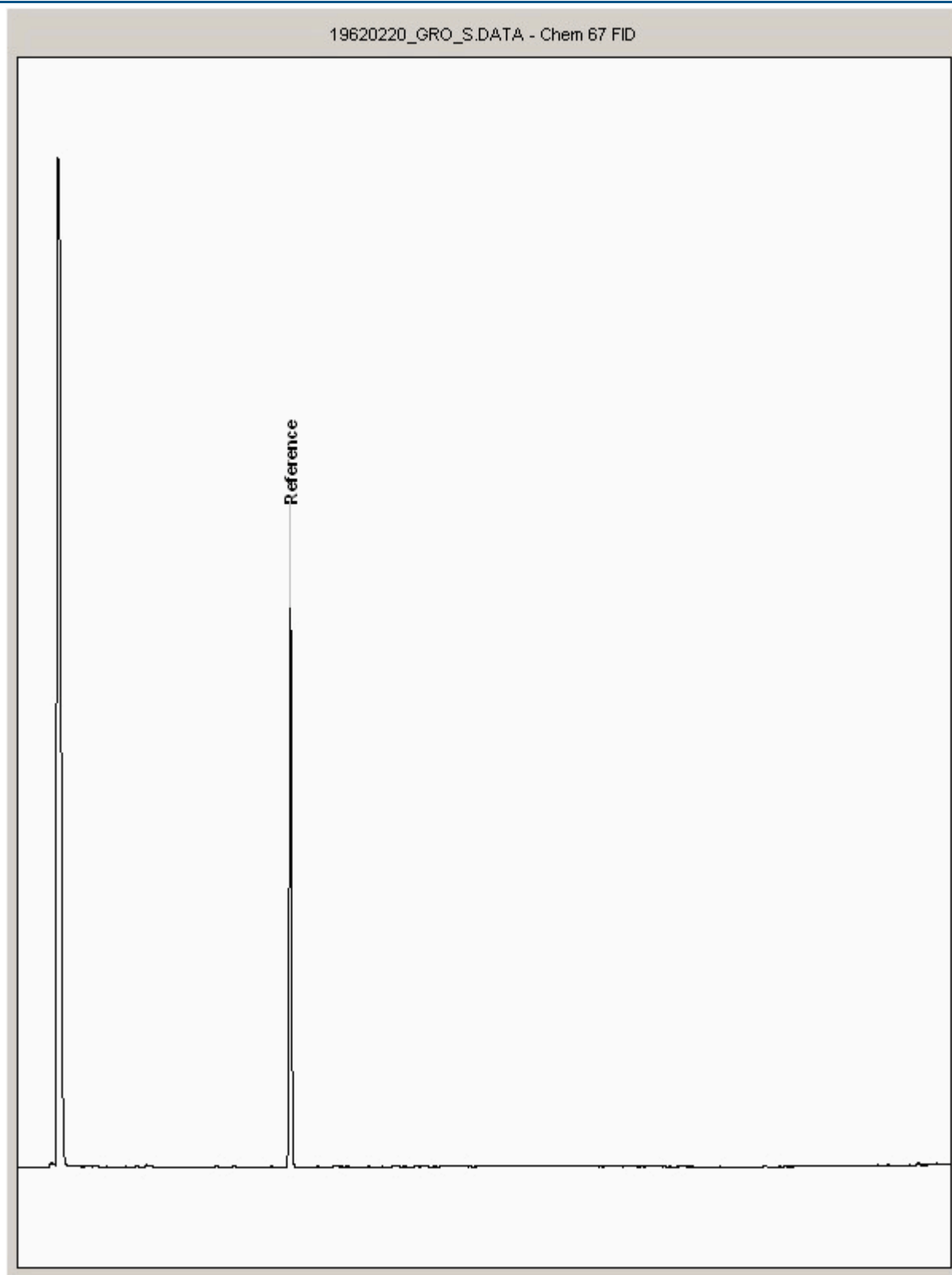
SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19620220
Sample ID : BH001

Depth : 0.00 - 0.10





CERTIFICATE OF ANALYSIS

Validated

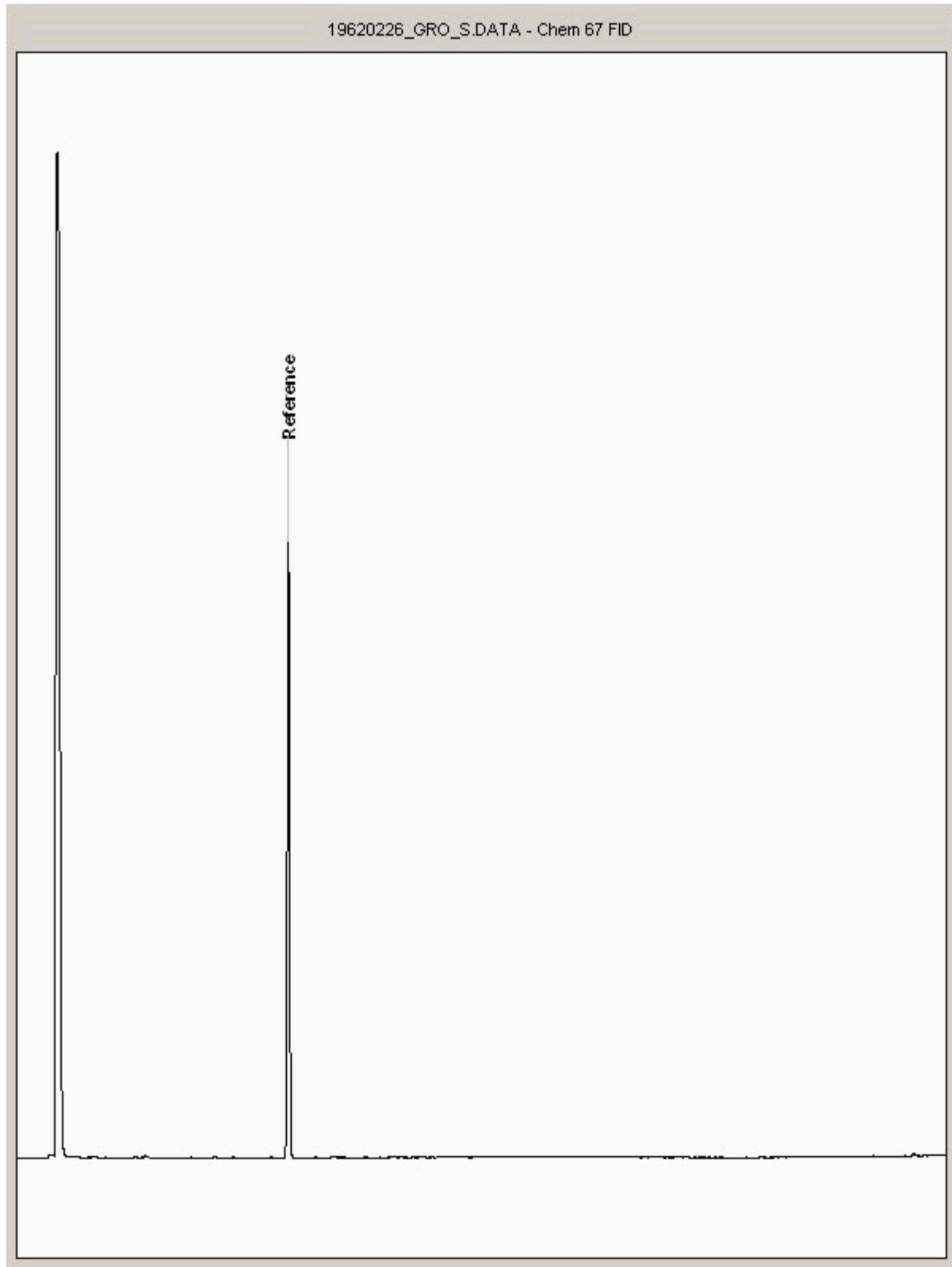
SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19620226
Sample ID : BH001

Depth : 0.30 - 0.50





CERTIFICATE OF ANALYSIS

SDG:	190322-11	Client Reference:	70044279	Report Number:	499219
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	499214

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

General

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
§	Sampled on date not provided
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



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WSP PB BBC
3rd Floor, Kings Orchard,
1 Queen Street
Bristol
Gloucestershire
BS2 0HQ

Attention: Emma Waite

CERTIFICATE OF ANALYSIS

Date of report Generation:	17 April 2019
Customer:	H_WSP_BRI
Sample Delivery Group (SDG):	190406-77
Your Reference:	70044279
Location:	George Street Reading
Report No:	501562

This report has been revised and directly supersedes 501309 in its entirety.

We received 27 samples on Saturday April 06, 2019 and 27 of these samples were scheduled for analysis which was completed on Wednesday April 17, 2019. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
19724985	BH001	ES	0.20 - 0.20	04/03/2019
19725061	BH001	ES	0.50 - 0.50	04/03/2019
19725124	BH001	ES	1.20 - 1.20	04/03/2019
19725143	BH001	ES	11.00 - 11.00	04/03/2019
19725129	BH001	ES	2.20 - 2.20	04/03/2019
19725137	BH001	ES	8.00 - 8.00	04/03/2019
19725055	BH002	ES	0.30 - 0.30	04/04/2019
19725067	BH002	ES	1.00 - 1.00	04/04/2019
19725075	BH002	ES	1.70 - 1.80	04/04/2019
19725097	BH002	ES	11.00 - 11.20	04/04/2019
19725085	BH002	ES	2.50 - 2.50	04/04/2019
19725092	BH002	ES	6.00 - 6.00	04/04/2019
19725103	SS1	ES	0.00 - 0.05	05/04/2019
19725112	SS2	ES	0.00 - 0.05	05/04/2019
19725118	SS3	ES	0.00 - 0.05	05/04/2019
19725148	WS001	ES	0.15 - 0.15	04/03/2019
19725155	WS001	ES	0.50 - 0.50	04/03/2019
19725161	WS001	ES	1.10 - 1.10	04/03/2019
19724994	WS002	ES	0.10 - 0.10	04/03/2019
19725001	WS002	ES	0.50 - 0.50	04/03/2019
19725008	WS002	ES	1.10 - 1.10	04/03/2019
19725015	WS003	ES	0.15 - 0.15	04/03/2019
19725020	WS003	ES	0.70 - 0.70	04/03/2019
19725028	WS003	ES	1.00 - 1.00	04/03/2019
19725034	WS005	ES	0.10 - 0.10	04/03/2019
19725041	WS005	ES	0.70 - 0.70	04/03/2019
19725048	WS005	ES	1.20 - 1.20	04/03/2019

Maximum Sample/Coolbox Temperature (°C) :

8.6

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Results Legend

X Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container		Sample Type	
	19725085	BH002	ES	2.50 - 2.50	250g Amber Jar (ALE210)	S						
	19725097	BH002	ES	11.00 - 11.20	250g Amber Jar (ALE210)	S						
	19725075	BH002	ES	1.70 - 1.80	250g Amber Jar (ALE210)	S						
	19725067	BH002	ES	1.00 - 1.00	250g Amber Jar (ALE210)	S						
	19725055	BH002	ES	0.30 - 0.30	250g Amber Jar (ALE210)	S						
Ammoniacal N as NH4 in 2:1 extract	All	NDPs: 0 Tests: 19										
Anions by ion Chromatography	All	NDPs: 0 Tests: 19										
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 13										
Asbestos Quantification - Full	All	NDPs: 0 Tests: 2										
Boron Water Soluble	All	NDPs: 0 Tests: 27										
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 19										
Easily Liberated Sulphide	All	NDPs: 0 Tests: 19										
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 19										
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 19										
GRO by GC-FID (S)	All	NDPs: 0 Tests: 19										
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 27										
Metals in solid samples by OES	All	NDPs: 0 Tests: 27										
NO3, NO2 and TON by KONE (s)	All	NDPs: 0 Tests: 19										
PAH by GCMS	All	NDPs: 0 Tests: 27										
PCBs by GCMS	All	NDPs: 0 Tests: 3										

[illegible]



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Results Legend

X Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type										
						19724985	19725061	19725124	19725143	19725129	19725137	19725055	19725067	19725075	19725097
						BH001	BH001	BH001	BH001	BH001	BH001	BH002	BH002	BH002	BH002
						ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
						0.20 - 0.20	0.50 - 0.50	1.20 - 1.20	11.00 - 11.00	2.20 - 2.20	8.00 - 8.00	0.30 - 0.30	1.00 - 1.00	1.70 - 1.80	11.00 - 11.20
						250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)
						S	S	S	S	S	S	S	S	S	S
pH	All	NDPs: 0 Tests: 27				X	X	X	X	X	X	X	X	X	X
Phenols by HPLC (S)	All	NDPs: 0 Tests: 3								X		X	X		
Sample description	All	NDPs: 0 Tests: 27				X	X	X	X	X	X	X	X	X	X
Semi Volatile Organic Compounds	All	NDPs: 0 Tests: 3								X		X	X		
Total Sulphate	All	NDPs: 0 Tests: 19				X	X		X			X	X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 19				X	X		X			X	X		
VOC MS (S)	All	NDPs: 0 Tests: 19					X			X		X	X		

19724994	WS002	ES	0.10 - 0.10	60g VOC (ALE215)	S		X							X
				250g Amber Jar (ALE210)	S	X								
				1kg TUB	S		X							
19725161	WS001	ES	1.10 - 1.10	250g Amber Jar (ALE210)	S	X		X						
19725155	WS001	ES	0.50 - 0.50	60g VOC (ALE215)	S								X	
				250g Amber Jar (ALE210)	S	X								
				1kg TUB	S			X						
19725148	WS001	ES	0.15 - 0.15	60g VOC (ALE215)	S									X
				250g Amber Jar (ALE210)	S	X								
				1kg TUB	S			X						
19725118	SS3	ES	0.00 - 0.05	60g VOC (ALE215)	S									X
				250g Amber Jar (ALE210)	S	X								
				1kg TUB	S			X						
19725112	SS2	ES	0.00 - 0.05	60g VOC (ALE215)	S									X
				250g Amber Jar (ALE210)	S	X								
				1kg TUB	S			X						
19725103	SS1	ES	0.00 - 0.05	60g VOC (ALE215)	S									X
				250g Amber Jar (ALE210)	S	X								
				1kg TUB	S									
				250g Amber Jar (ALE210)	S	X		X						
19725092	BH002	ES	6.00 - 6.00	250g Amber Jar (ALE210)	S	X		X						



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Results Legend



Test



No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
19725048	WS005	ES	1.20 - 1.20	60g VOC (ALE215)	S
19725041	WS005	ES	0.70 - 0.70	250g Amber Jar (ALE210)	S
19725034	WS005	ES	0.10 - 0.10	60g VOC (ALE215)	S
19725028	WS003	ES	1.00 - 1.00	250g Amber Jar (ALE210)	S
19725020	WS003	ES	0.70 - 0.70	60g VOC (ALE215)	S
19725015	WS003	ES	0.15 - 0.15	250g Amber Jar (ALE210)	S
19725008	WS002	ES	1.10 - 1.10	60g VOC (ALE215)	S
19725001	WS002	ES	0.50 - 0.50	250g Amber Jar (ALE210)	S
19725001	WS002	ES	0.50 - 0.50	60g VOC (ALE215)	S
19725001	WS002	ES	0.50 - 0.50	1kg TUB	S
Ammoniacal N as NH ₄ in 2:1 extract	All	NDPs: 0 Tests: 19			
Anions by ion Chromatography	All	NDPs: 0 Tests: 19			
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 13			
Asbestos Quantification - Full	All	NDPs: 0 Tests: 2			
Boron Water Soluble	All	NDPs: 0 Tests: 27			
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 19			
Easily Liberated Sulphide	All	NDPs: 0 Tests: 19			
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 19			
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 19			
GRO by GC-FID (S)	All	NDPs: 0 Tests: 19			
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 27			
Metals in solid samples by OES	All	NDPs: 0 Tests: 27			
NO ₃ , NO ₂ and TON by KONE (s)	All	NDPs: 0 Tests: 19			
PAH by GCMS	All	NDPs: 0 Tests: 27			
PCBs by GCMS	All	NDPs: 0 Tests: 3			



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
19724985	BH001	0.20 - 0.20	Dark Brown	Sandy Loam	Stones	Crushed Brick
19725061	BH001	0.50 - 0.50	Dark Brown	Loamy Sand	Stones	None
19725124	BH001	1.20 - 1.20	Dark Brown	Sandy Clay	Stones	None
19725129	BH001	2.20 - 2.20	Dark Brown	Silty Clay Loam	None	None
19725137	BH001	8.00 - 8.00	White	Clay Loam	Stones	None
19725143	BH001	11.00 - 11.00	White	Chalk	None	None
19725055	BH002	0.30 - 0.30	Dark Brown	Sandy Loam	Stones	Crushed Brick
19725067	BH002	1.00 - 1.00	Dark Brown	Loamy Sand	Stones	Brick
19725075	BH002	1.70 - 1.80	Dark Brown	Loamy Sand	None	None
19725085	BH002	2.50 - 2.50	Dark Brown	Sand	Stones	None
19725092	BH002	6.00 - 6.00	White	Chalk	None	None
19725097	BH002	11.00 - 11.20	White	Chalk	None	None
19725103	SS1	0.00 - 0.05	Dark Brown	Sandy Loam	Stones	N/A
19725112	SS2	0.00 - 0.05	Dark Brown	Sandy Loam	Stones	Concrete/Aggregate
19725118	SS3	0.00 - 0.05	Dark Brown	Sandy Loam	Stones	Crushed Brick
19725148	WS001	0.15 - 0.15	Dark Brown	Sandy Loam	Stones	Vegetation
19725155	WS001	0.50 - 0.50	Dark Brown	Sandy Loam	Stones	None
19725161	WS001	1.10 - 1.10	Dark Brown	Loamy Sand	Stones	None
19724994	WS002	0.10 - 0.10	Dark Brown	Loamy Sand	Stones	Vegetation
19725001	WS002	0.50 - 0.50	Dark Brown	Loamy Sand	Stones	Crushed Brick
19725008	WS002	1.10 - 1.10	Dark Brown	Sandy Silt Loam	Stones	Vegetation
19725015	WS003	0.15 - 0.15	Dark Brown	Loamy Sand	Stones	None
19725020	WS003	0.70 - 0.70	Dark Brown	Loamy Sand	Stones	Vegetation
19725028	WS003	1.00 - 1.00	Dark Brown	Loamy Sand	Stones	Vegetation
19725034	WS005	0.10 - 0.10	Dark Brown	Loamy Sand	Vegetation	Brick
19725041	WS005	0.70 - 0.70	Dark Brown	Loamy Sand	Stones	None
19725048	WS005	1.20 - 1.20	Dark Brown	Sandy Clay Loam	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Results Legend			Customer Sample Ref.					
#	ISO17025 accredited.		BH001					
M	mCERTS accredited.		BH001					
aq	Aqueous / settled sample.		BH001					
diss.filt	Dissolved / filtered sample.		BH001					
tot.unfilt	Total / unfiltered sample.		BH001					
+	Subcontracted - refer to subcontractor report for accreditation status.		BH001					
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery		BH001					
(F)	Trigger breach confirmed		BH001					
1.3+5@	Sample deviation (see appendix)		BH001					
Customer Sample Ref.			Customer Sample Ref.					
Depth (m)			Depth (m)					
Sample Type			Sample Type					
Date Sampled			Date Sampled					
Sampled Time			Sampled Time					
Date Received			Date Received					
SDG Ref			SDG Ref					
Lab Sample No.(s)			Lab Sample No.(s)					
AGS Reference			AGS Reference					
Method			Method					
Moisture Content Ratio (% of as received sample)	%	PM024	14	11	18	19	17	21
Nitrate as NO ₃ , 2:1 water soluble	<0.5 mg/kg	TM019	22	8.46			0.7	
Catechol	<0.01 mg/kg	TM062 (S)					<0.01	
Phenol	<0.01 mg/kg	TM062 (S)					<0.01	
Cresols	<0.01 mg/kg	TM062 (S)					<0.01	
Resorcinol	<0.05 mg/kg	TM062 (S)					<0.05	
Xylenols	<0.015 mg/kg	TM062 (S)					<0.015	
1-Naphthol	<0.01 mg/kg	TM062 (S)					<0.01	
2,3,5-Trimethylphenol	<0.01 mg/kg	TM062 (S)					<0.01	
2-Isopropylphenol	<0.015 mg/kg	TM062 (S)					<0.015	
Phenols, Total Detected 5 speciated	<0.06 mg/kg	TM062 (S)					<0.06	
Phenols, Total Detected 8 Speciated	<0.13 mg/kg	TM062 (S)					<0.13	
pH	1 pH Units	TM133	8.17	8.3	8.19	8.95	6.79	8.85
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Cyanide, Total	<1 mg/kg	TM153	1.55	<1			<1	
Cyanide, Free	<1 mg/kg	TM153	<1	<1			<1	
Cyanide, Complex	<1 mg/kg	TM153	1.32	<1			<1	
PCB congener 118	<0.003 mg/kg	TM168	0.00745					
PCB congener 81	<0.003 mg/kg	TM168	<0.003					
PCB congener 77	<0.003 mg/kg	TM168	<0.003					
PCB congener 123	<0.003 mg/kg	TM168	<0.003					
PCB congener 114	<0.003 mg/kg	TM168	<0.003					
PCB congener 105	<0.003 mg/kg	TM168	<0.003					
PCB congener 126	<0.003 mg/kg	TM168	<0.003					
PCB congener 167	<0.003 mg/kg	TM168	<0.003					
PCB congener 156	<0.003 mg/kg	TM168	<0.003					
PCB congener 157	<0.003 mg/kg	TM168	<0.003					
PCB congener 169	<0.003 mg/kg	TM168	<0.003					
PCB congener 189	<0.003 mg/kg	TM168	<0.003					
Sum of detected WHO 12 PCBs	<0.036 mg/kg	TM168	<0.036					
Sulphide, Easily liberated	<15 mg/kg	TM180	<15	<15			23	
Arsenic	<0.6 mg/kg	TM181	24.9	25.6	16.9	<0.6	21.8	<0.6



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Results Legend			Customer Sample Ref.					
#	ISO17025 accredited.		BH002					
M	mCERTS accredited.		BH002					
aq	Aqueous / settled sample.		BH002					
diss.filt	Dissolved / filtered sample.		BH002					
tot.unfilt	Total / unfiltered sample.		BH002					
*	Subcontracted - refer to subcontractor report for accreditation status.		BH002					
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery		BH002					
(F)	Trigger breach confirmed		BH002					
1-3+5@	Sample deviation (see appendix)		BH002					
Component	LOD/Units	Method	Depth (m)	Sample Type	Date Sampled	Sampled Time	Date Received	SDG Ref
Moisture Content Ratio (% of as received sample)	%	PM024	0.30 - 0.30	Soil/Solid (S)	04/04/2019			190406-77
Nitrate as NO ₃ , 2:1 water soluble	<0.5 mg/kg	TM019	0.30 - 0.30	Soil/Solid (S)	04/04/2019			19725055
Catechol	<0.01 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			ES
Phenol	<0.01 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Cresols	<0.01 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Resorcinol	<0.05 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Xylenols	<0.015 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
1-Naphthol	<0.01 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
2,3,5-Trimethylphenol	<0.01 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
2-Isopropylphenol	<0.015 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Phenols, Total Detected 5 speciated	<0.06 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Phenols, Total Detected 8 Speciated	<0.13 mg/kg	TM062 (S)	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
pH	1 pH Units	TM133	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Chromium, Hexavalent	<0.6 mg/kg	TM151	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Cyanide, Total	<1 mg/kg	TM153	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Cyanide, Free	<1 mg/kg	TM153	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Cyanide, Complex	<1 mg/kg	TM153	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Sulphide, Easily liberated	<15 mg/kg	TM180	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Arsenic	<0.6 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Barium	<0.6 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Beryllium	<0.01 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Cadmium	<0.02 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Chromium	<0.9 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Copper	<1.4 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Lead	<0.7 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Mercury	<0.14 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Nickel	<0.2 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Selenium	<1 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Vanadium	<0.2 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Zinc	<1.9 mg/kg	TM181	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Sulphate, Total	<48 mg/kg	TM221	0.30 - 0.30	Soil/Solid (S)	04/04/2019			
Boron, water soluble	<1 mg/kg	TM222	0.30 - 0.30	Soil/Solid (S)	04/04/2019			



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Results Legend			Customer Sample Ref.		WS002	WS002	WS002	WS003	WS003	WS003
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	WS002	0.10 - 0.10	0.50 - 0.50	1.10 - 1.10	0.15 - 0.15	0.70 - 0.70	1.00 - 1.00
M	mCERIS accredited.				Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
aq	Aqueous / settled sample.				04/03/2019	04/03/2019	04/03/2019	04/03/2019	04/03/2019	04/03/2019
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.				06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019
+	Subcontracted - refer to subcontractor report for accreditation status.				190406-77	190406-77	190406-77	190406-77	190406-77	190406-77
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery				19724994	19725001	19725008	19725015	19725020	19725028
(F)	Trigger breach confirmed				ES	ES	ES	ES	ES	ES
1-3+5@	Sample deviation (see appendix)									
Component	LOD/Units	Method								
Moisture Content Ratio (% of as received sample)	%	PM024			8.9	15	15	11	11	15
Nitrate as NO ₃ , 2:1 water soluble	<0.5 mg/kg	TM019			11.7 M	10.8 M	4.68 M	6.38 M	27.8 M	15.5 M
pH	1 pH Units	TM133			8.08 @ M	8.15 @ M	8.32 @ M	8.25 @ M	10.1 @ M	8.44 @ M
Chromium, Hexavalent	<0.6 mg/kg	TM151			<0.6 @ #	<0.6 @ #	<0.6 @ #	2.33 @ #	<0.6 @ #	<0.6 @ #
Cyanide, Total	<1 mg/kg	TM153			<1 @ M	<1 @ M	<1 @ M	3.75 @ M	<1 @ M	<1 @ M
Cyanide, Free	<1 mg/kg	TM153			<1 @ M	<1 @ M	<1 @ M	<1 @ M	<1 @ M	<1 @ M
Cyanide, Complex	<1 mg/kg	TM153			<1 @ M	<1 @ M	<1 @ M	3.63 @ M	<1 @ M	<1 @ M
PCB congener 118	<0.003 mg/kg	TM168			0.00411 @ M					
PCB congener 81	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 77	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 123	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 114	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 105	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 126	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 167	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 156	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 157	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 169	<0.003 mg/kg	TM168			<0.003 @ M					
PCB congener 189	<0.003 mg/kg	TM168			<0.003 @ M					
Sum of detected WHO 12 PCBs	<0.036 mg/kg	TM168			<0.036 @ M					
Sulphide, Easily liberated	<15 mg/kg	TM180			<15 @ M	<15 @ M	<15 @ M	<15 @ M	<15 @ M	<15 @ M
Arsenic	<0.6 mg/kg	TM181			11.7 M	22.9 M	22.2 M	27 M	23.5 M	18.3 M
Barium	<0.6 mg/kg	TM181			268 #	586 #	78.2 #	1340 #	393 #	118 #
Beryllium	<0.01 mg/kg	TM181			0.677 M	1.09 M	0.62 M	1.46 M	1.36 M	0.529 M
Cadmium	<0.02 mg/kg	TM181			0.712 M	0.805 M	0.262 M	1.18 M	0.831 M	0.342 M
Chromium	<0.9 mg/kg	TM181			9.99 M	15.7 M	18.3 M	4.1 M	10.6 M	9.09 M
Copper	<1.4 mg/kg	TM181			59.7 M	71.6 M	17.2 M	75 M	68.8 M	28.1 M
Lead	<0.7 mg/kg	TM181			390 M	802 M	64.2 M	4580 M	1090 M	152 M
Mercury	<0.14 mg/kg	TM181			0.495 @ M	2.09 @ M	<0.14 @ M	0.322 @ M	0.715 @ M	0.269 @ M
Nickel	<0.2 mg/kg	TM181			19.8 M	26.8 M	24.2 M	60.8 M	41.2 M	20.6 M
Selenium	<1 mg/kg	TM181			<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Vanadium	<0.2 mg/kg	TM181			25.4 #	41.6 #	47.6 #	49.2 #	51.9 #	35.6 #



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501562
Superseded Report: 501309

Results Legend			Customer Sample Ref.	WS005	WS005	WS005			
#	ISO17025 accredited.								
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-3+5@	Sample deviation (see appendix)								
Component	LOD/Units	Method	Depth (m)	Sample Type	Date Sampled	Sampled Time	Date Received	SDG Ref	Lab Sample No.(s)
Moisture Content Ratio (% of as received sample)	%	PM024	0.10 - 0.10	Soil/Solid (S)	04/03/2019			190406-77	19725034
Nitrate as NO3, 2:1 water soluble	<0.5 mg/kg	TM019	0.70 - 0.70	Soil/Solid (S)	04/03/2019			190406-77	19725041
pH	1 pH Units	TM133	1.20 - 1.20	Soil/Solid (S)	04/03/2019			190406-77	19725048
Chromium, Hexavalent	<0.6 mg/kg	TM151							
Cyanide, Total	<1 mg/kg	TM153							
Cyanide, Free	<1 mg/kg	TM153							
Cyanide, Complex	<1 mg/kg	TM153							
PCB congener 118	<0.003 mg/kg	TM168							
PCB congener 81	<0.003 mg/kg	TM168							
PCB congener 77	<0.003 mg/kg	TM168							
PCB congener 123	<0.003 mg/kg	TM168							
PCB congener 114	<0.003 mg/kg	TM168							
PCB congener 105	<0.003 mg/kg	TM168							
PCB congener 126	<0.003 mg/kg	TM168							
PCB congener 167	<0.003 mg/kg	TM168							
PCB congener 156	<0.003 mg/kg	TM168							
PCB congener 157	<0.003 mg/kg	TM168							
PCB congener 169	<0.003 mg/kg	TM168							
PCB congener 189	<0.003 mg/kg	TM168							
Sum of detected WHO 12 PCBs	<0.036 mg/kg	TM168							
Sulphide, Easily liberated	<15 mg/kg	TM180							
Arsenic	<0.6 mg/kg	TM181							
Barium	<0.6 mg/kg	TM181							
Beryllium	<0.01 mg/kg	TM181							
Cadmium	<0.02 mg/kg	TM181							
Chromium	<0.9 mg/kg	TM181							
Copper	<1.4 mg/kg	TM181							
Lead	<0.7 mg/kg	TM181							
Mercury	<0.14 mg/kg	TM181							
Nickel	<0.2 mg/kg	TM181							
Selenium	<1 mg/kg	TM181							
Vanadium	<0.2 mg/kg	TM181							



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77
Location: George Street ReadingClient Reference: 70044279
Order Number: 70044279-008Report Number: 501562
Superseded Report: 501309

PAH by GCMS

Results Legend			Customer Sample Ref.					
#	ISO17025 accredited.		BH001					
M	mCERIS accredited.		BH001					
aq	Aqueous / settled sample.		BH001					
diss.filt	Dissolved / filtered sample.		BH001					
tot.unfilt	Total / unfiltered sample.		BH001					
*	Subcontracted - refer to subcontractor report for accreditation status.		BH001					
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery		BH001					
(F)	Trigger breach confirmed		BH001					
1-3+5@	Sample deviation (see appendix)		BH001					
Component	LOD/Units	Method	Depth (m)	Sample Type	Date Sampled	Sampled Time	SDG Ref	Lab Sample No.(s)
Naphthalene-d8 % recovery**	%	TM218	0.20 - 0.20	Soil/Solid (S)	04/03/2019		190406-77	19724985
Acenaphthene-d10 % recovery**	%	TM218	0.50 - 0.50	Soil/Solid (S)	04/03/2019		190406-77	19725061
Phenanthrene-d10 % recovery**	%	TM218	1.20 - 1.20	Soil/Solid (S)	04/03/2019		190406-77	19725124
Chrysene-d12 % recovery**	%	TM218	11.00 - 11.00	Soil/Solid (S)	04/03/2019		190406-77	19725143
Perylene-d12 % recovery**	%	TM218	2.20 - 2.20	Soil/Solid (S)	04/03/2019		190406-77	19725129
Naphthalene	<0.009 mg/kg	TM218	8.00 - 8.00	Soil/Solid (S)	04/03/2019		190406-77	19725137
Acenaphthylene	<0.012 mg/kg	TM218						ES
Acenaphthene	<0.008 mg/kg	TM218						
Fluorene	<0.01 mg/kg	TM218						
Phenanthrene	<0.015 mg/kg	TM218						
Anthracene	<0.016 mg/kg	TM218						
Fluoranthene	<0.017 mg/kg	TM218						
Pyrene	<0.015 mg/kg	TM218						
Benz(a)anthracene	<0.014 mg/kg	TM218						
Chrysene	<0.01 mg/kg	TM218						
Benzo(b)fluoranthene	<0.015 mg/kg	TM218						
Benzo(k)fluoranthene	<0.014 mg/kg	TM218						
Benzo(a)pyrene	<0.015 mg/kg	TM218						
Indeno(1,2,3-cd)pyrene	<0.018 mg/kg	TM218						
Dibenzo(a,h)anthracene	<0.023 mg/kg	TM218						
Benzo(g,h,i)perylene	<0.024 mg/kg	TM218						
PAH, Total Detected USEPA 16	<0.118 mg/kg	TM218						



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501562
Superseded Report: 501309

Semi Volatile Organic Compounds

Results Legend			Customer Sample Ref.	BH001	BH002	BH002			
#	ISO17025 accredited.								
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1.3+5@	Sample deviation (see appendix)								
Component	LOD/Units	Method	Depth (m)	Sample Type	Date Sampled	Sampled Time	Date Received	SDG Ref	Lab Sample No.(s)
Phenol	<0.1 mg/kg	TM157	2.20 - 2.20	Soil/Solid (S)	04/03/2019			190406-77	19725129
Pentachlorophenol	<0.1 mg/kg	TM157	0.30 - 0.30	Soil/Solid (S)	04/04/2019			190406-77	19725055
n-Nitroso-n-dipropylamine	<0.1 mg/kg	TM157	1.00 - 1.00	Soil/Solid (S)	04/04/2019			190406-77	19725067
Nitrobenzene	<0.1 mg/kg	TM157							ES
Isophorone	<0.1 mg/kg	TM157							
Hexachloroethane	<0.1 mg/kg	TM157							
Hexachlorocyclopentadiene	<0.1 mg/kg	TM157							
Hexachlorobutadiene	<0.1 mg/kg	TM157							
Hexachlorobenzene	<0.1 mg/kg	TM157							
n-Dioctyl phthalate	<0.1 mg/kg	TM157							
Dimethyl phthalate	<0.1 mg/kg	TM157							
Diethyl phthalate	<0.1 mg/kg	TM157							
n-Dibutyl phthalate	<0.1 mg/kg	TM157							
Dibenzofuran	<0.1 mg/kg	TM157							
Carbazole	<0.1 mg/kg	TM157							
Butylbenzyl phthalate	<0.1 mg/kg	TM157							
bis(2-Ethylhexyl) phthalate	<0.1 mg/kg	TM157							
bis(2-Chloroethoxy)methane	<0.1 mg/kg	TM157							
bis(2-Chloroethyl)ether	<0.1 mg/kg	TM157							
Azobenzene	<0.1 mg/kg	TM157							
4-Nitrophenol	<0.1 mg/kg	TM157							
4-Nitroaniline	<0.1 mg/kg	TM157							
4-Methylphenol	<0.1 mg/kg	TM157							
4-Chlorophenylphenylether	<0.1 mg/kg	TM157							
4-Chloroaniline	<0.1 mg/kg	TM157							
4-Chloro-3-methylphenol	<0.1 mg/kg	TM157							
4-Bromophenylphenylether	<0.1 mg/kg	TM157							
3-Nitroaniline	<0.1 mg/kg	TM157							
2-Nitrophenol	<0.1 mg/kg	TM157							
2-Nitroaniline	<0.1 mg/kg	TM157							
2-Methylphenol	<0.1 mg/kg	TM157							
1,2,4-Trichlorobenzene	<0.1 mg/kg	TM157							



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501562
Superseded Report: 501309

Semi Volatile Organic Compounds

Results Legend			Customer Sample Ref.	BH001	BH002	BH002			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference						
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-3*5@	Sample deviation (see appendix)								
Component	LOD/Units	Method							
2-Chlorophenol	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2,6-Dinitrotoluene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2,4-Dinitrotoluene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2,4-Dimethylphenol	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2,4-Dichlorophenol	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2,4,6-Trichlorophenol	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2,4,5-Trichlorophenol	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
1,4-Dichlorobenzene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
1,3-Dichlorobenzene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
1,2-Dichlorobenzene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2-Chloronaphthalene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
2-Methylnaphthalene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
Acenaphthylene	<0.1 mg/kg	TM157		<0.1	13.8	3.7			
Acenaphthene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
Anthracene	<0.1 mg/kg	TM157		<0.1	7.05	2.14			
Benzo(a)anthracene	<0.1 mg/kg	TM157		<0.1	134	34.2			
Benzo(b)fluoranthene	<0.1 mg/kg	TM157		<0.1	198	46.6			
Benzo(k)fluoranthene	<0.1 mg/kg	TM157		<0.1	81.8	21			
Benzo(a)pyrene	<0.1 mg/kg	TM157		<0.1	167	40			
Benzo(g,h,i)perylene	<0.1 mg/kg	TM157		<0.1	88.7	22.2			
Chrysene	<0.1 mg/kg	TM157		<0.1	84.2	24.8			
Fluoranthene	<0.1 mg/kg	TM157		<0.1	155	39.8			
Fluorene	<0.1 mg/kg	TM157		<0.1	<2	<0.5			
Indeno(1,2,3-cd)pyrene	<0.1 mg/kg	TM157		<0.1	142	36.7			
Phenanthrene	<0.1 mg/kg	TM157		<0.1	8.4	2.21			
Pyrene	<0.1 mg/kg	TM157		<0.1	160	39.6			
Naphthalene	<0.1 mg/kg	TM157		<0.1	5.56	1.54			
Dibenzo(a,h)anthracene	<0.1 mg/kg	TM157		<0.1	14	3.04			
Bis(2-chloroisopropyl) ether	<0.1 mg/kg	TM157		<0.1	<2	<0.5			



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

VOC MS (S)

Results Legend			Customer Sample Ref.		BH001	BH001	BH001	BH002	BH002	SS1
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	BH001	0.20 - 0.20	0.50 - 0.50	2.20 - 2.20	0.30 - 0.30	1.00 - 1.00	0.00 - 0.05
M	mCERTS accredited.				Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
aq	Aqueous / settled sample.				04/03/2019	04/03/2019	04/03/2019	04/04/2019	04/04/2019	05/04/2019
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.									
*	Subcontracted - refer to subcontractor report for accreditation status.				06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery				190406-77	190406-77	190406-77	190406-77	190406-77	190406-77
(F)	Trigger breach confirmed				19724985	19725061	19725129	19725055	19725067	19725103
1-3+5@	Sample deviation (see appendix)				ES	ES	ES	ES	ES	ES
Component	LOD/Units	Method								
Dibromofluoromethane**	%	TM116					105	108	104	
							@			
Toluene-d8**	%	TM116					98.7	98.8	100	
							@			
4-Bromofluorobenzene**	%	TM116					96.8	89	90.5	
							@			
Dichlorodifluoromethane	<0.006 mg/kg	TM116					<0.06	<0.06	<0.06	
							@ M	M	M	
Chloromethane	<0.007 mg/kg	TM116					<0.07	<0.07	<0.07	
							@ #	#	#	
Vinyl Chloride	<0.006 mg/kg	TM116					<0.06	<0.06	<0.06	
							@ M	M	M	
Bromomethane	<0.01 mg/kg	TM116					<0.1	<0.1	<0.1	
							@ M	M	M	
Chloroethane	<0.01 mg/kg	TM116					<0.1	<0.1	<0.1	
							@ M	M	M	
Trichlorofluoromethane	<0.006 mg/kg	TM116					<0.06	<0.06	<0.06	
							@ M	M	M	
1,1-Dichloroethene	<0.01 mg/kg	TM116					<0.1	<0.1	<0.1	
							@ #	#	#	
Carbon Disulphide	<0.007 mg/kg	TM116					<0.07	<0.07	<0.07	
							@ M	M	M	
Dichloromethane	<0.01 mg/kg	TM116					<0.1	<0.1	<0.1	
							@ #	#	#	
Methyl Tertiary Butyl Ether	<0.01 mg/kg	TM116	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			@ M	@ M	@ M	@ M	M	M	M	M
trans-1,2-Dichloroethene	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@ M	@ M	M	M	M	
1,1-Dichloroethane	<0.008 mg/kg	TM116			<0.08	<0.08	<0.08	<0.08	<0.08	
					@ M	@ M	M	M	M	
cis-1,2-Dichloroethene	<0.006 mg/kg	TM116			<0.06	<0.06	<0.06	<0.06	<0.06	
					@ M	@ M	M	M	M	
2,2-Dichloropropane	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@	@				
Bromochloromethane	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@ M	@ M	M	M	M	
Chloroform	<0.008 mg/kg	TM116			<0.08	<0.08	<0.08	<0.08	<0.08	
					@ M	@ M	M	M	M	
1,1,1-Trichloroethane	<0.007 mg/kg	TM116			<0.07	<0.07	<0.07	<0.07	<0.07	
					@ M	@ M	M	M	M	
1,1-Dichloropropene	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@ M	@ M	M	M	M	
Carbontetrachloride	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@ M	@ M	M	M	M	
1,2-Dichloroethane	<0.005 mg/kg	TM116			<0.05	<0.05	<0.05	<0.05	<0.05	
					@ M	@ M	M	M	M	
Benzene	<0.009 mg/kg	TM116	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09
			@ M	@ M	@ M	@ M	M	M	M	M
Trichloroethene	<0.009 mg/kg	TM116			<0.09	<0.09	<0.09	<0.09	<0.09	
					@ #	@ #	#	#	#	
1,2-Dichloropropane	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@ M	@ M	M	M	M	
Dibromomethane	<0.009 mg/kg	TM116			<0.09	<0.09	<0.09	<0.09	<0.09	
					@ M	@ M	M	M	M	
Bromodichloromethane	<0.007 mg/kg	TM116			<0.07	<0.07	<0.07	<0.07	<0.07	
					@ M	@ M	M	M	M	
cis-1,3-Dichloropropene	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@ M	@ M	M	M	M	
Toluene	<0.007 mg/kg	TM116	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
			@ M	@ M	@ M	@ M	M	M	M	M
trans-1,3-Dichloropropene	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@	@				
1,1,2-Trichloroethane	<0.01 mg/kg	TM116			<0.1	<0.1	<0.1	<0.1	<0.1	
					@ M	@ M	M	M	M	



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

VOC MS (S)

Results Legend			Customer Sample Ref.		BH001	BH001	BH001	BH002	BH002	SS1
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.20 - 0.20	0.50 - 0.50	2.20 - 2.20	0.30 - 0.30	1.00 - 1.00	0.00 - 0.05
M	mCERTS accredited.				Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
aq	Aqueous / settled sample.				04/03/2019	04/03/2019	04/03/2019	04/04/2019	04/04/2019	05/04/2019
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.									
+	Subcontracted - refer to subcontractor report for accreditation status.				06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019	06/04/2019
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery				190406-77	190406-77	190406-77	190406-77	190406-77	190406-77
(F)	Trigger breach confirmed				19724985	19725061	19725129	19725055	19725067	19725103
1-3+5@	Sample deviation (see appendix)				ES	ES	ES	ES	ES	ES
Component	LOD/Units	Method								
1,3-Dichloropropane	<0.007 mg/kg	TM116					<0.07 @ M	<0.07 M	<0.07 M	
Tetrachloroethene	<0.005 mg/kg	TM116					<0.05 @ M	<0.05 M	<0.05 M	
Dibromochloromethane	<0.01 mg/kg	TM116					<0.1 @ M	<0.1 M	<0.1 M	
1,2-Dibromoethane	<0.01 mg/kg	TM116					<0.1 @ M	<0.1 M	<0.1 M	
Chlorobenzene	<0.005 mg/kg	TM116					<0.05 @ M	<0.05 M	<0.05 M	
1,1,1,2-Tetrachloroethane	<0.01 mg/kg	TM116					<0.1 @ M	<0.1 M	<0.1 M	
Ethylbenzene	<0.004 mg/kg	TM116		<0.04 @ M	<0.04 @ M	<0.04 @ M	<0.04 M	<0.04 M	<0.04 M	<0.04 M
p/m-Xylene	<0.01 mg/kg	TM116		<0.1 @ #	<0.1 @ #	<0.1 @ #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
o-Xylene	<0.01 mg/kg	TM116		<0.1 @ M	<0.1 @ M	<0.1 @ M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Styrene	<0.01 mg/kg	TM116				<0.1 @ #	<0.1 #	<0.1 #	<0.1 #	
Bromoform	<0.01 mg/kg	TM116				<0.1 @ M	<0.1 M	<0.1 M	<0.1 M	
Isopropylbenzene	<0.005 mg/kg	TM116				<0.05 @ #	<0.05 #	<0.05 #	<0.05 #	
1,1,2,2-Tetrachloroethane	<0.01 mg/kg	TM116				<0.1 @ #	<0.1 #	<0.1 #	<0.1 #	
1,2,3-Trichloropropane	<0.016 mg/kg	TM116				<0.16 @ M	<0.16 M	<0.16 M	<0.16 M	
Bromobenzene	<0.01 mg/kg	TM116				<0.1 @ M	<0.1 M	<0.1 M	<0.1 M	
Propylbenzene	<0.01 mg/kg	TM116				<0.1 @ M	<0.1 M	<0.1 M	<0.1 M	
2-Chlorotoluene	<0.009 mg/kg	TM116				<0.09 @ M	<0.09 M	<0.09 M	<0.09 M	
1,3,5-Trimethylbenzene	<0.008 mg/kg	TM116				<0.08 @ M	<0.08 M	<0.08 M	<0.08 M	
4-Chlorotoluene	<0.01 mg/kg	TM116				<0.1 @ M	<0.1 M	<0.1 M	<0.1 M	
tert-Butylbenzene	<0.014 mg/kg	TM116				<0.14 @ M	<0.14 M	<0.14 M	<0.14 M	
1,2,4-Trimethylbenzene	<0.009 mg/kg	TM116				<0.09 @ #	<0.09 #	<0.09 #	<0.09 #	
sec-Butylbenzene	<0.01 mg/kg	TM116				<0.1 @	<0.1	<0.1	<0.1	
4-Isopropyltoluene	<0.01 mg/kg	TM116				<0.1 @ M	<0.1 M	<0.1 M	<0.1 M	
1,3-Dichlorobenzene	<0.008 mg/kg	TM116				<0.08 @ M	<0.08 M	<0.08 M	<0.08 M	
1,4-Dichlorobenzene	<0.005 mg/kg	TM116				<0.05 @ M	<0.05 M	<0.05 M	<0.05 M	
n-Butylbenzene	<0.011 mg/kg	TM116				<0.11 @	<0.11	<0.11	<0.11	
1,2-Dichlorobenzene	<0.01 mg/kg	TM116				<0.1 @ M	<0.1 M	<0.1 M	<0.1 M	
1,2-Dibromo-3-chloropropane	<0.014 mg/kg	TM116				<0.14 @ M	<0.14 M	<0.14 M	<0.14 M	
Tert-amyl methyl ether	<0.01 mg/kg	TM116		<0.1 @ #	<0.1 @ #	<0.1 @ #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
1,2,4-Trichlorobenzene	<0.02 mg/kg	TM116				<0.2 @	<0.2	<0.2	<0.2	
Hexachlorobutadiene	<0.02 mg/kg	TM116				<0.2 @	<0.2	<0.2	<0.2	
Naphthalene	<0.013 mg/kg	TM116				<0.13 @ M	0.238 M	0.164 M	0.164 M	



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Asbestos Identification - Solid Samples

Results Legend

ISO17025 accredited.
M mCERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&\$\$@ Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH001ES 0.20 - 0.20 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19724985 TM048	11/04/19	Andrzej Ferfecki	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH001ES 0.50 - 0.50 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725061 TM048	11/04/2019	Lucy Caroe	Soil containing debris typical of asbestos cement	Not Detected (#)	Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH002ES 0.30 - 0.30 SOLID 04/04/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725055 TM048	11/04/2019	Renata Bozhkov	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH002ES 1.00 - 1.00 SOLID 04/04/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725067 TM048	16/04/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	SS1ES 0.00 - 0.05 SOLID 05/04/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725103 TM048	11/04/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	SS2ES 0.00 - 0.05 SOLID 05/04/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725112 TM048	11/04/2019	Barbara Urbanek-Walsh	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	SS3ES 0.00 - 0.05 SOLID 05/04/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725118 TM048	11/04/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS001ES 0.15 - 0.15 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725148 TM048	11/04/19	Andrzej Ferfecki	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS001ES 0.50 - 0.50 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725155 TM048	11/04/2019	Renata Bozhkov	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS002ES 0.10 - 0.10 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19724994 TM048	11/04/19	Andrzej Fernecki	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS002ES 0.50 - 0.50 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725001 TM048	11/04/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS003ES 0.15 - 0.15 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725015 TM048	11/04/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS005ES 0.10 - 0.10 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725034 TM048	11/04/2019	Barbara Urbanek-Walsh	Loose fibres in soil.	Not Detected (#)	Trace (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Asbestos Quantification - Full

Results Legend

ISO17025 accredited.
M mCERIS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&*\$@ Sample deviation (see appendix)

		Additional Asbestos Components	Analysts Comments	Asbestos Quantification - Gravimetric - %	Asbestos Quantification - PCOM Evaluation	Asbestos Quantification - Total - %
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	BH001ES 0.50 - 0.50 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725061 TM304	None (#)	N/A	<0.001 (#)	<0.001 (#)	<0.001 (#)
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS005ES 0.10 - 0.10 SOLID 04/03/2019 00:00:00 06/04/2019 11:55:00 190406-77 19725034 TM304	None (#)	N/A	<0.001 (#)	<0.001 (#)	<0.001 (#)



CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Table of Results - Appendix

Method No	Reference	Description
ASB_PREP		
PM001		Preparation of Samples for Metals Analysis
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM019	Modified: US EPA Method 9056	Determination of Anions in Soils using Ion Chromatography
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM157	HP 6890 Gas Chromatograph (GC) system and HP 5973 Mass Selective Detector (MSD).	Determination of SVOC in Soils by GC-MS extracted by sonication in DCM/Acetone
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer
TM243		Mixed Anions In Soils By Kone
TM248	In-House Method	Determination of Ammonium BRE (2:1 Extract) on solids
TM304	HSE Contract research Report no 83/1996	Asbestos Quantification in Soil: Fibres identified by morphology only

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Test Completion Dates

Lab Sample No(s)	19724985	19725061	19725124	19725129	19725137	19725143	19725055	19725067	19725075	19725085
Customer Sample Ref.	BH001	BH001	BH001	BH001	BH001	BH001	BH002	BH002	BH002	BH002
AGS Ref.	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Depth	0.20 - 0.20	0.50 - 0.50	1.20 - 1.20	2.20 - 2.20	8.00 - 8.00	11.00 - 11.00	0.30 - 0.30	1.00 - 1.00	1.70 - 1.80	2.50 - 2.50
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Ammoniacal N as NH4 in 2:1 extract	09-Apr-2019	11-Apr-2019		11-Apr-2019			09-Apr-2019	11-Apr-2019		
Anions by ion Chromatography	10-Apr-2019	10-Apr-2019		10-Apr-2019			10-Apr-2019	10-Apr-2019		
Asbestos ID in Solid Samples	11-Apr-2019	11-Apr-2019					11-Apr-2019	16-Apr-2019		
Asbestos Quantification - Full		17-Apr-2019								
Boron Water Soluble	11-Apr-2019	09-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019
Cyanide Comp/Free/Total/Thiocyanate	10-Apr-2019	13-Apr-2019		10-Apr-2019			10-Apr-2019	10-Apr-2019		
Easily Liberated Sulphide	12-Apr-2019	12-Apr-2019		12-Apr-2019			12-Apr-2019	12-Apr-2019		
EPH CWG (Aliphatic) GC (S)	11-Apr-2019	11-Apr-2019		11-Apr-2019			11-Apr-2019	11-Apr-2019		
EPH CWG (Aromatic) GC (S)	11-Apr-2019	11-Apr-2019		11-Apr-2019			11-Apr-2019	11-Apr-2019		
GRO by GC-FID (S)	13-Apr-2019	12-Apr-2019		12-Apr-2019			12-Apr-2019	12-Apr-2019		
Hexavalent Chromium (s)	11-Apr-2019	11-Apr-2019	12-Apr-2019	11-Apr-2019	12-Apr-2019	12-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019
Metals in solid samples by OES	11-Apr-2019	10-Apr-2019	10-Apr-2019	09-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	09-Apr-2019	10-Apr-2019
NO3, NO2 and TON by KONE (s)	09-Apr-2019	09-Apr-2019		09-Apr-2019			09-Apr-2019	09-Apr-2019		
PAH by GCMS	10-Apr-2019	10-Apr-2019	11-Apr-2019	10-Apr-2019	10-Apr-2019	11-Apr-2019	11-Apr-2019	10-Apr-2019	10-Apr-2019	11-Apr-2019
PCBs by GCMS	10-Apr-2019									
pH	10-Apr-2019	10-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	10-Apr-2019	10-Apr-2019	09-Apr-2019	09-Apr-2019
Phenols by HPLC (S)				10-Apr-2019			10-Apr-2019	10-Apr-2019		
Sample description	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019
Semi Volatile Organic Compounds				10-Apr-2019			10-Apr-2019	10-Apr-2019		
Total Sulphate	10-Apr-2019	10-Apr-2019		10-Apr-2019			10-Apr-2019	10-Apr-2019		
TPH CWG GC (S)	13-Apr-2019	12-Apr-2019		12-Apr-2019			12-Apr-2019	12-Apr-2019		
VOC MS (S)	10-Apr-2019	10-Apr-2019		10-Apr-2019			10-Apr-2019	10-Apr-2019		

Lab Sample No(s)	19725092	19725097	19725103	19725112	19725118	19725148	19725155	19725161	19724994	19725001
Customer Sample Ref.	BH002	BH002	SS1	SS2	SS3	WS001	WS001	WS001	WS002	WS002
AGS Ref.	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Depth	6.00 - 6.00	11.00 - 11.20	0.00 - 0.05	0.00 - 0.05	0.00 - 0.05	0.15 - 0.15	0.50 - 0.50	1.10 - 1.10	0.10 - 0.10	0.50 - 0.50
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Ammoniacal N as NH4 in 2:1 extract			09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019		11-Apr-2019	11-Apr-2019
Anions by ion Chromatography			10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019		10-Apr-2019	10-Apr-2019
Asbestos ID in Solid Samples			11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019		11-Apr-2019	11-Apr-2019
Boron Water Soluble	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	09-Apr-2019	09-Apr-2019	11-Apr-2019	11-Apr-2019	09-Apr-2019
Cyanide Comp/Free/Total/Thiocyanate			10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019		10-Apr-2019	10-Apr-2019
Easily Liberated Sulphide			12-Apr-2019	12-Apr-2019	12-Apr-2019	12-Apr-2019	12-Apr-2019		12-Apr-2019	12-Apr-2019
EPH CWG (Aliphatic) GC (S)			10-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019		11-Apr-2019	11-Apr-2019
EPH CWG (Aromatic) GC (S)			10-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019		11-Apr-2019	11-Apr-2019
GRO by GC-FID (S)			11-Apr-2019	12-Apr-2019	11-Apr-2019	12-Apr-2019	12-Apr-2019		12-Apr-2019	12-Apr-2019
Hexavalent Chromium (s)	11-Apr-2019	11-Apr-2019	11-Apr-2019	12-Apr-2019	12-Apr-2019	11-Apr-2019	11-Apr-2019	12-Apr-2019	11-Apr-2019	11-Apr-2019
Metals in solid samples by OES	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019
NO3, NO2 and TON by KONE (s)			09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019		09-Apr-2019	09-Apr-2019
PAH by GCMS	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	10-Apr-2019	10-Apr-2019
PCBs by GCMS									10-Apr-2019	
pH	09-Apr-2019	09-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	09-Apr-2019	10-Apr-2019	09-Apr-2019
Sample description	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019
Total Sulphate			10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019		10-Apr-2019	10-Apr-2019
TPH CWG GC (S)			11-Apr-2019	12-Apr-2019	11-Apr-2019	12-Apr-2019	12-Apr-2019		12-Apr-2019	12-Apr-2019
VOC MS (S)			10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019		10-Apr-2019	10-Apr-2019



CERTIFICATE OF ANALYSIS

Validated

SDG: 190406-77 Client Reference: 70044279 Report Number: 501562
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 501309

Lab Sample No(s)
Customer Sample Ref.

AGS Ref.
Depth
Type

	19725008	19725015	19725020	19725028	19725034	19725041	19725048
	WS002	WS003	WS003	WS003	WS005	WS005	WS005
	ES	ES	ES	ES	ES	ES	ES
	1.10 - 1.10	0.15 - 0.15	0.70 - 0.70	1.00 - 1.00	0.10 - 0.10	0.70 - 0.70	1.20 - 1.20
	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Ammoniacal N as NH4 in 2:1 extract	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019
Anions by ion Chromatography	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019
Asbestos ID in Solid Samples		11-Apr-2019			11-Apr-2019		
Asbestos Quantification - Full					17-Apr-2019		
Boron Water Soluble	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	09-Apr-2019	11-Apr-2019	11-Apr-2019
Cyanide Comp/Free/Total/Thiocyanate	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019
Easily Liberated Sulphide	12-Apr-2019	12-Apr-2019	12-Apr-2019	12-Apr-2019	12-Apr-2019	12-Apr-2019	12-Apr-2019
EPH CWG (Aliphatic) GC (S)	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019
EPH CWG (Aromatic) GC (S)	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019
GRO by GC-FID (S)	12-Apr-2019	11-Apr-2019	11-Apr-2019	12-Apr-2019	11-Apr-2019	12-Apr-2019	13-Apr-2019
Hexavalent Chromium (s)	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019
Metals in solid samples by OES	10-Apr-2019	11-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	09-Apr-2019
NO3, NO2 and TON by KONE (s)	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019	09-Apr-2019
PAH by GCMS	11-Apr-2019	11-Apr-2019	11-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019
PCBs by GCMS					10-Apr-2019		
pH	09-Apr-2019	10-Apr-2019	09-Apr-2019	09-Apr-2019	10-Apr-2019	09-Apr-2019	09-Apr-2019
Sample description	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019	06-Apr-2019
Total Sulphate	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019	10-Apr-2019
TPH CWG GC (S)	12-Apr-2019	11-Apr-2019	11-Apr-2019	12-Apr-2019	11-Apr-2019	12-Apr-2019	13-Apr-2019
VOC MS (S)	10-Apr-2019	11-Apr-2019	11-Apr-2019	10-Apr-2019	11-Apr-2019	10-Apr-2019	10-Apr-2019



CERTIFICATE OF ANALYSIS

Validated

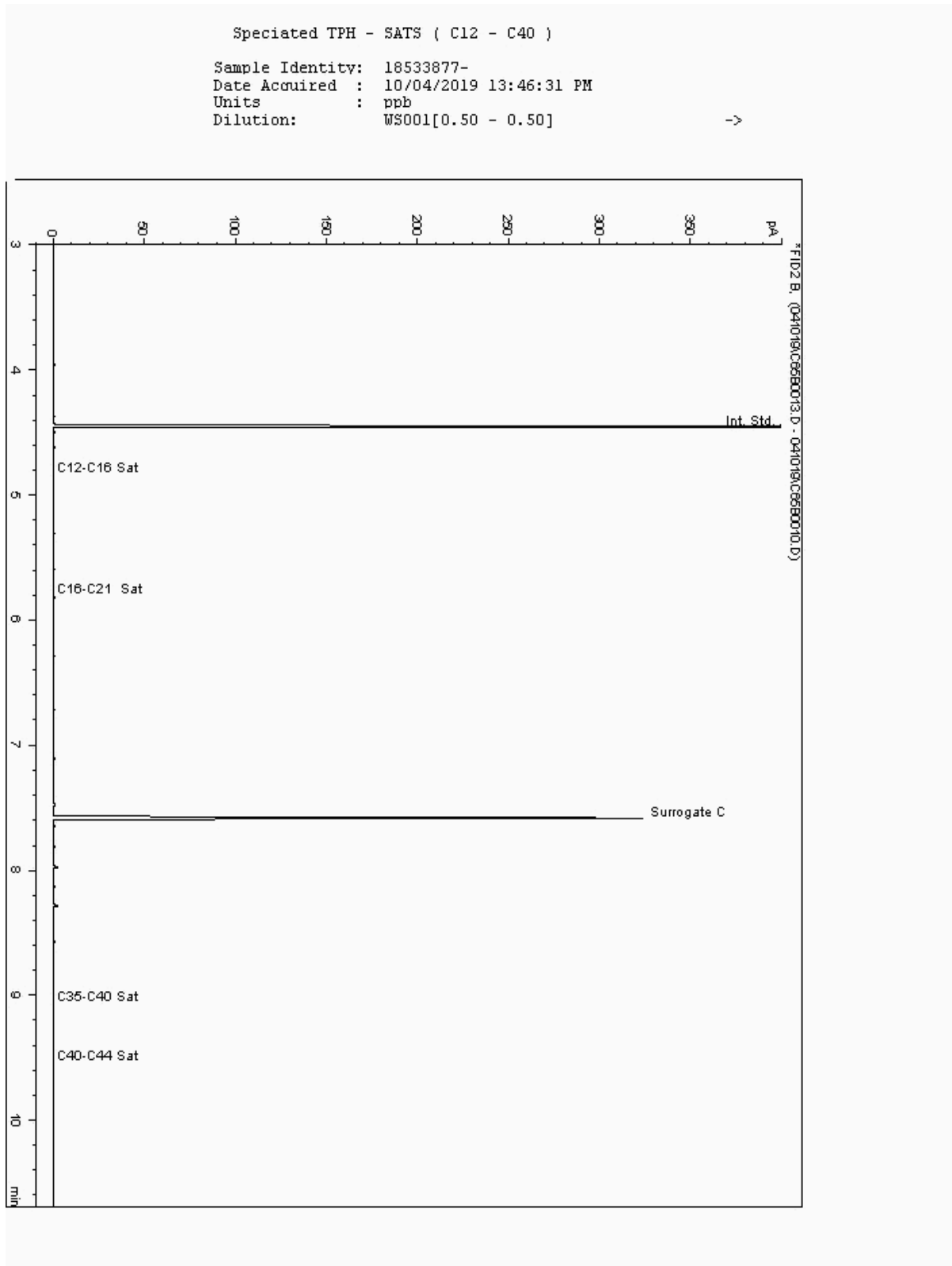
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726161
Sample ID : WS001

Depth : 0.50 - 0.50





CERTIFICATE OF ANALYSIS

Validated

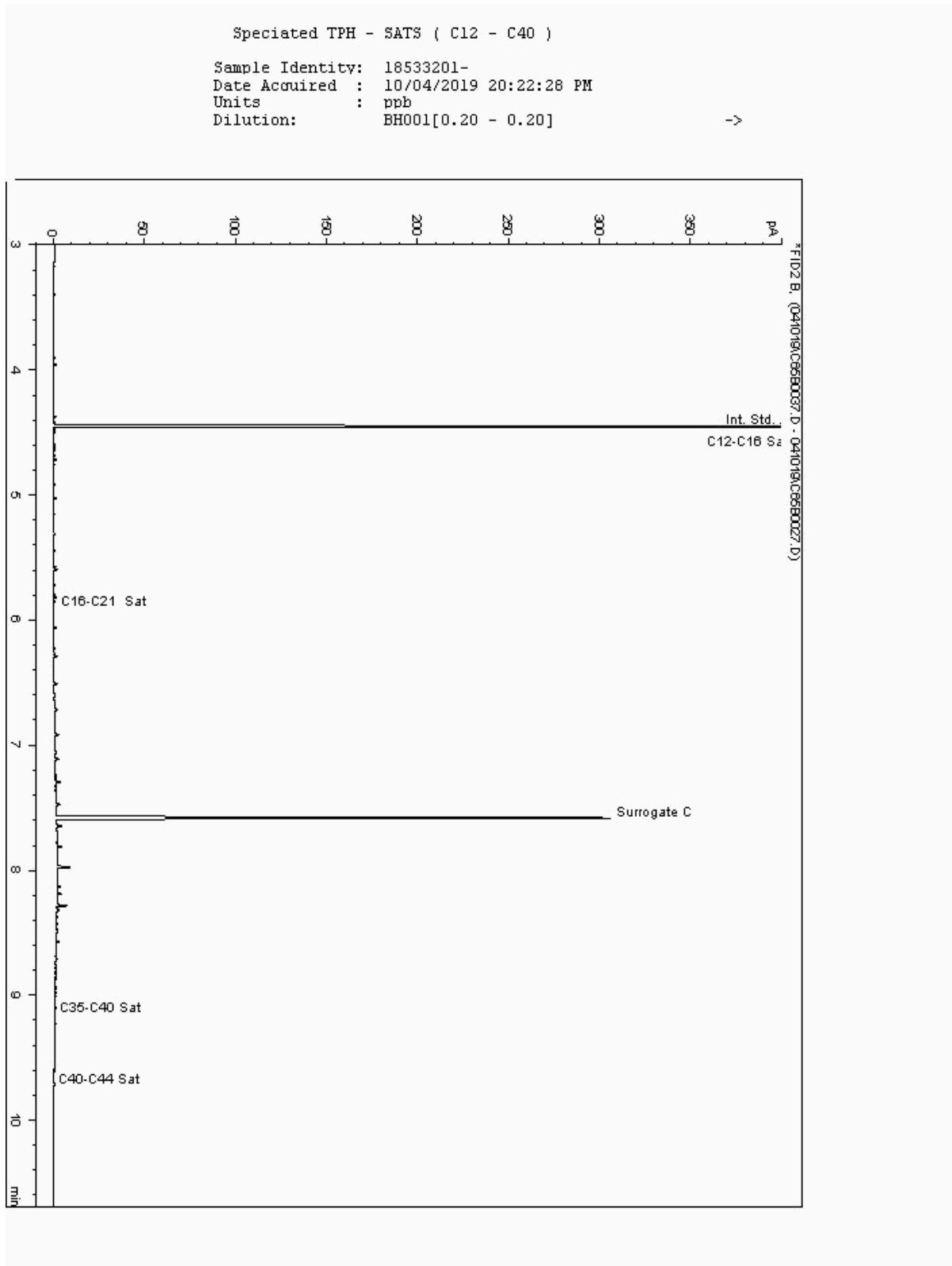
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726264
Sample ID : BH001

Depth : 0.20 - 0.20





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

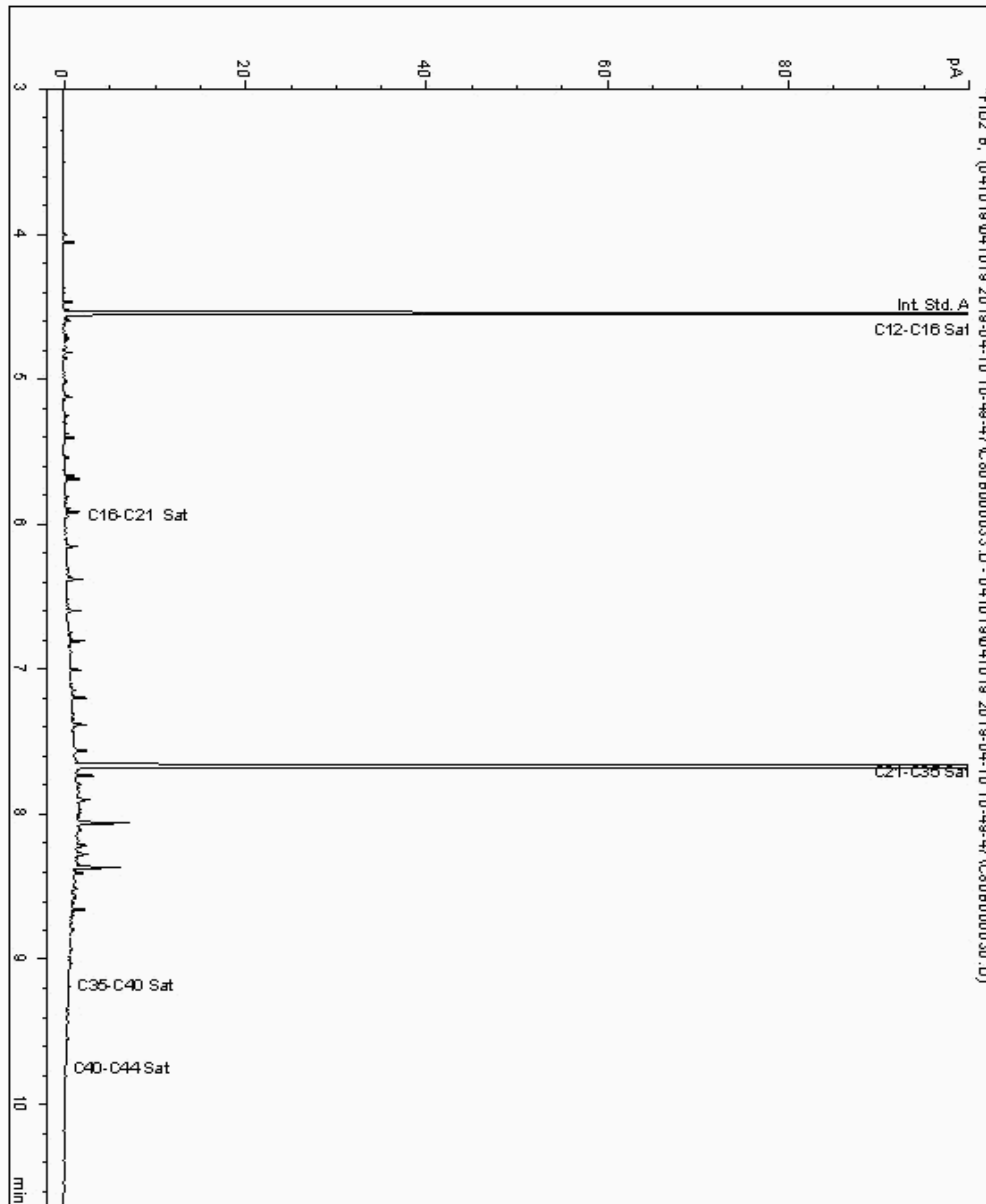
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726269
Sample ID : BH001

Depth : 0.50 - 0.50

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533501-
Date Acquired : 10/04/19 17:54:31
Units : ppb
Dilution :
CF : 1
Multiplier : 0.980





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

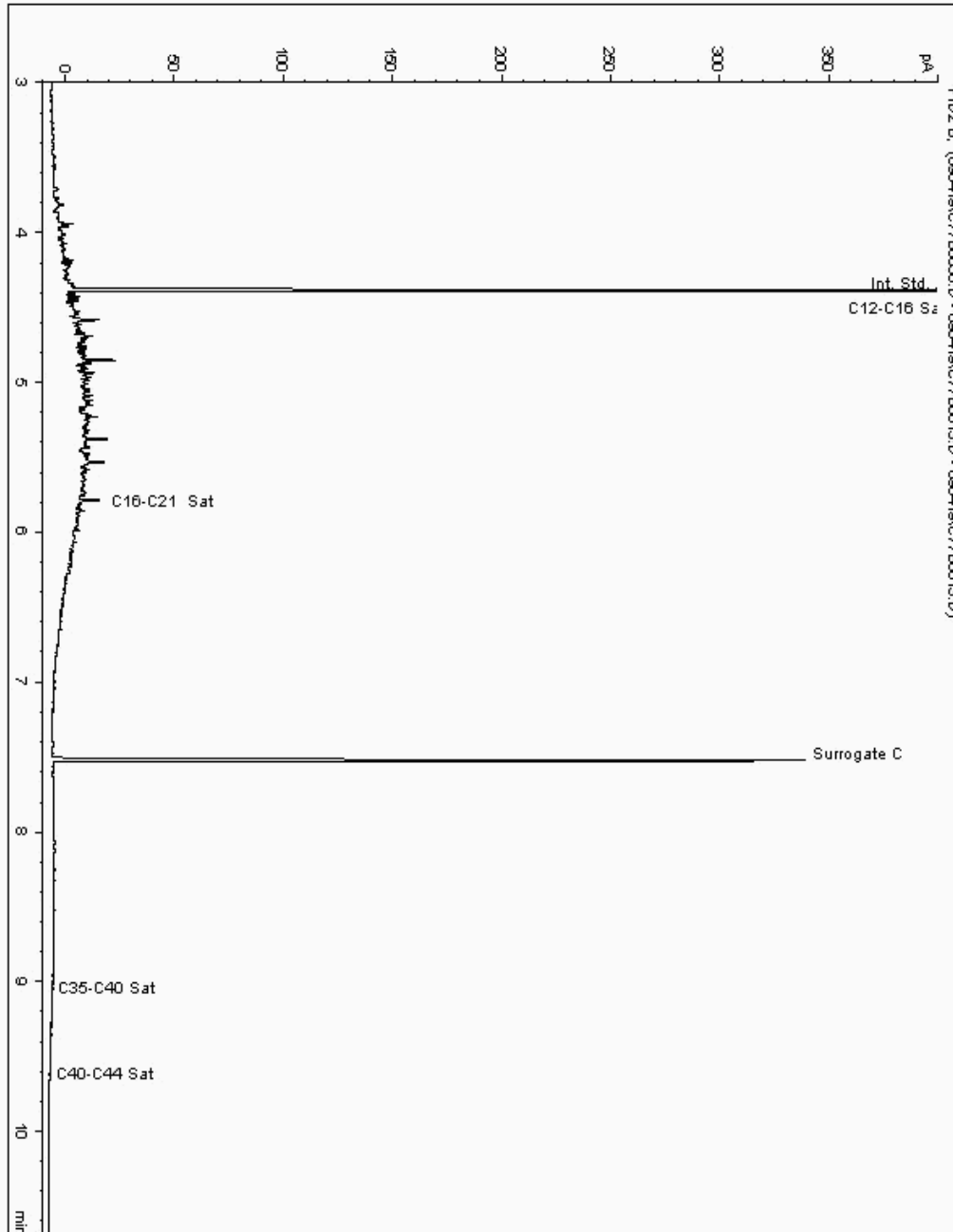
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726347
Sample ID : BH001

Depth : 2.20 - 2.20

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533751-
Date Acquired : 10/04/2019 13:51:55 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

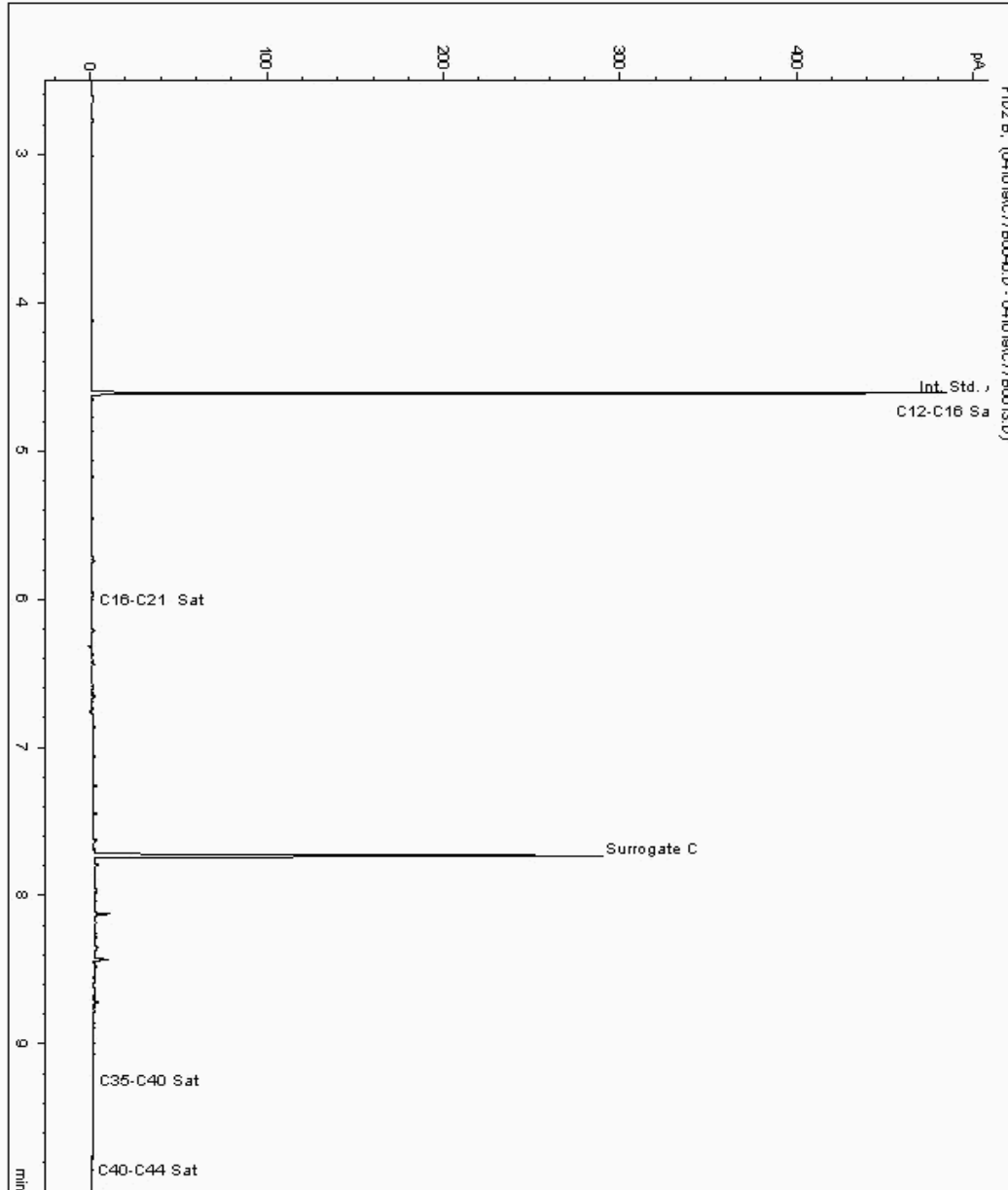
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726424
Sample ID : WS002

Depth : 0.10 - 0.10

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533228-
Date Acquired : 4/10/2019 11:11:53 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.960





CERTIFICATE OF ANALYSIS

Validated

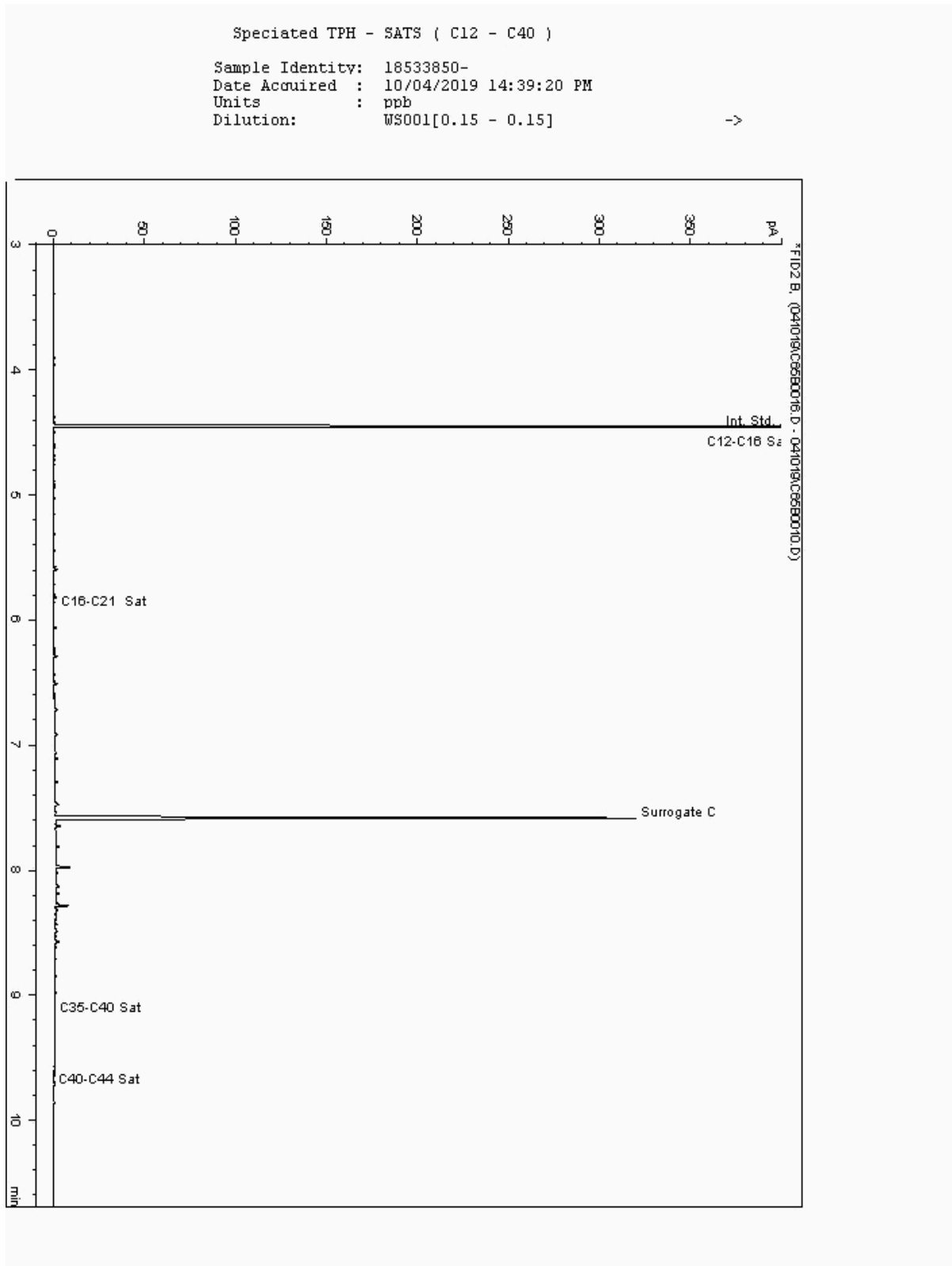
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726444
Sample ID : WS001

Depth : 0.15 - 0.15





CERTIFICATE OF ANALYSIS

Validated

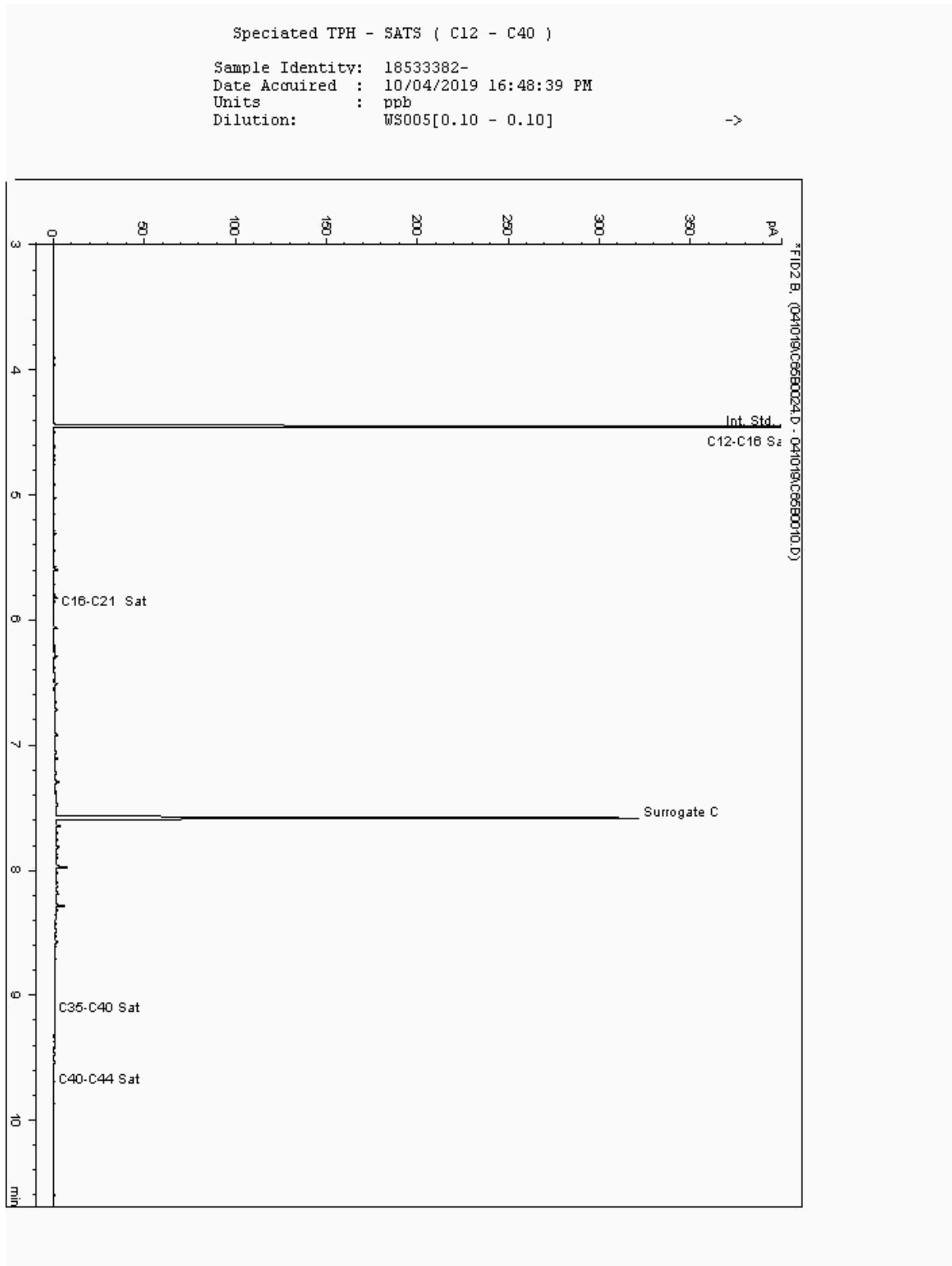
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726523
Sample ID : WS005

Depth : 0.10 - 0.10





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

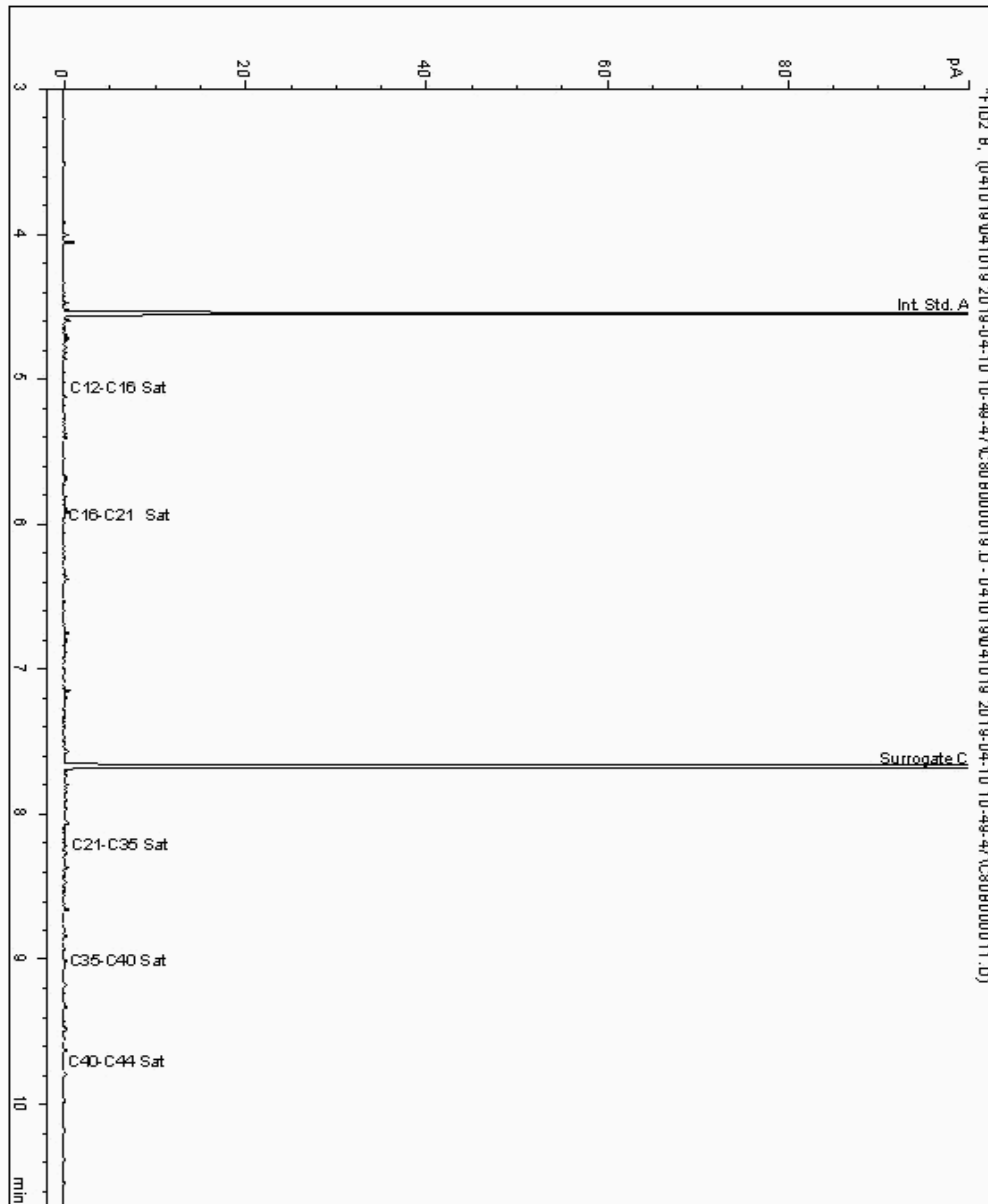
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726573
Sample ID : WS002

Depth : 1.10 - 1.10

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533278-
Date Acquired : 10/04/19 13:44:32
Units : ppb
Dilution :
CF : 1
Multiplier : 0.990





CERTIFICATE OF ANALYSIS

Validated

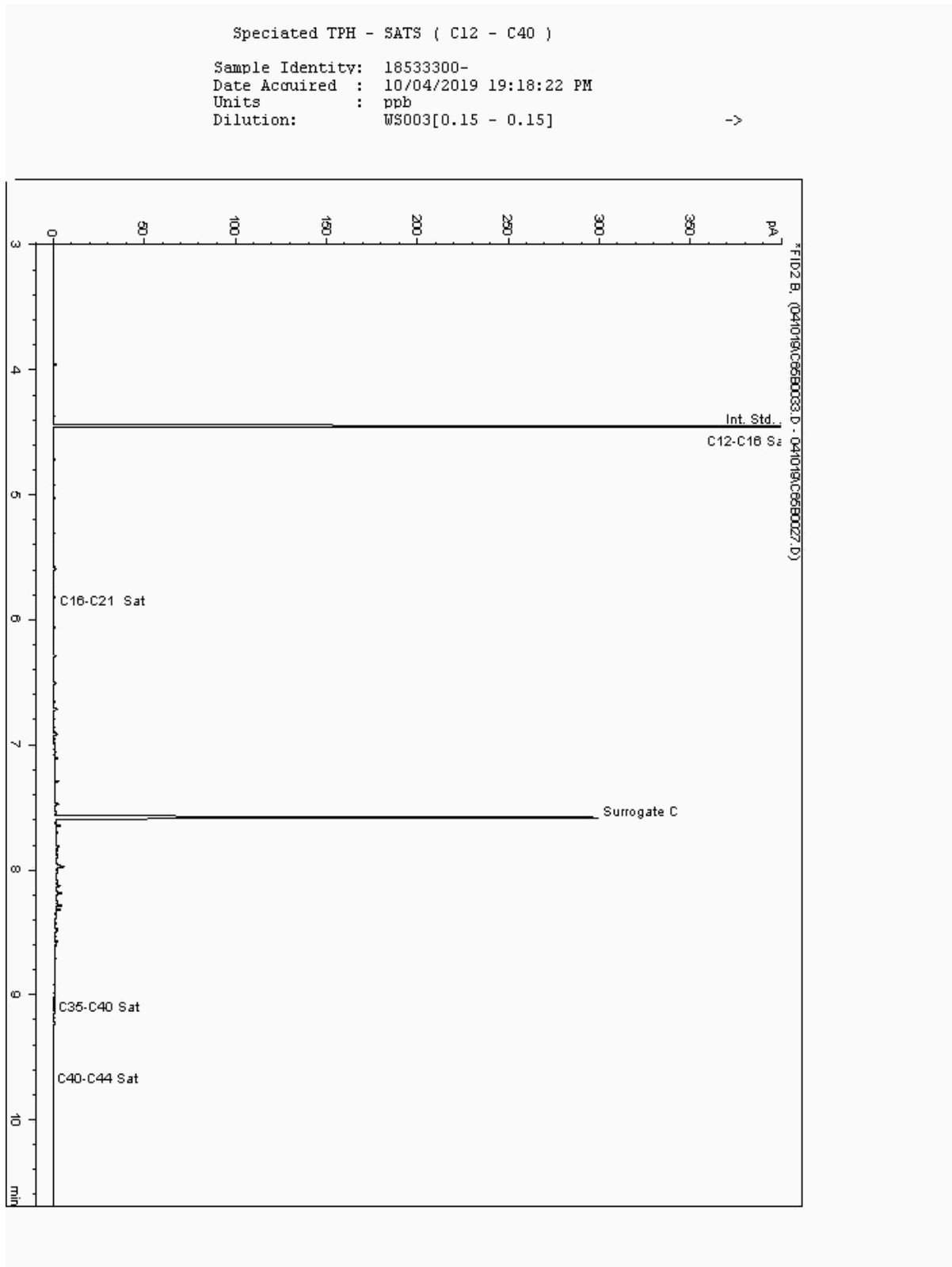
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726643
Sample ID : WS003

Depth : 0.15 - 0.15





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

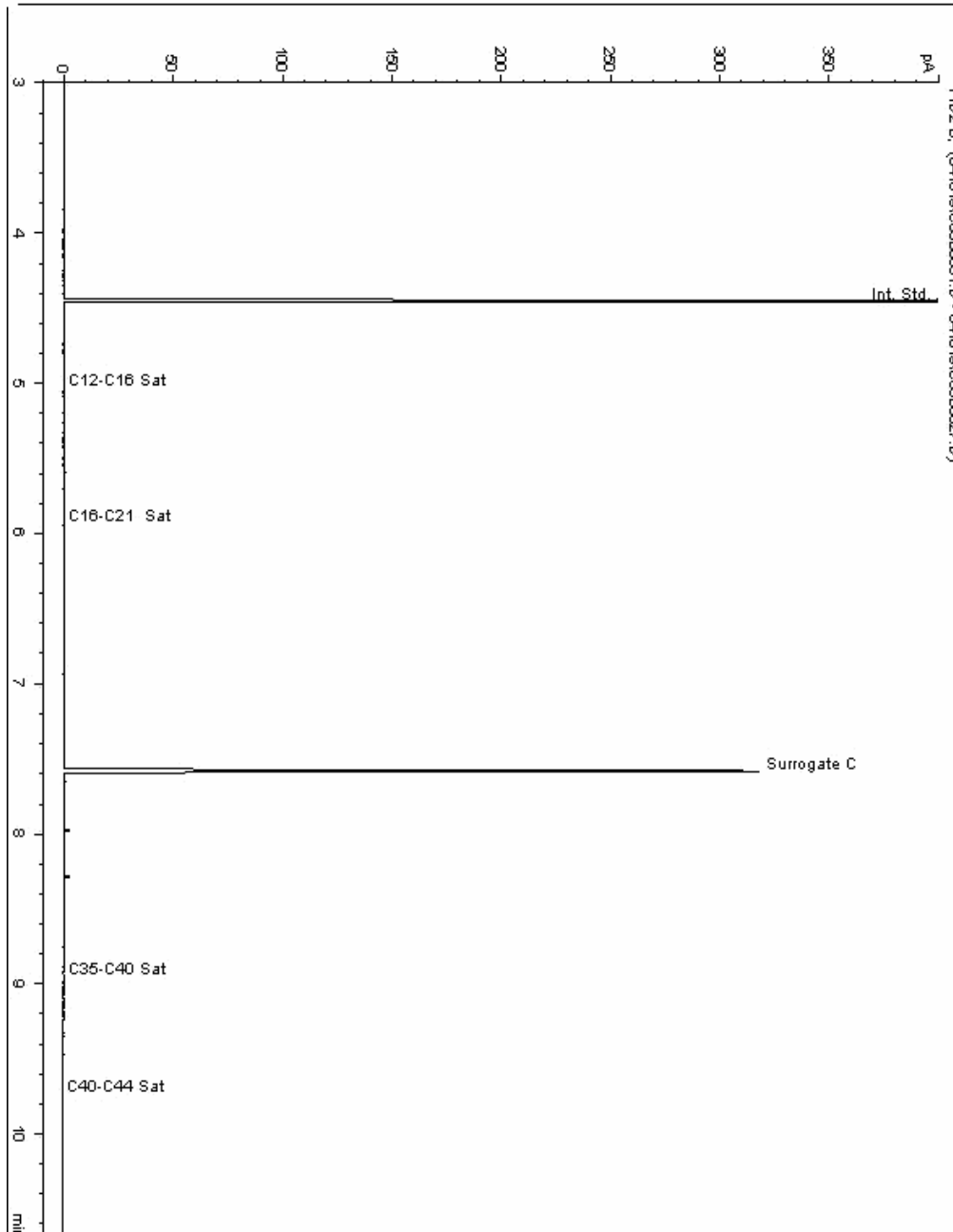
Sample No : 19726679
Sample ID : WS005

Depth : 1.20 - 1.20

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533430-
Date Acquired : 10/04/2019 18:46:08 PM
Units : ppb
Dilution: WS005[1.20 - 1.20]

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CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

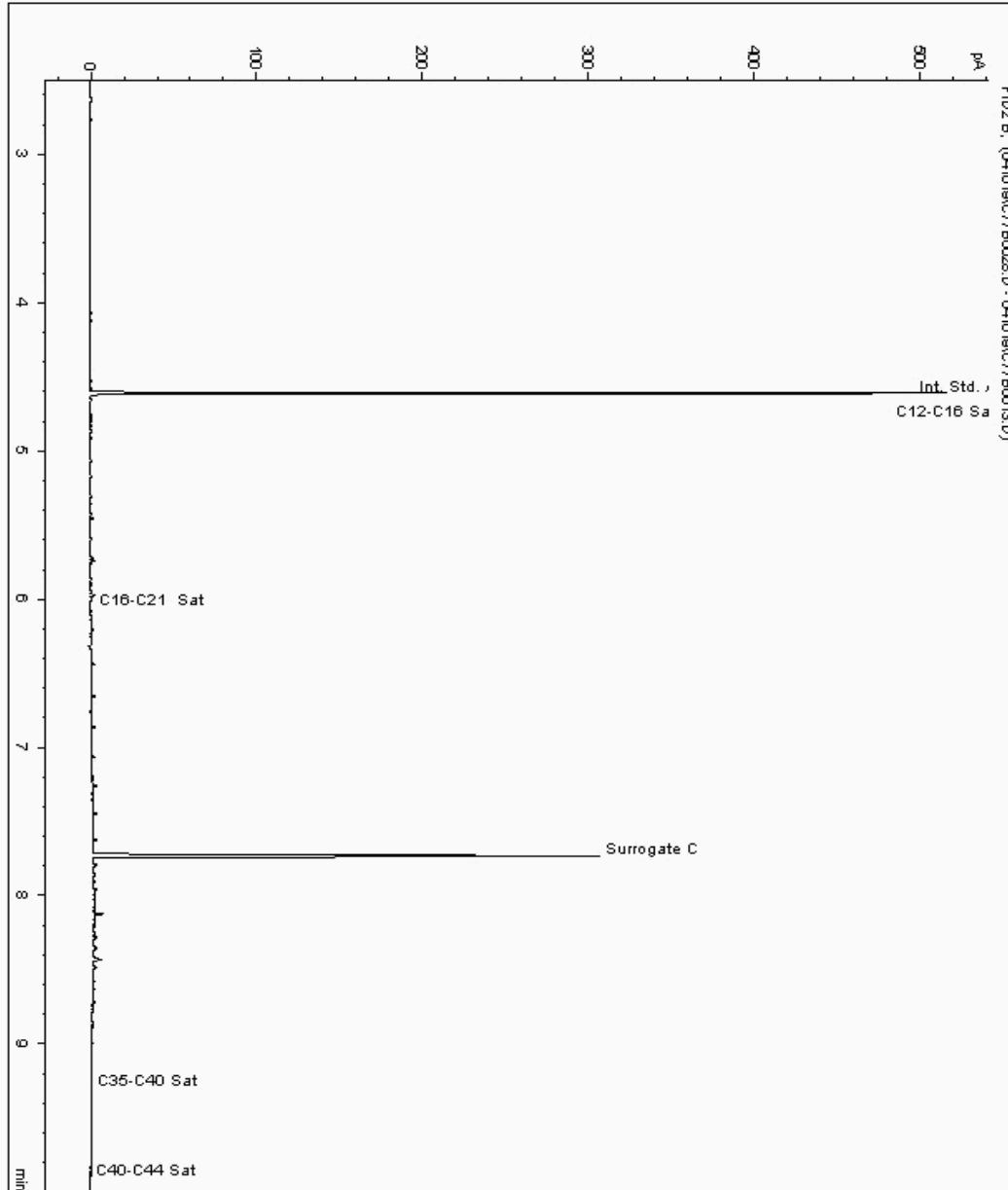
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726716
Sample ID : WS003

Depth : 0.70 - 0.70

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533326-
Date Acquired : 4/10/2019 5:53:26 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.960





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

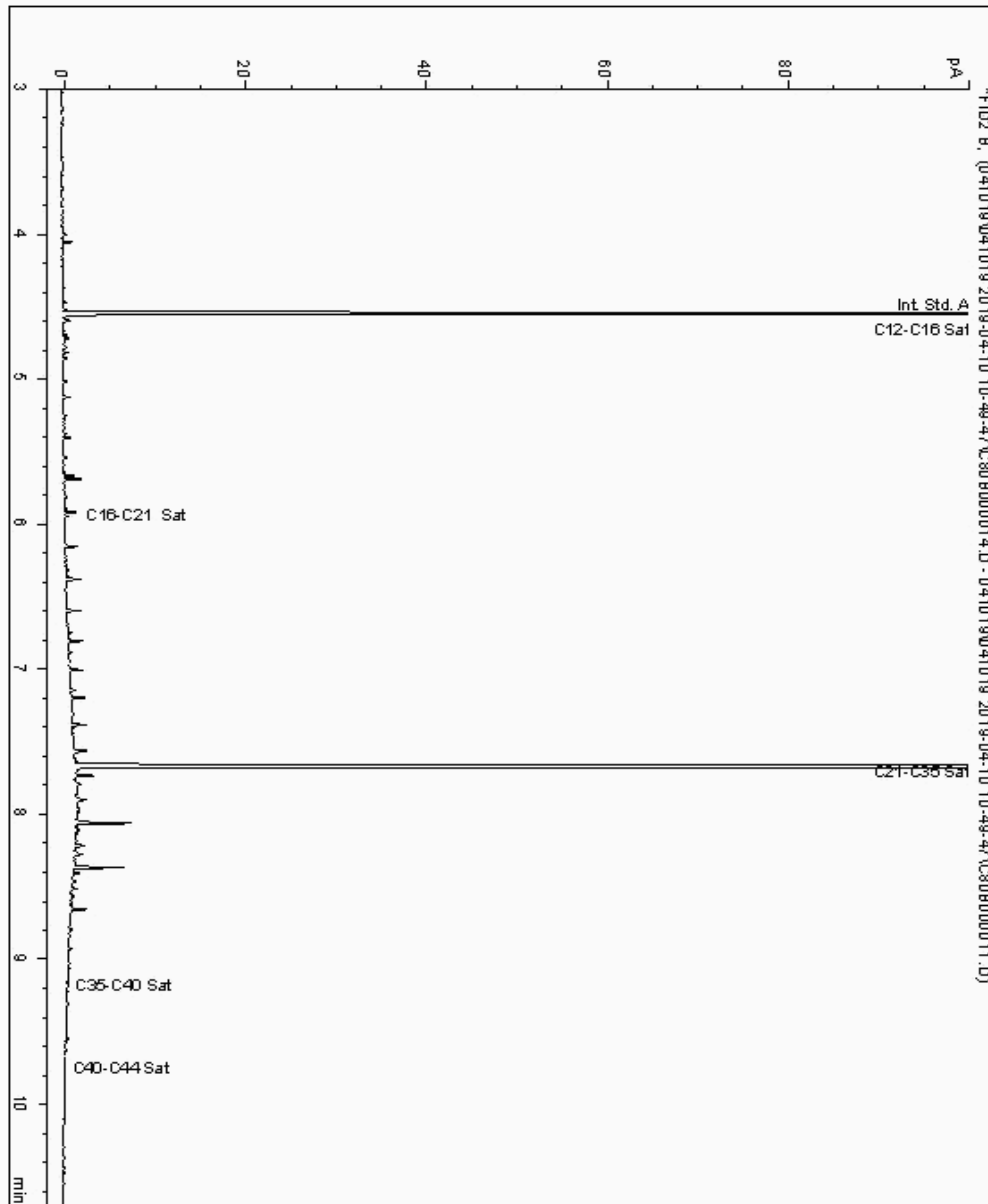
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726764
Sample ID : WS005

Depth : 0.70 - 0.70

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533408-
Date Acquired : 10/04/19 12:28:22
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

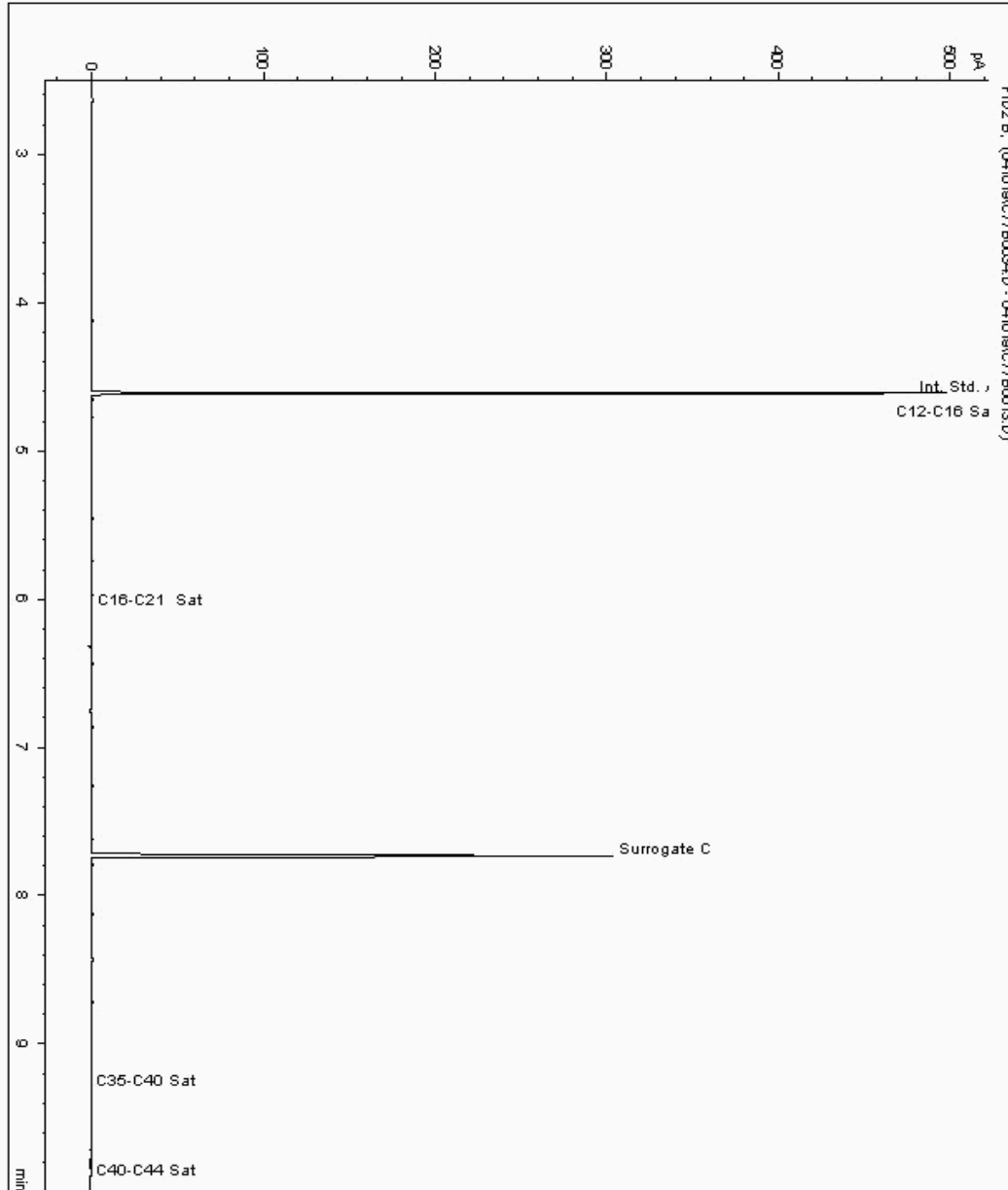
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726826
Sample ID : WS003

Depth : 1.00 - 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533358-
Date Acquired : 4/10/2019 7:28:19 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.990





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

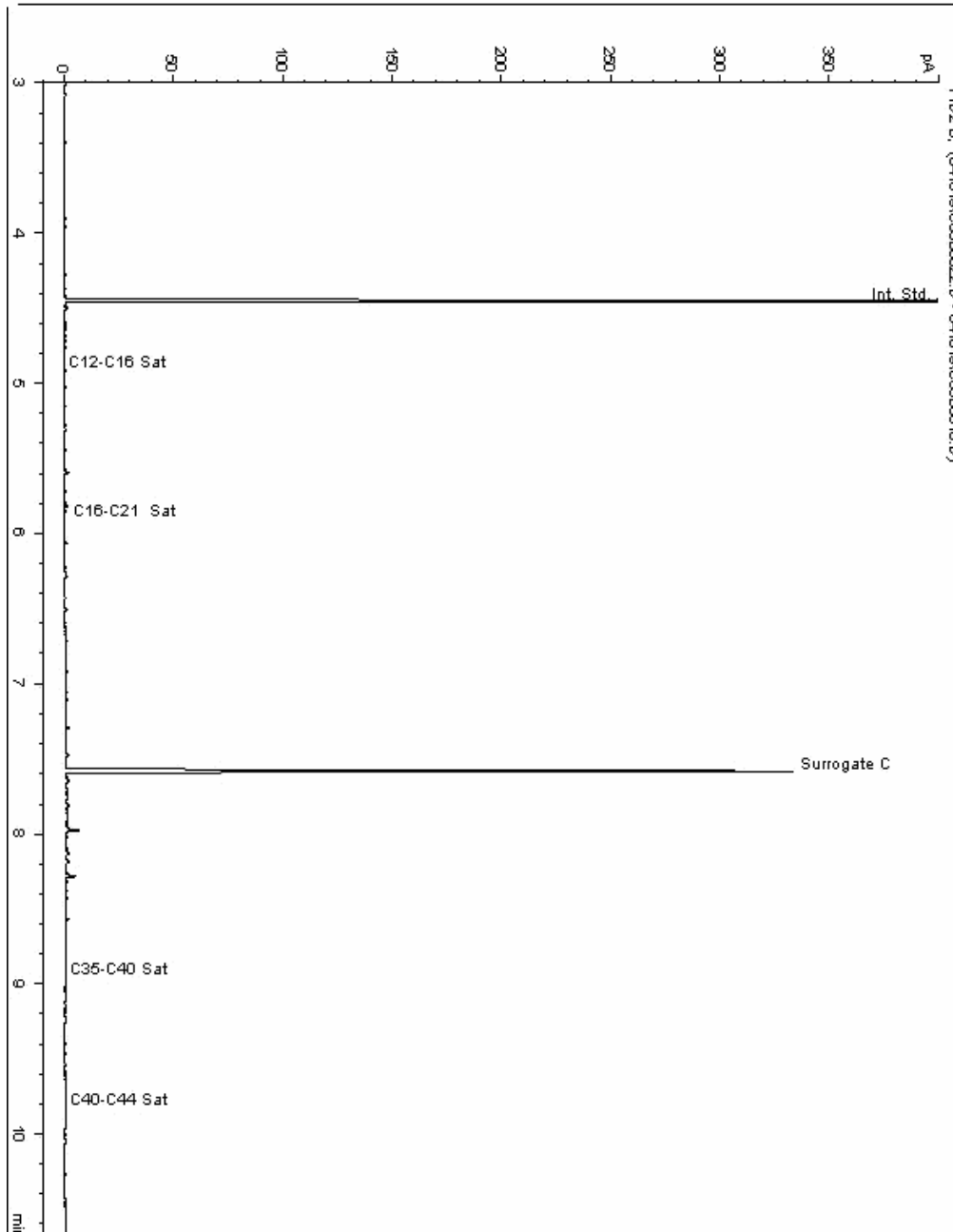
Sample No : 19726851
Sample ID : WS002

Depth : 0.50 - 0.50

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533252-
Date Acquired : 10/04/2019 16:16:21 PM
Units : ppb
Dilution: WS002[0.50 - 0.50]

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CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

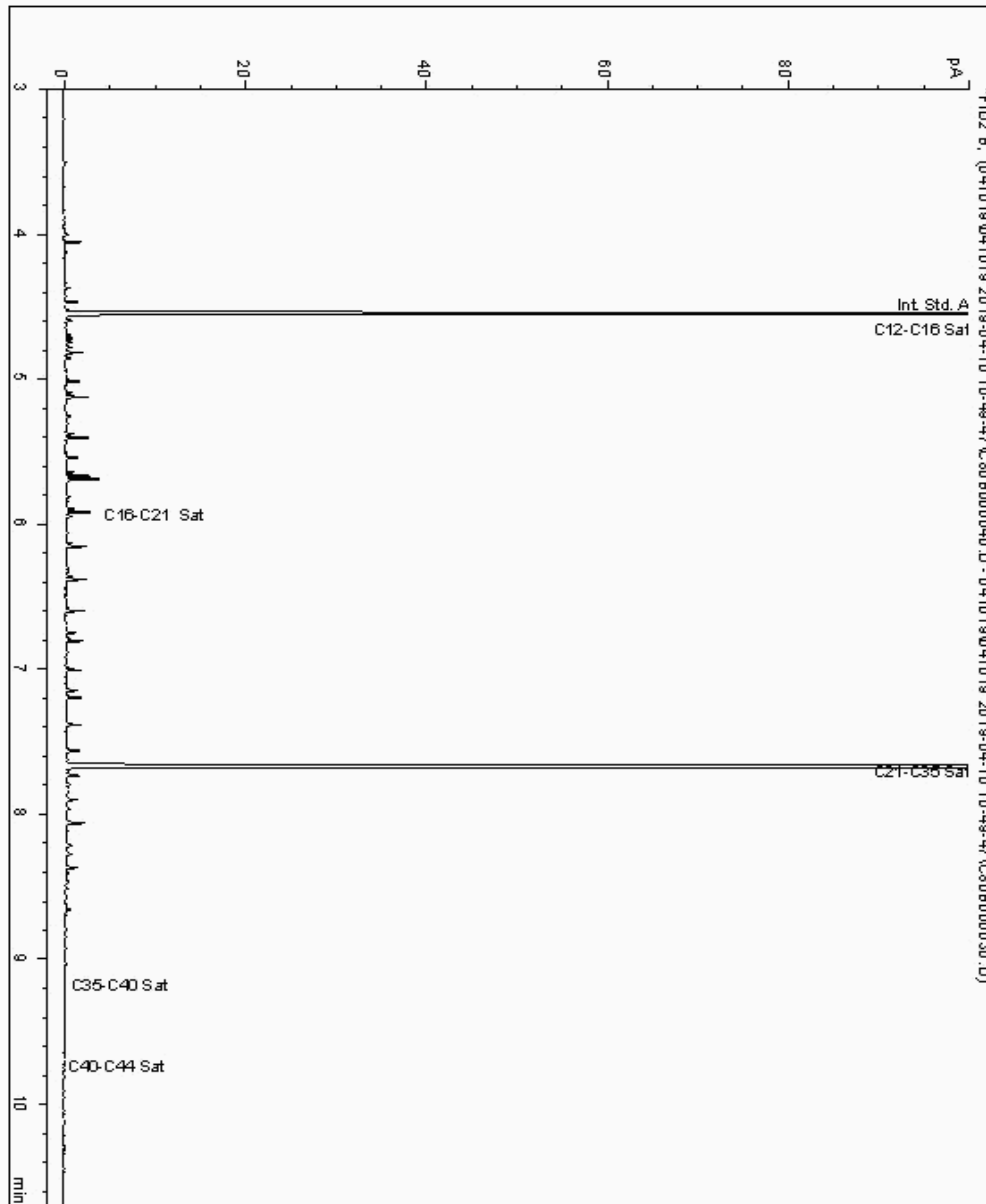
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726900
Sample ID : BH002

Depth : 1.00 - 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533553-
Date Acquired : 10/04/19 19:50:33
Units : ppb
Dilution :
CF : 1
Multiplier : 0.950





CERTIFICATE OF ANALYSIS

Validated

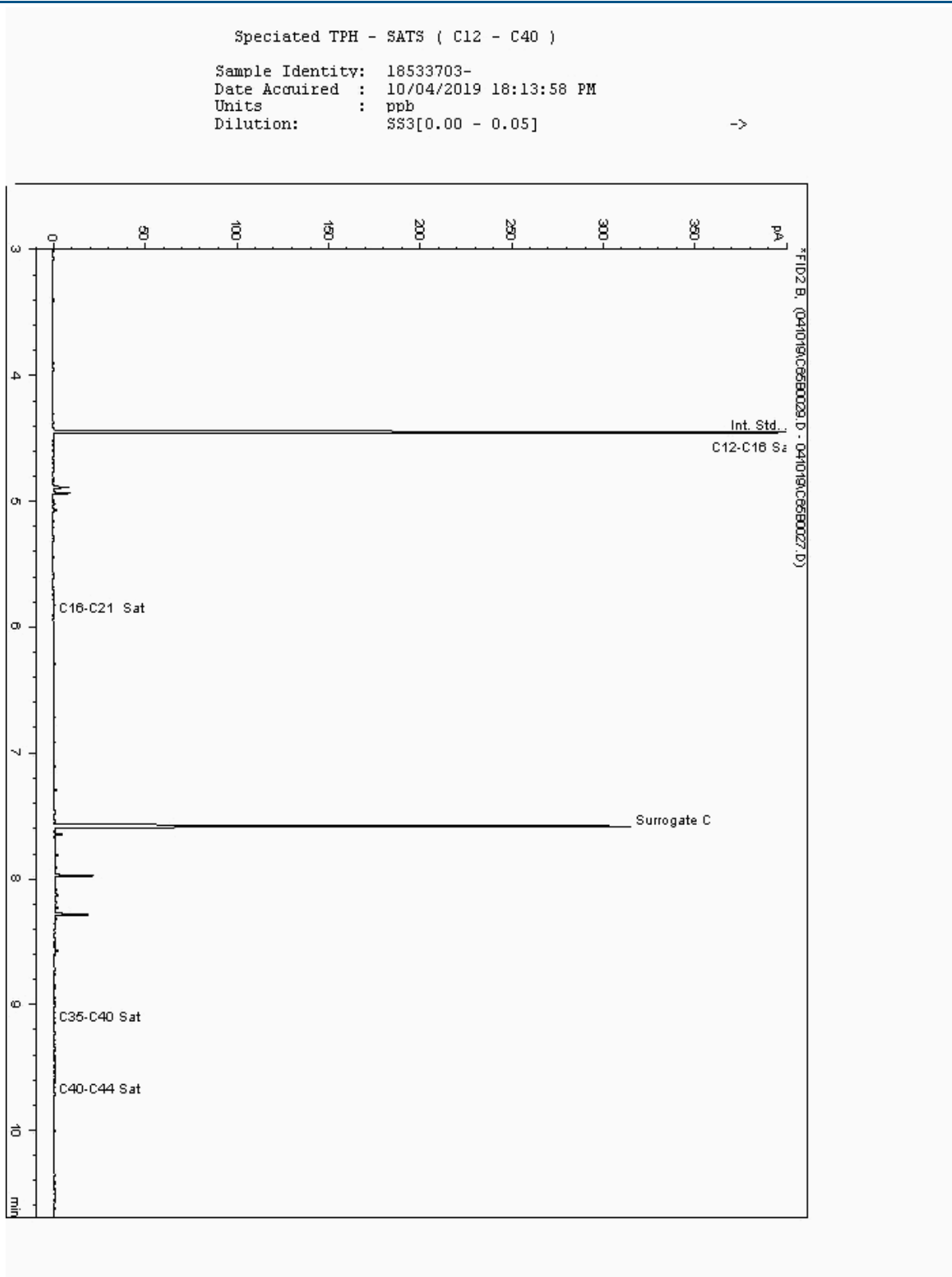
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726929
Sample ID : SS3

Depth : 0.00 - 0.05





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

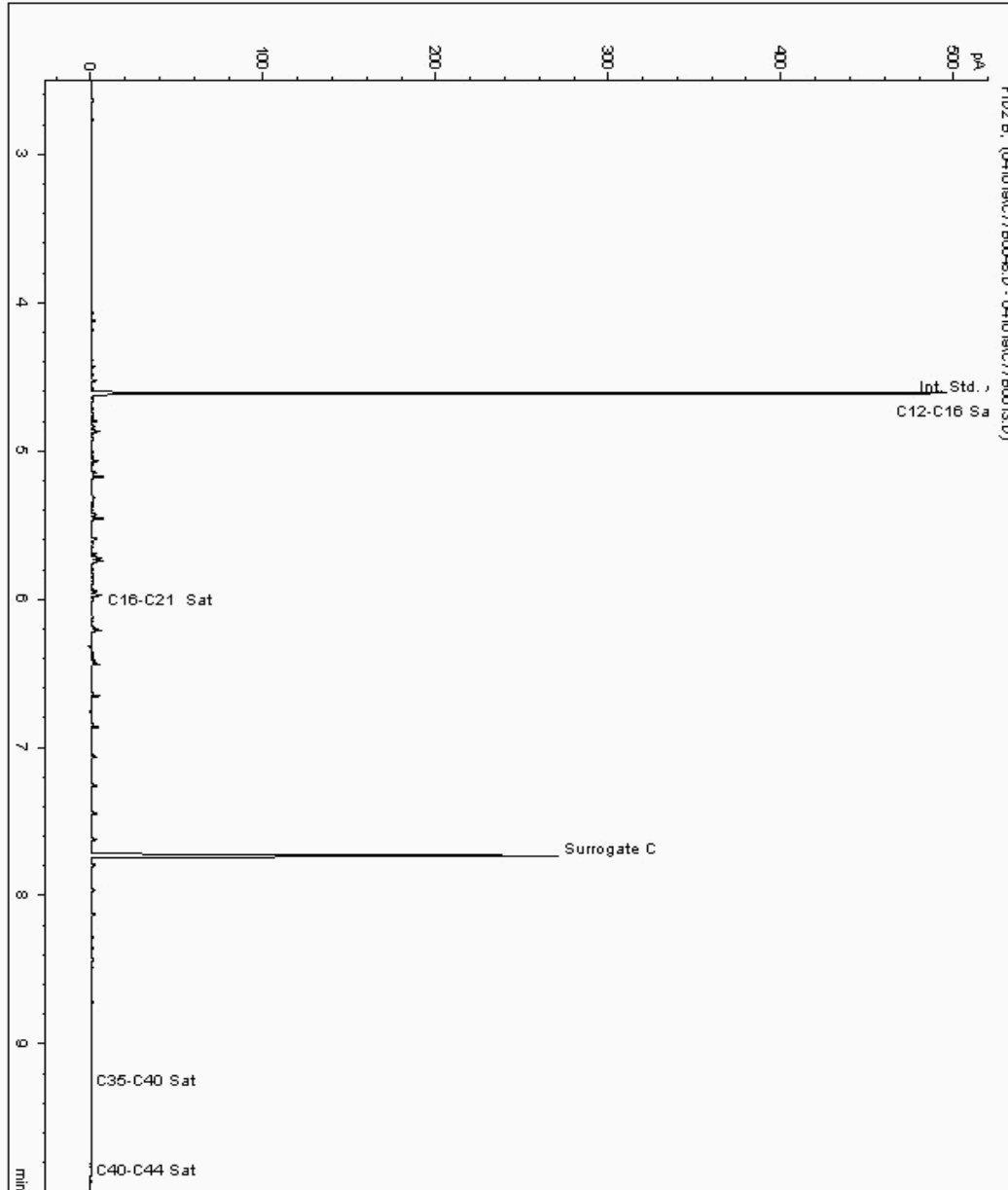
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19726983
Sample ID : BH002

Depth : 0.30 - 0.30

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533455-
Date Acquired : 4/10/2019 11:43:58 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010





CERTIFICATE OF ANALYSIS

Validated

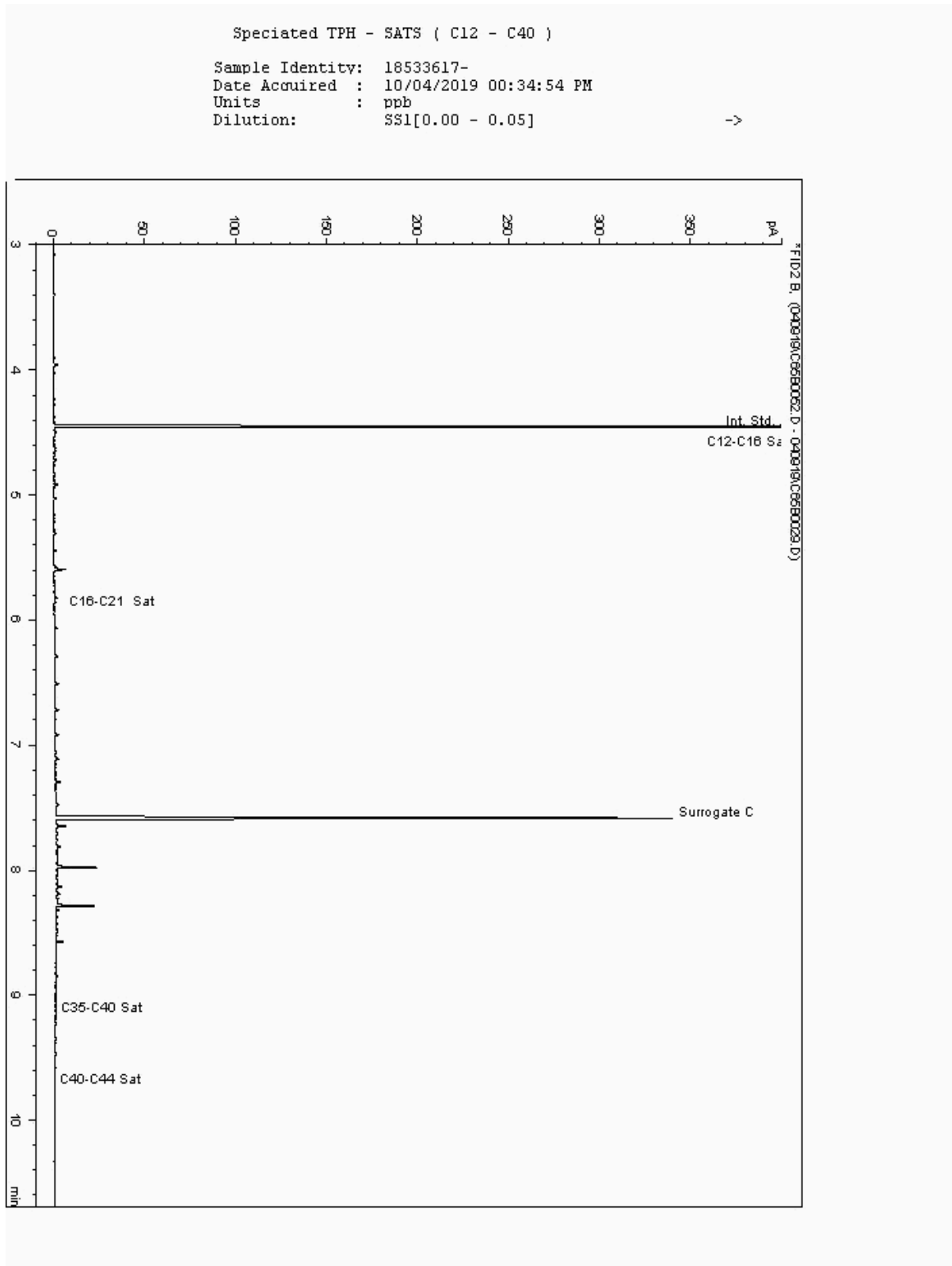
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19727044
Sample ID : SS1

Depth : 0.00 - 0.05





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

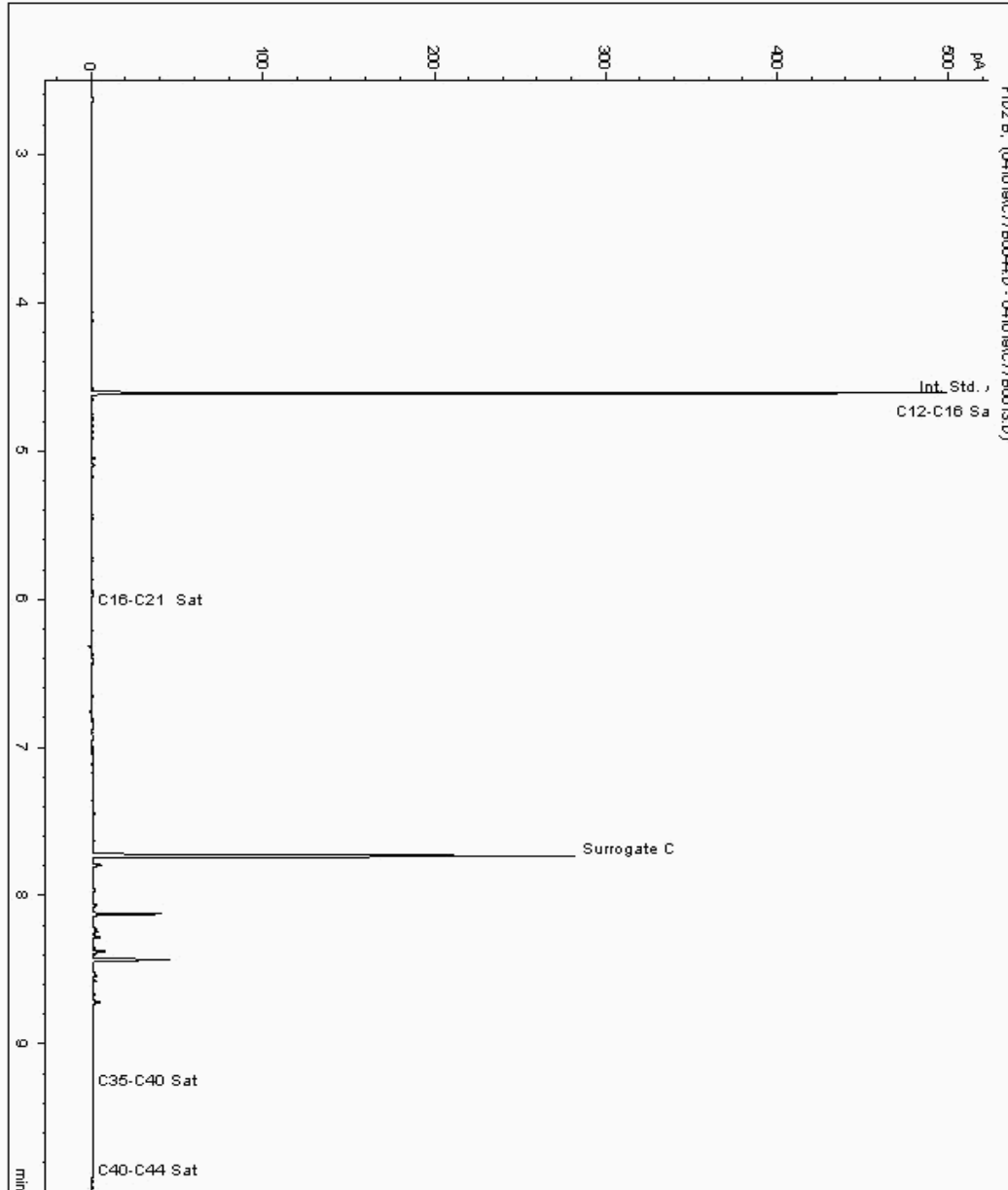
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19727060
Sample ID : SS2

Depth : 0.00 - 0.05

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533672-
Date Acquired : 4/10/2019 10:39:52 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 1.020





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

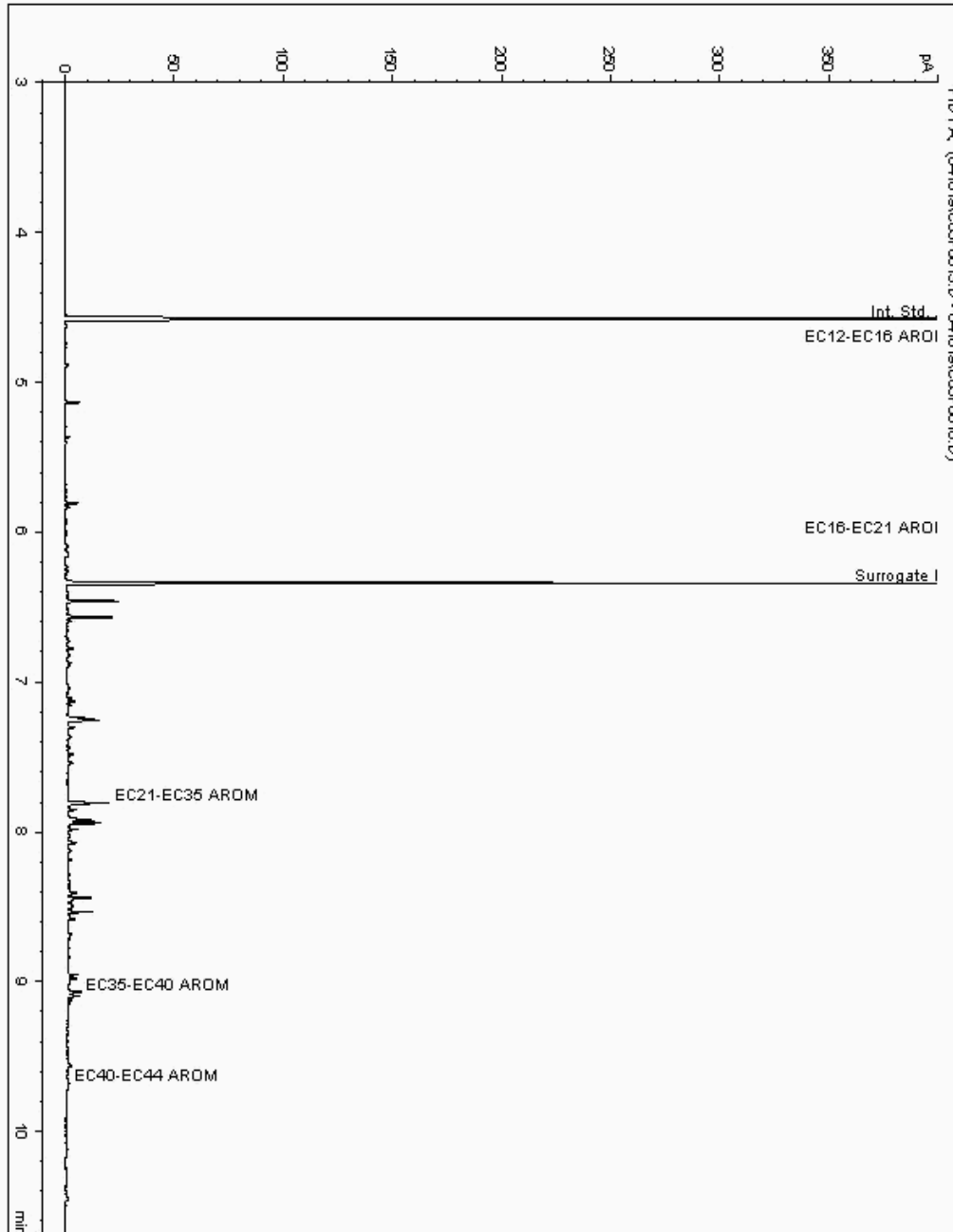
Sample No : 19726161
Sample ID : WS001

Depth : 0.50 - 0.50

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18533878-
Date Acquired : 10/04/2019 13:46:32 PM
Units : ppb
Dilution: WS001[0.50 - 0.50]

->





CERTIFICATE OF ANALYSIS

Validated

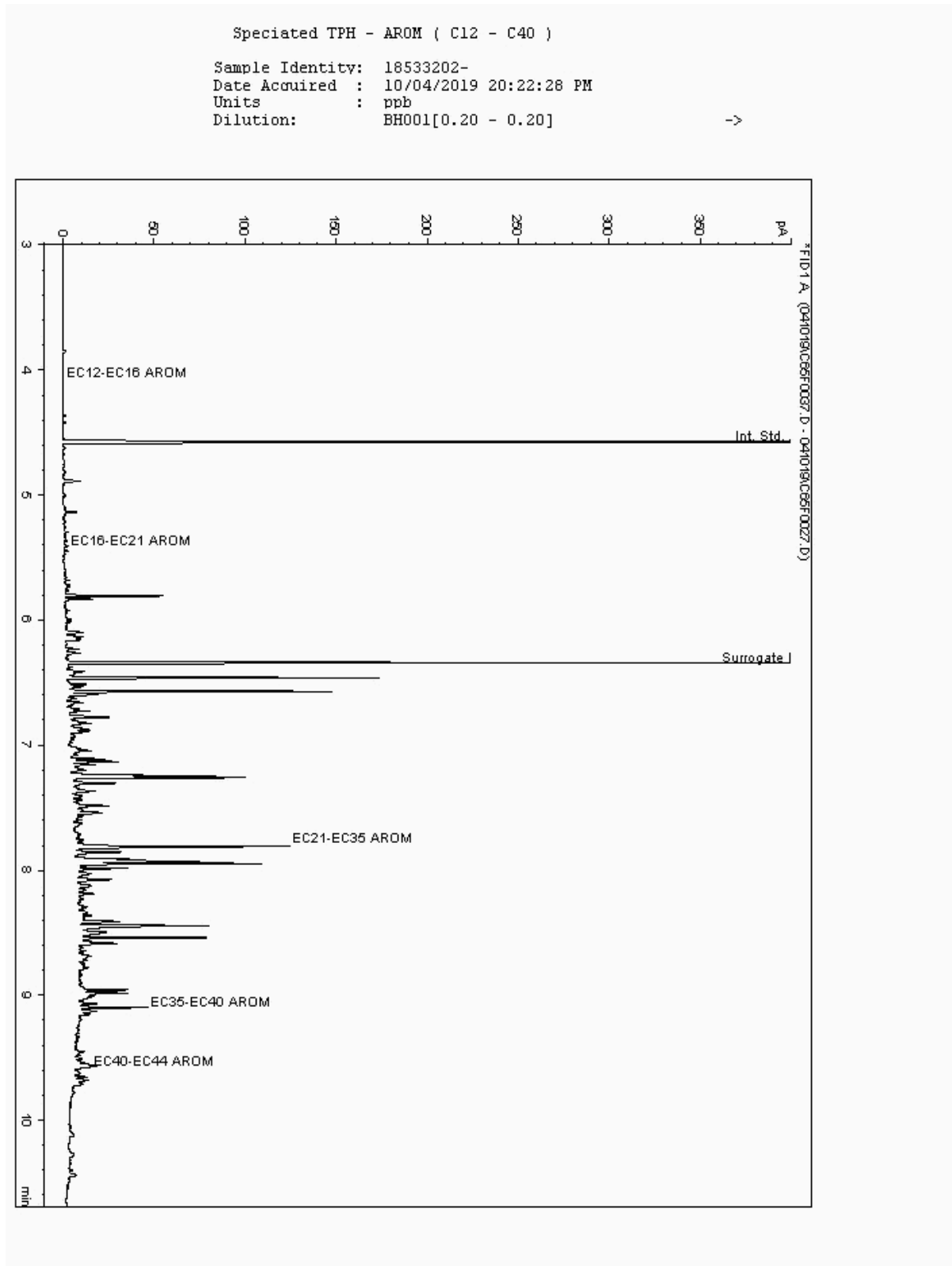
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726264
Sample ID : BH001

Depth : 0.20 - 0.20





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

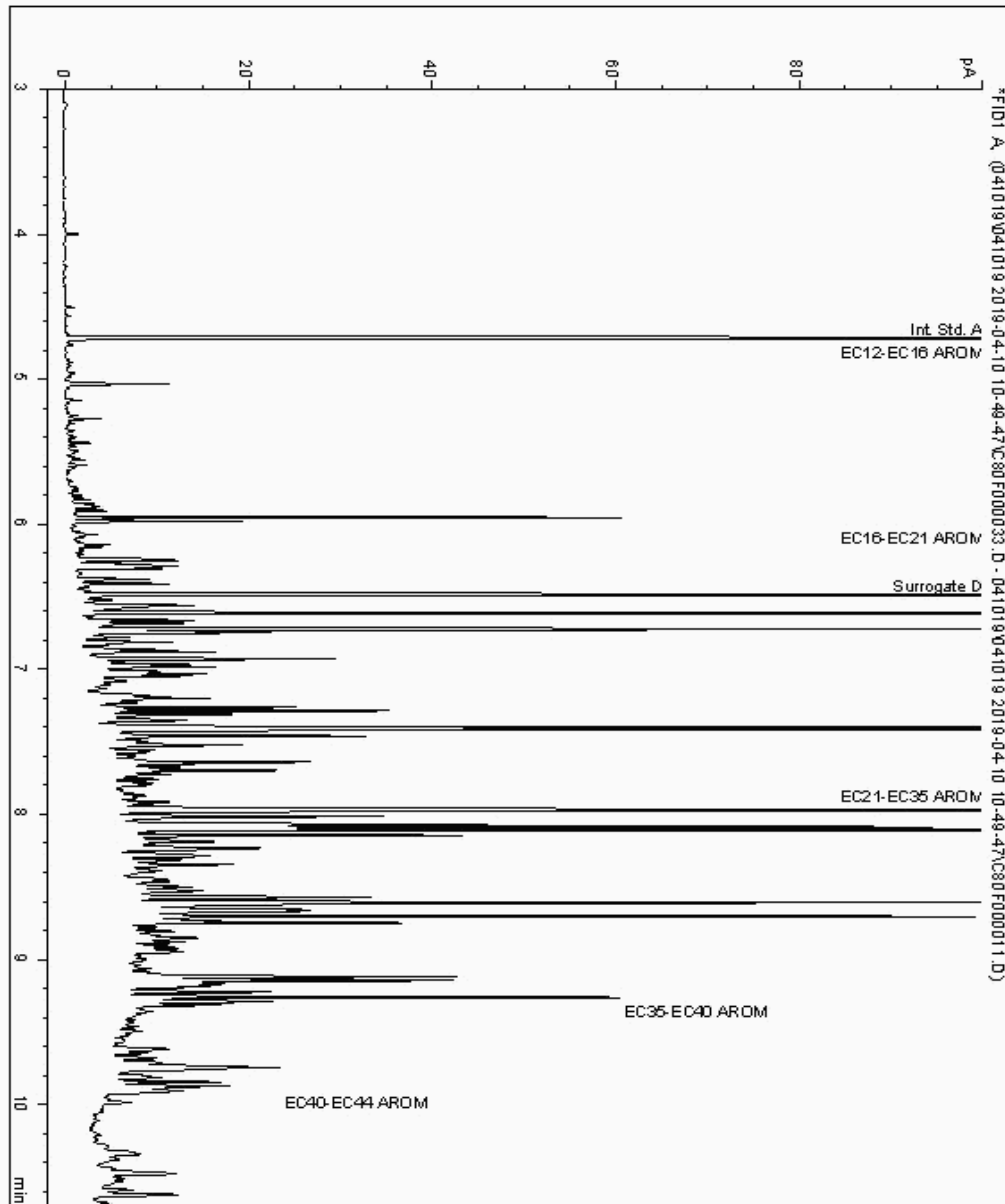
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726269
Sample ID : BH001

Depth : 0.50 - 0.50

Speciated TPH - AROMS (C12 - C44)

Sample Identity: 18533502-
Date Acquired : 10/04/19 17:54:31
Units : ppb
Dilution :
CF : 1
Multiplier : 0.980





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

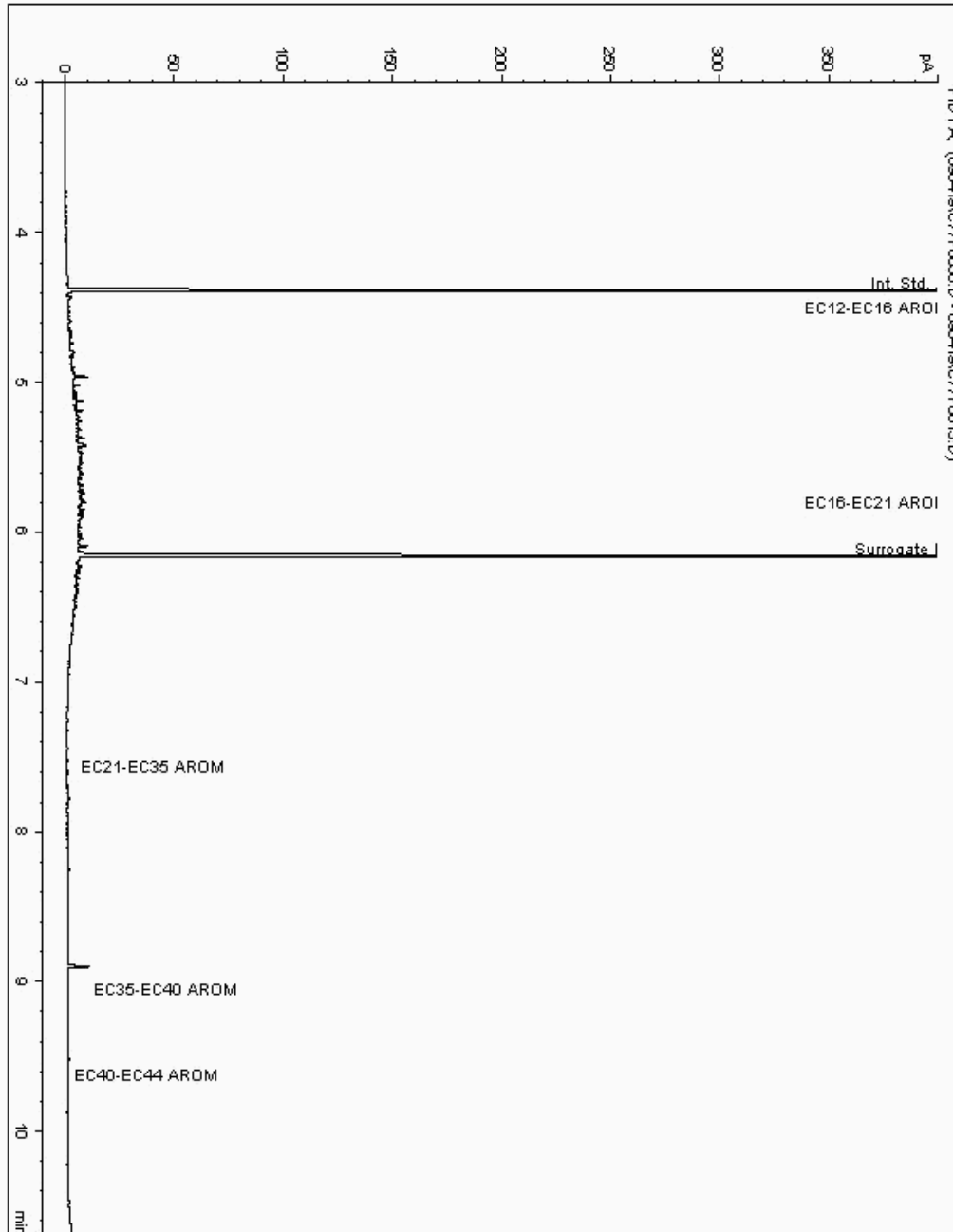
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726347
Sample ID : BH001

Depth : 2.20 - 2.20

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18533752-
Date Acquired : 10/04/2019 13:51:55 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

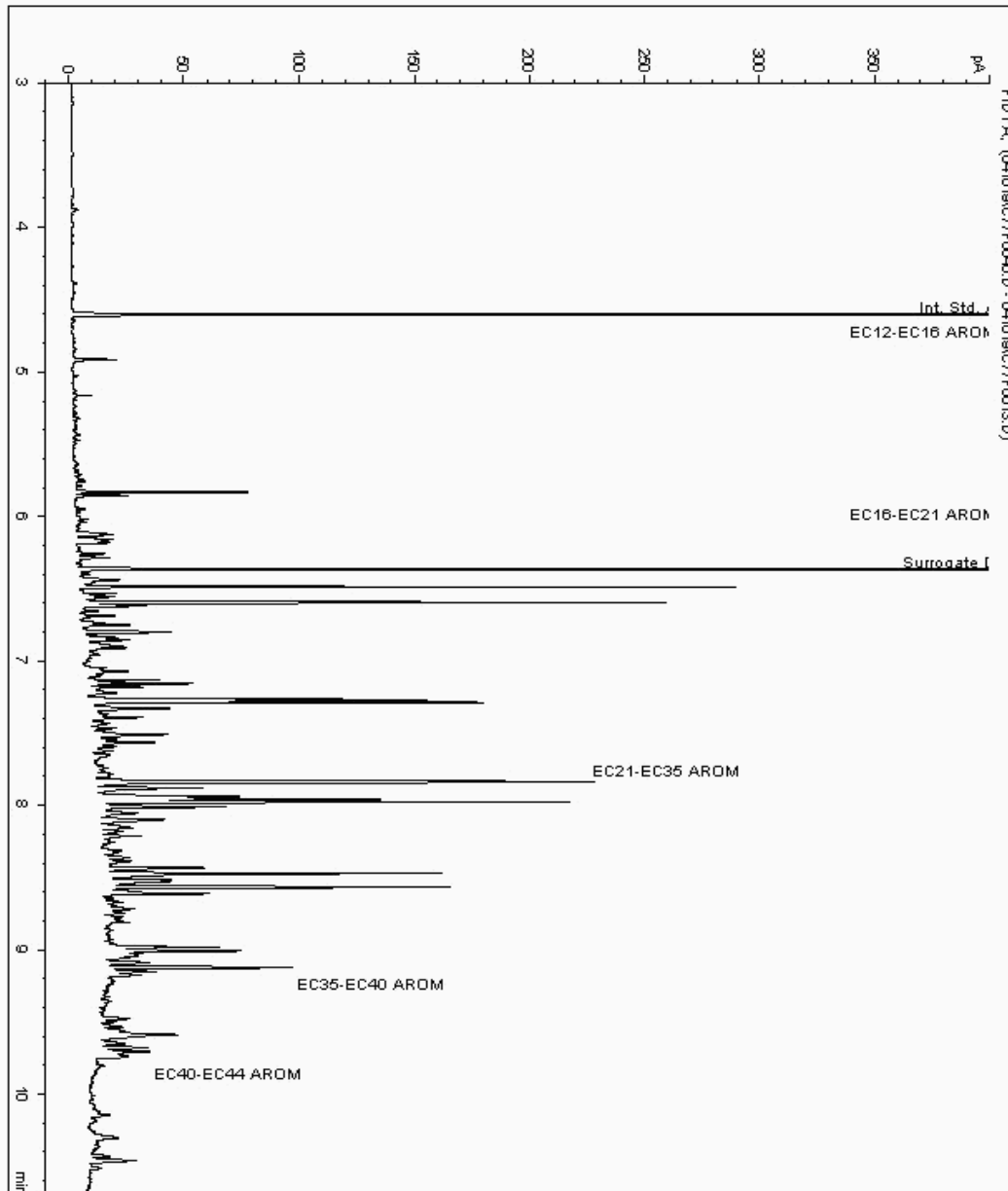
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726424
Sample ID : WS002

Depth : 0.10 - 0.10

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18533229-
Date Acquired : 4/10/2019 11:11:53 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

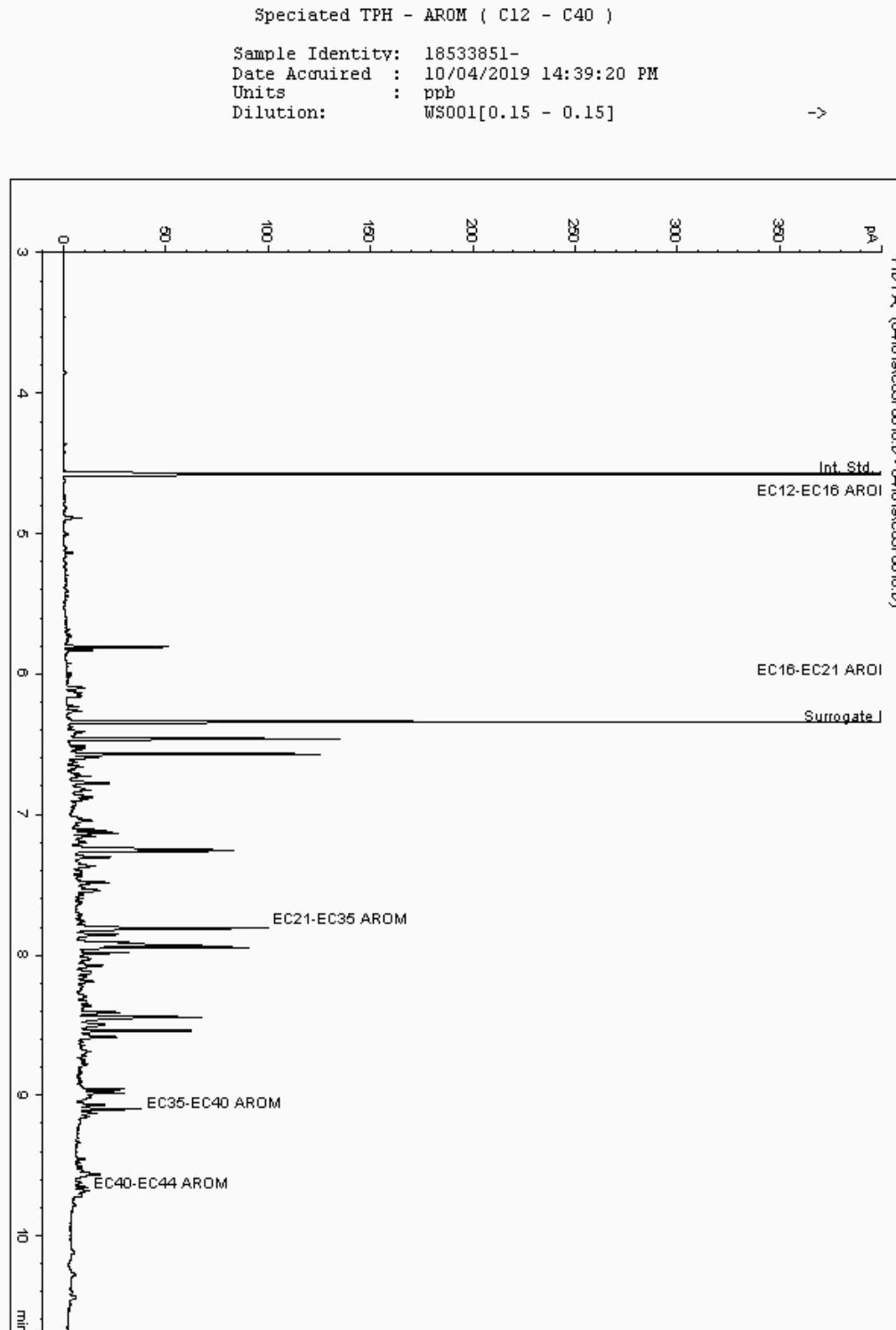
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726444
Sample ID : WS001

Depth : 0.15 - 0.15





CERTIFICATE OF ANALYSIS

Validated

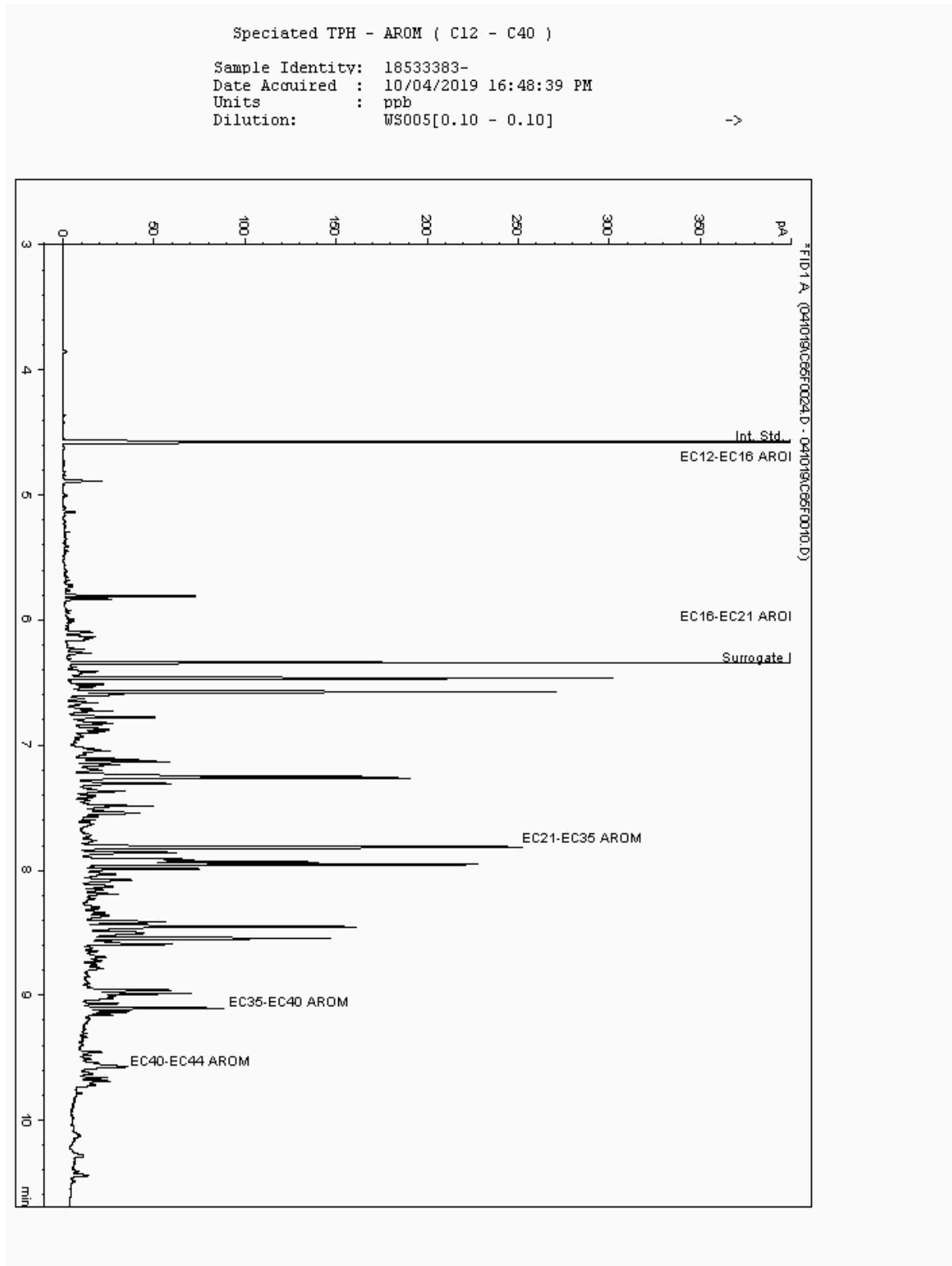
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726523
Sample ID : WS005

Depth : 0.10 - 0.10





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

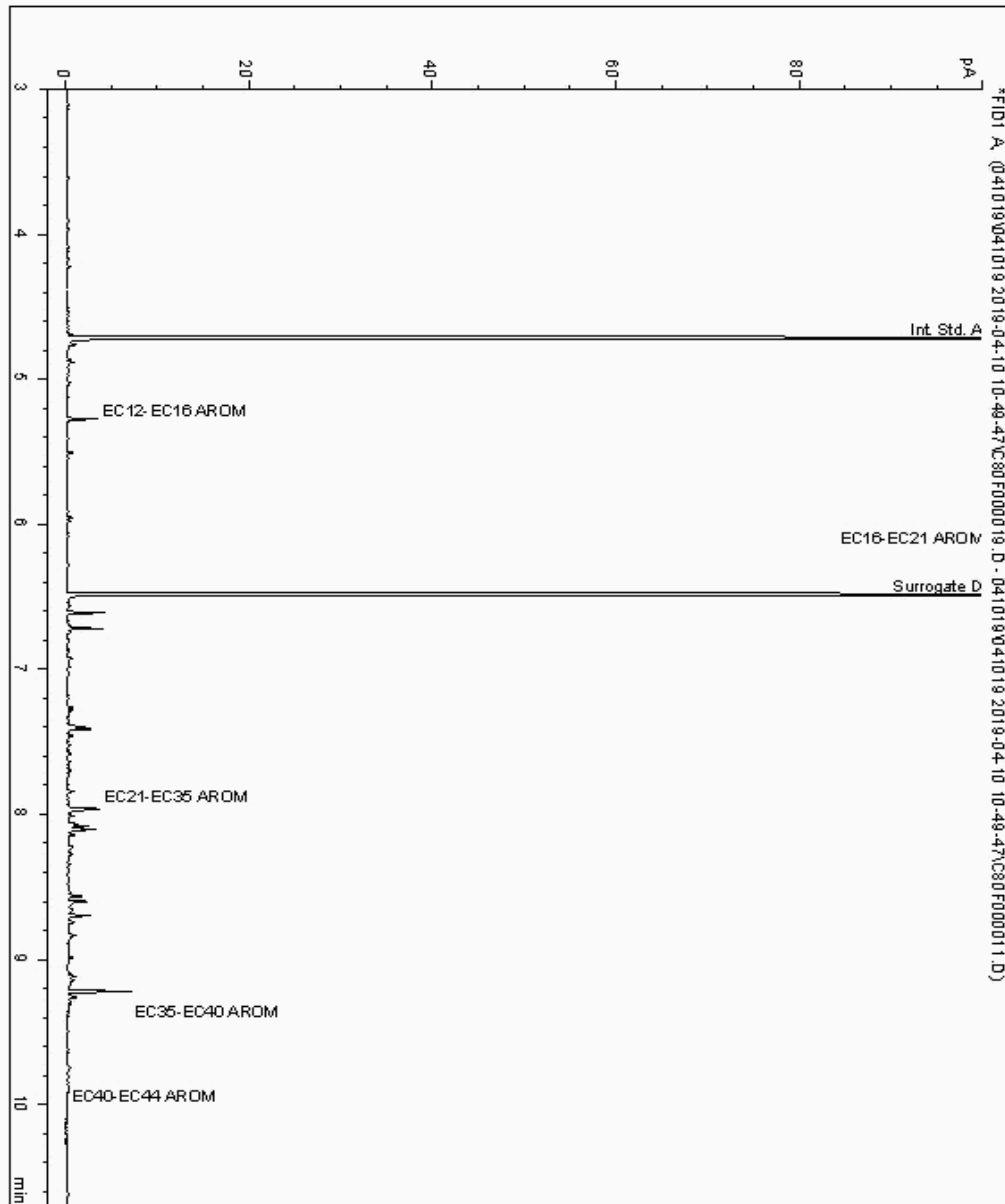
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726573
Sample ID : WS002

Depth : 1.10 - 1.10

Speciated TPH - AROMS (C12 - C44)

Sample Identity: 18533279-
Date Acquired : 10/04/19 13:44:33
Units : ppb
Dilution :
CF : 1
Multiplier : 0.990





CERTIFICATE OF ANALYSIS

Validated

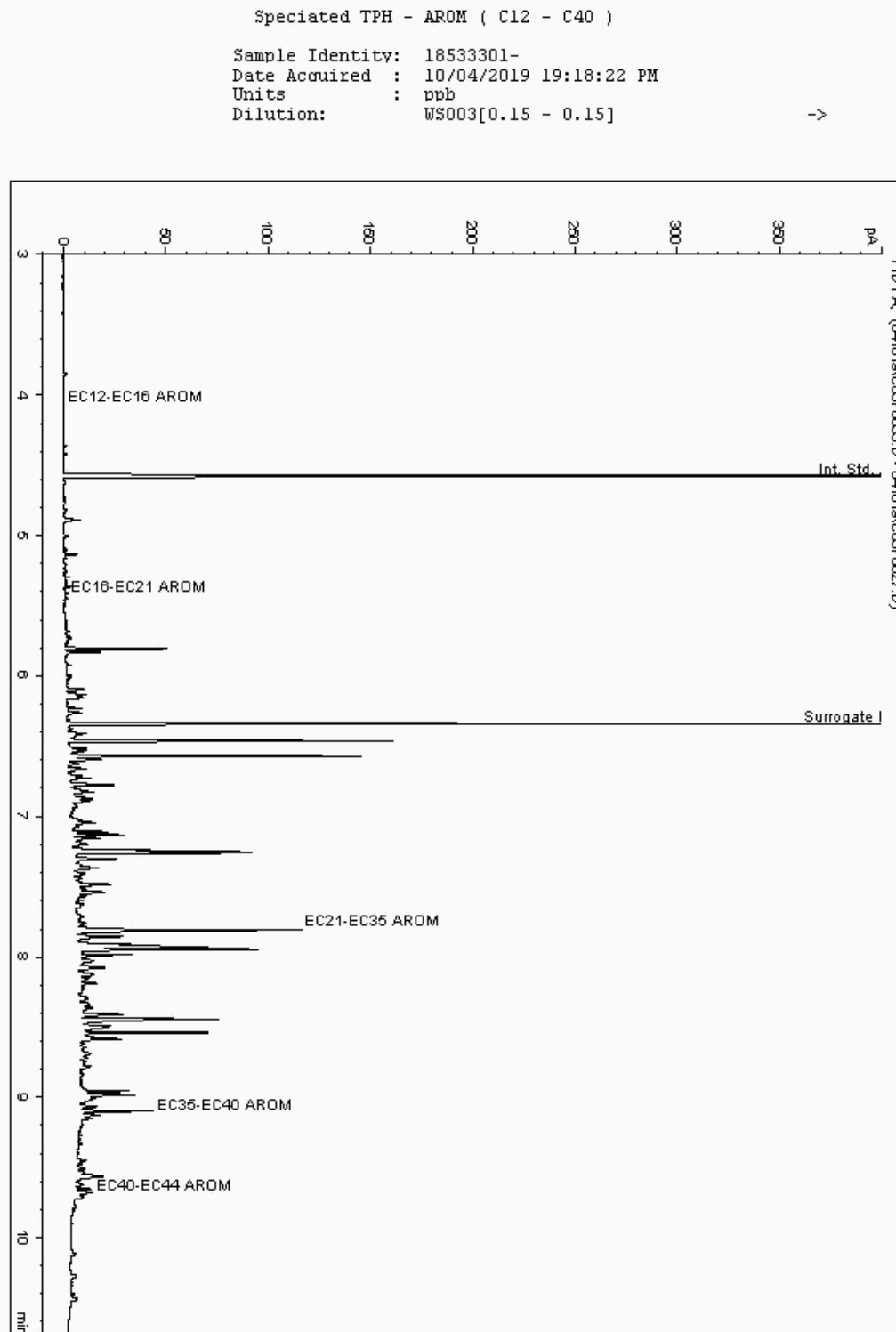
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726643
Sample ID : WS003

Depth : 0.15 - 0.15





CERTIFICATE OF ANALYSIS

Validated

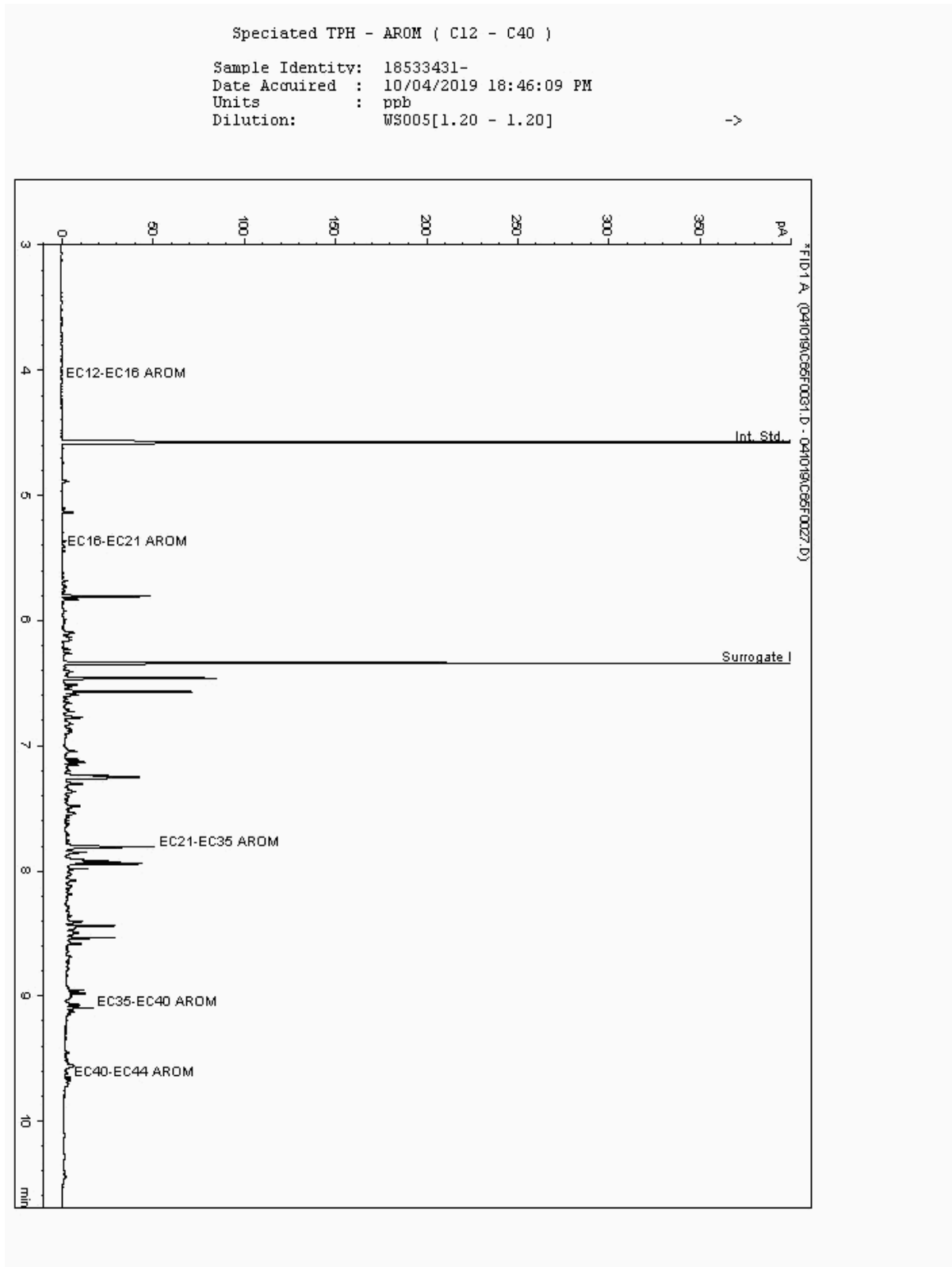
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726679
Sample ID : WS005

Depth : 1.20 - 1.20





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

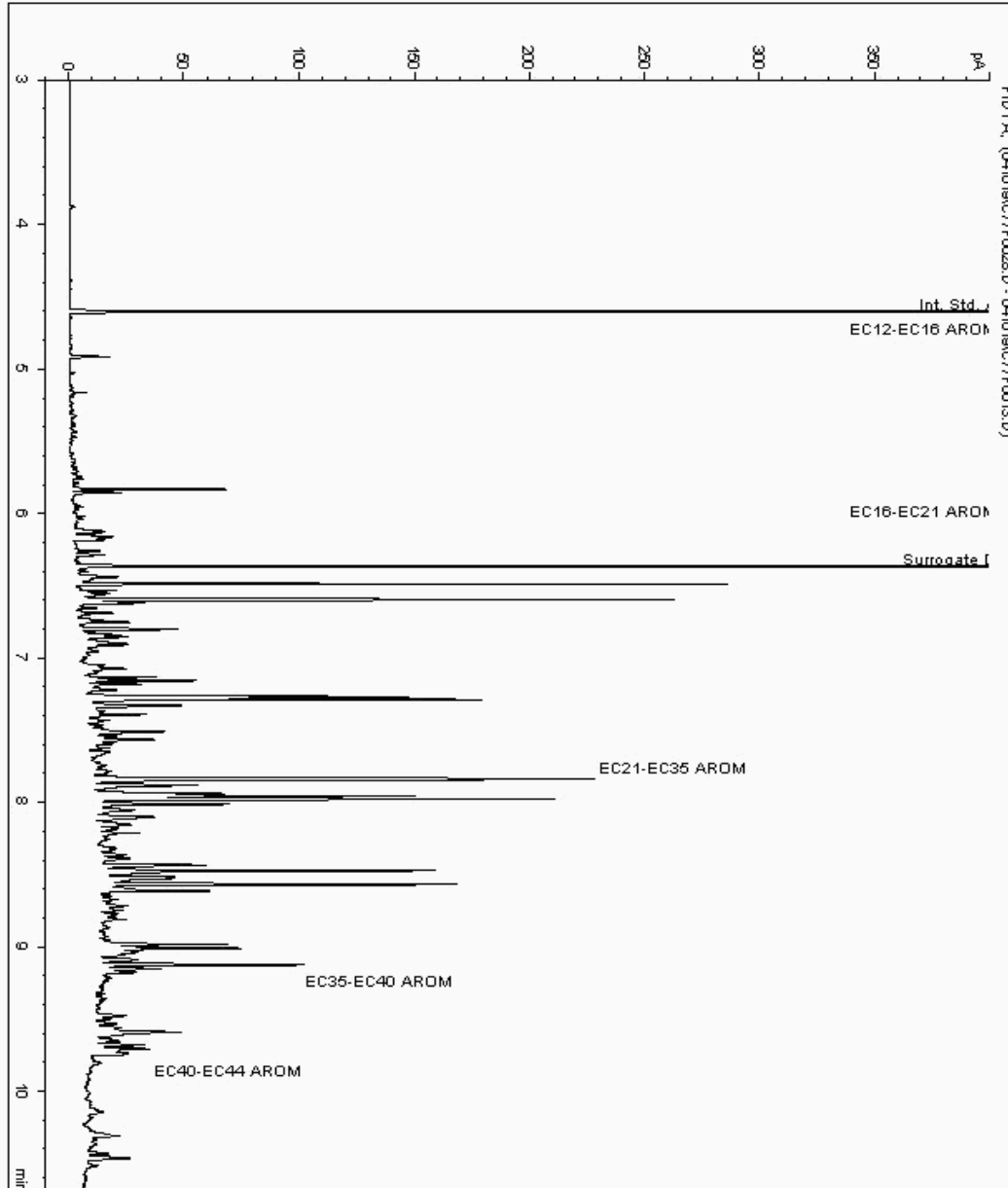
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726716
Sample ID : WS003

Depth : 0.70 - 0.70

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18533327-
Date Acquired : 4/10/2019 5:53:26 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

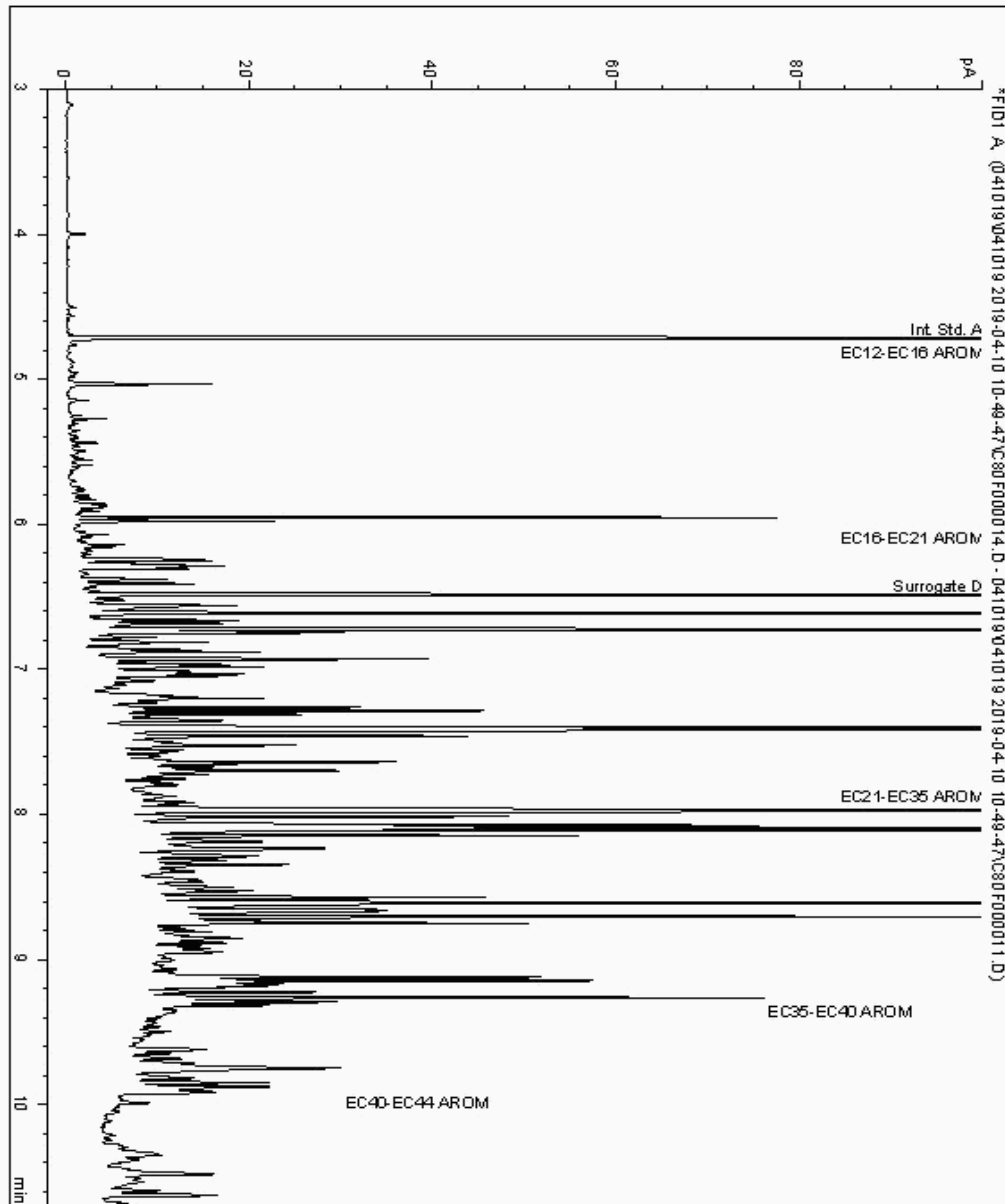
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726764
Sample ID : WS005

Depth : 0.70 - 0.70

Speciated TPH - AROMS (C12 - C44)

Sample Identity: 18533409-
Date Acquired : 10/04/19 12:28:22
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

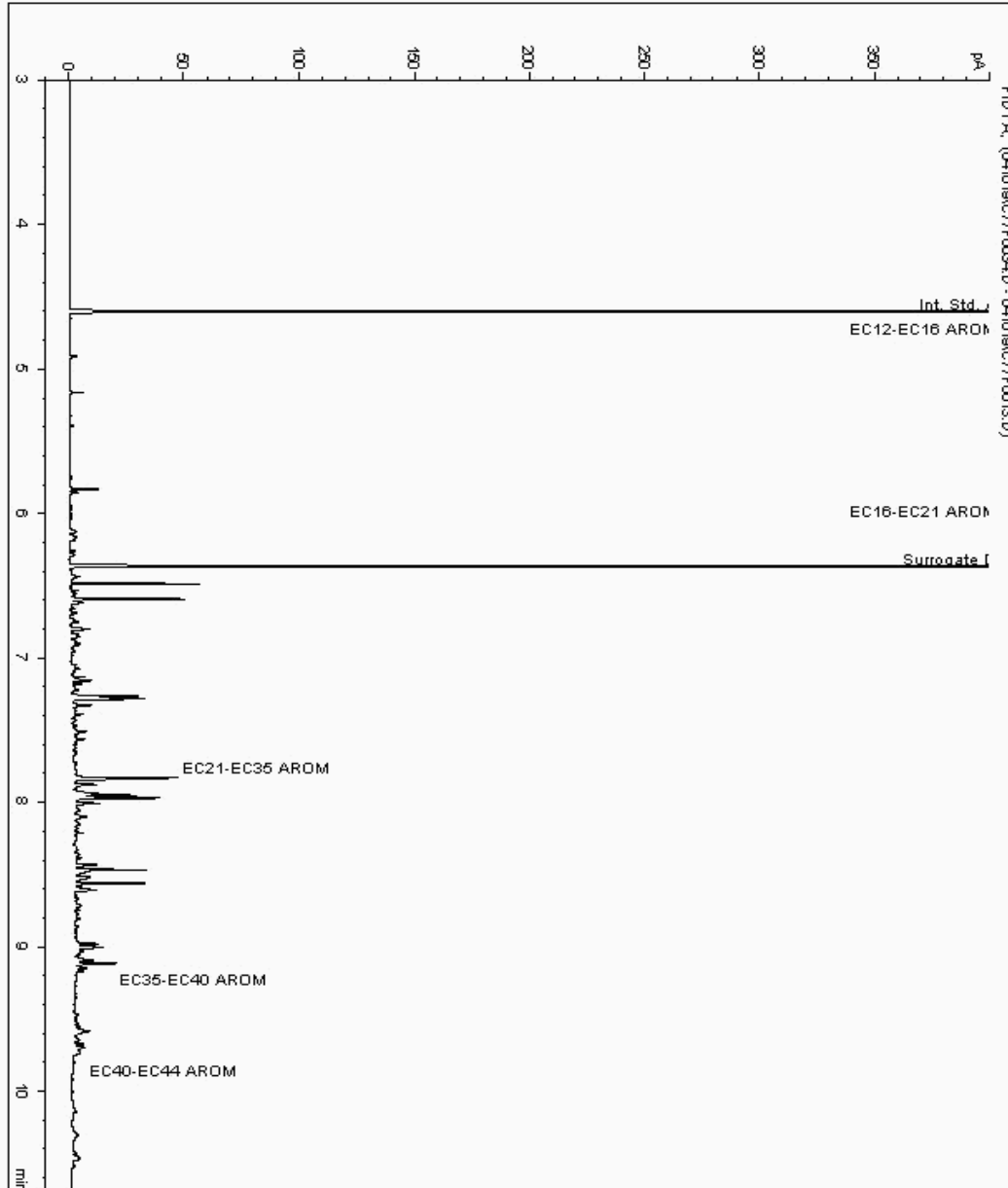
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726826
Sample ID : WS003

Depth : 1.00 - 1.00

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18533359-
Date Acquired : 4/10/2019 7:28:19 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

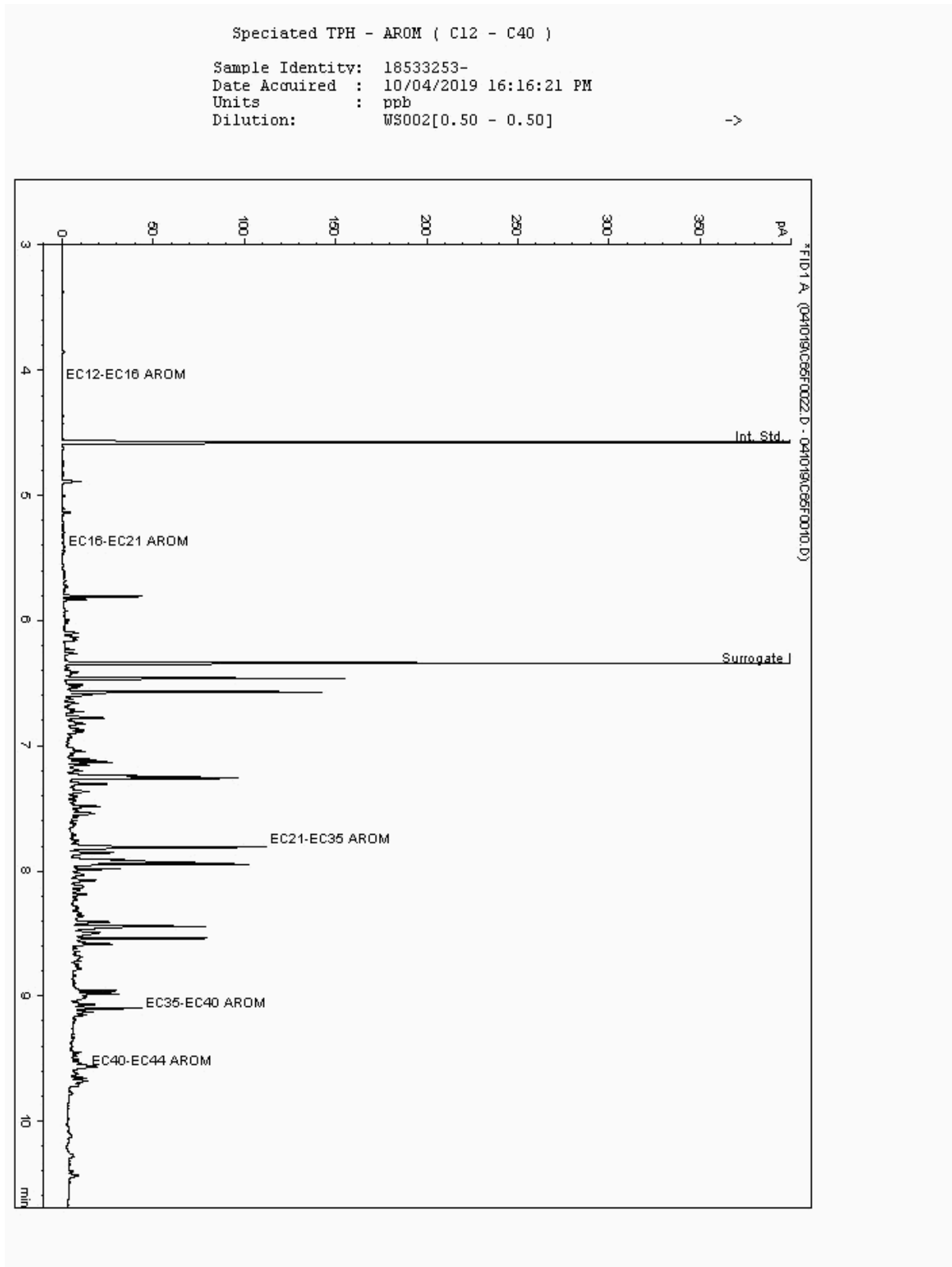
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726851
Sample ID : WS002

Depth : 0.50 - 0.50





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

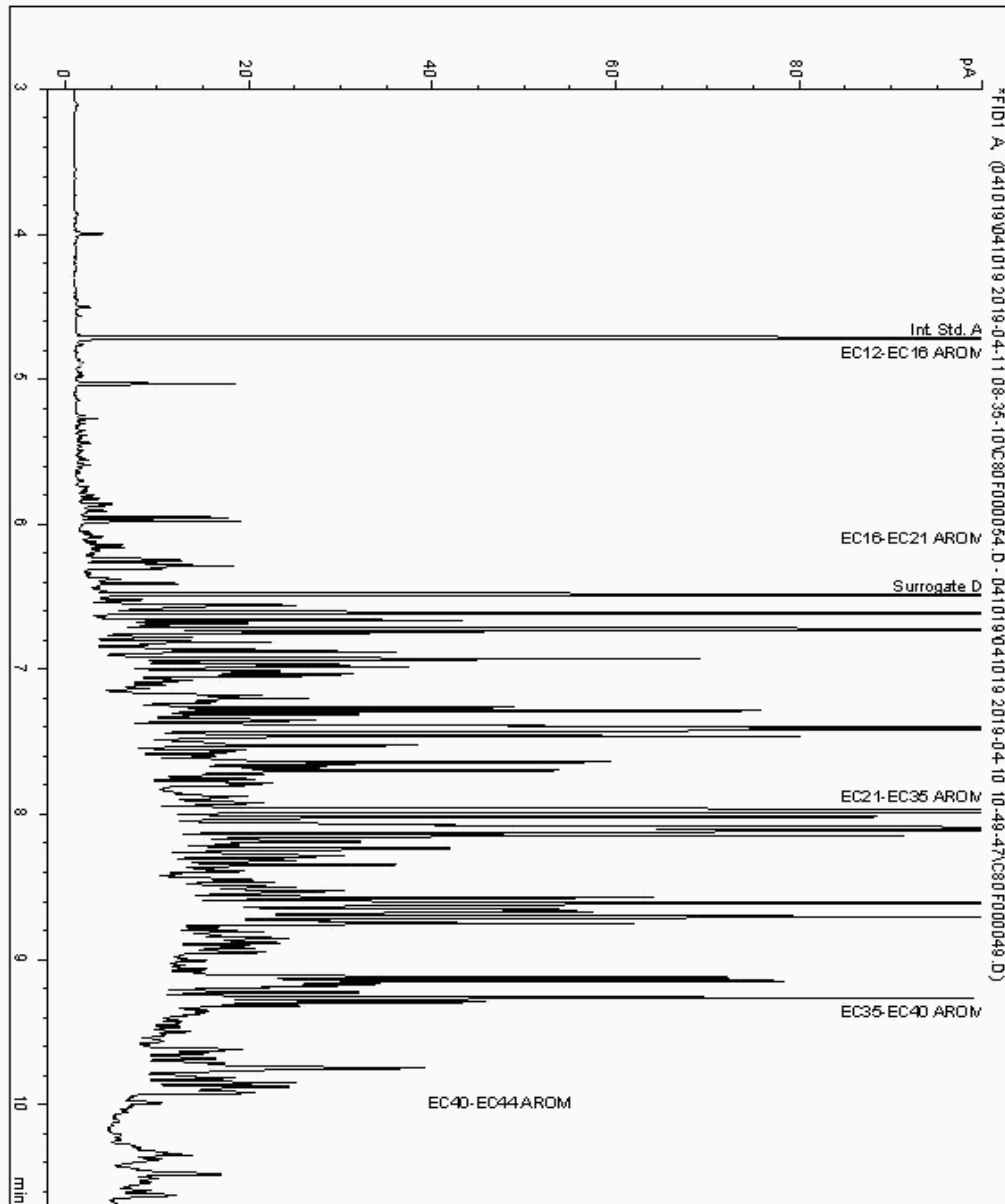
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726900
Sample ID : BH002

Depth : 1.00 - 1.00

Speciated TPH - AROMS (C12 - C44)

Sample Identity: 18533554-
Date Acquired : 11/04/19 08:52:54
Units : ppb
Dilution :
CF : 1
Multiplier : 1.910





CERTIFICATE OF ANALYSIS

Validated

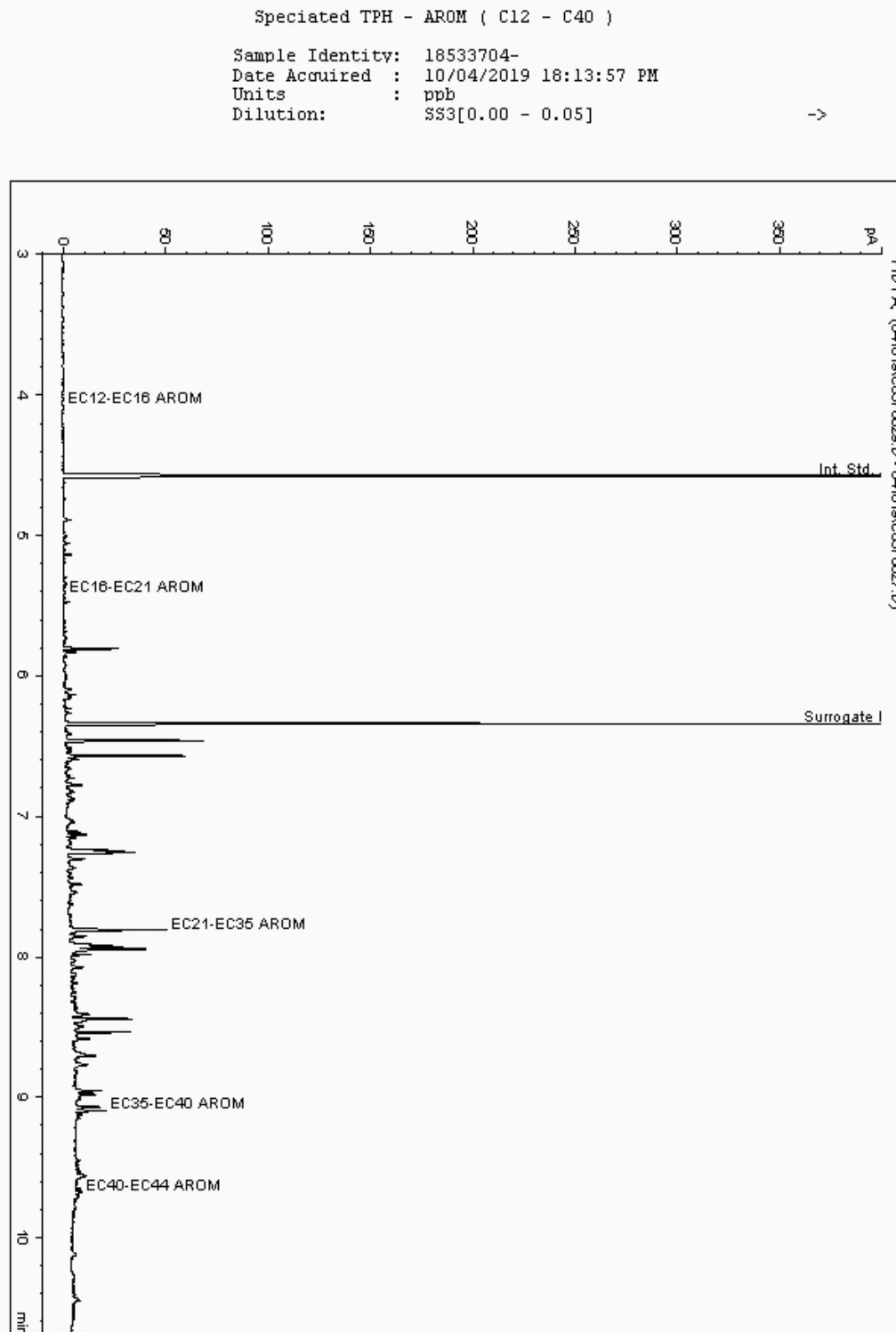
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726929
Sample ID : SS3

Depth : 0.00 - 0.05





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

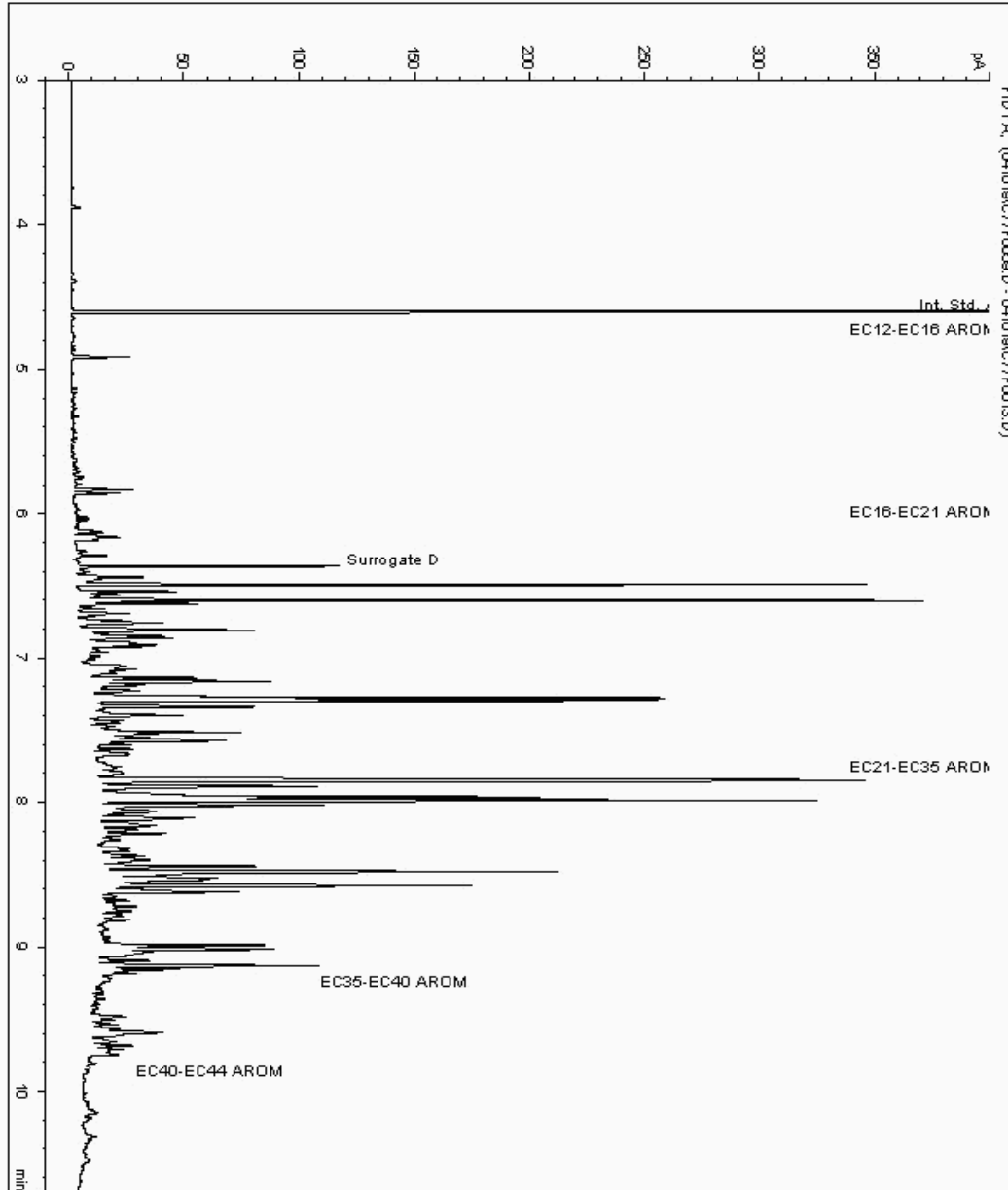
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19726983
Sample ID : BH002

Depth : 0.30 - 0.30

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18533456-
Date Acquired : 4/11/2019 11:10:43 AM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

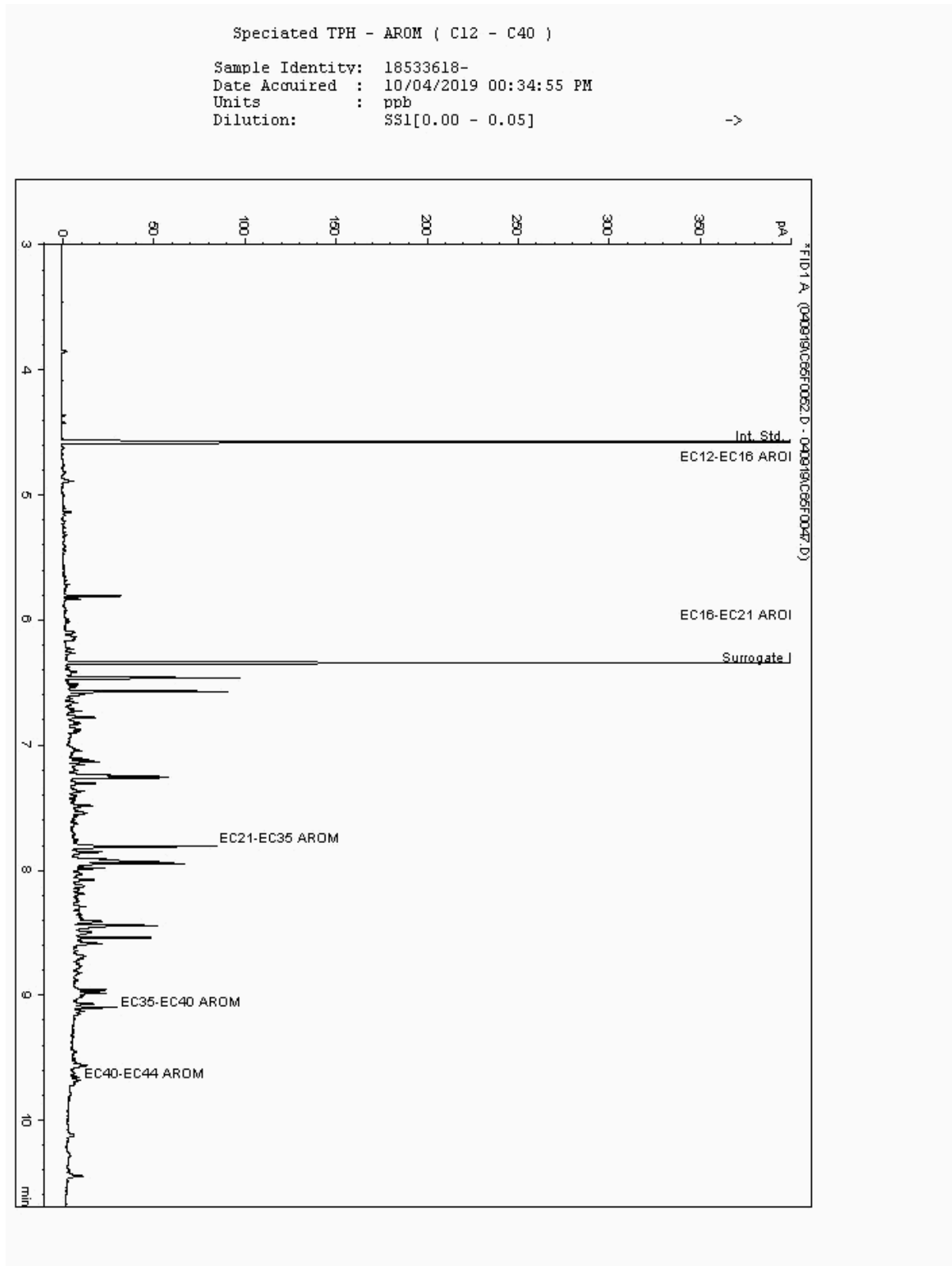
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19727044
Sample ID : SS1

Depth : 0.00 - 0.05





CERTIFICATE OF ANALYSIS

Validated

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

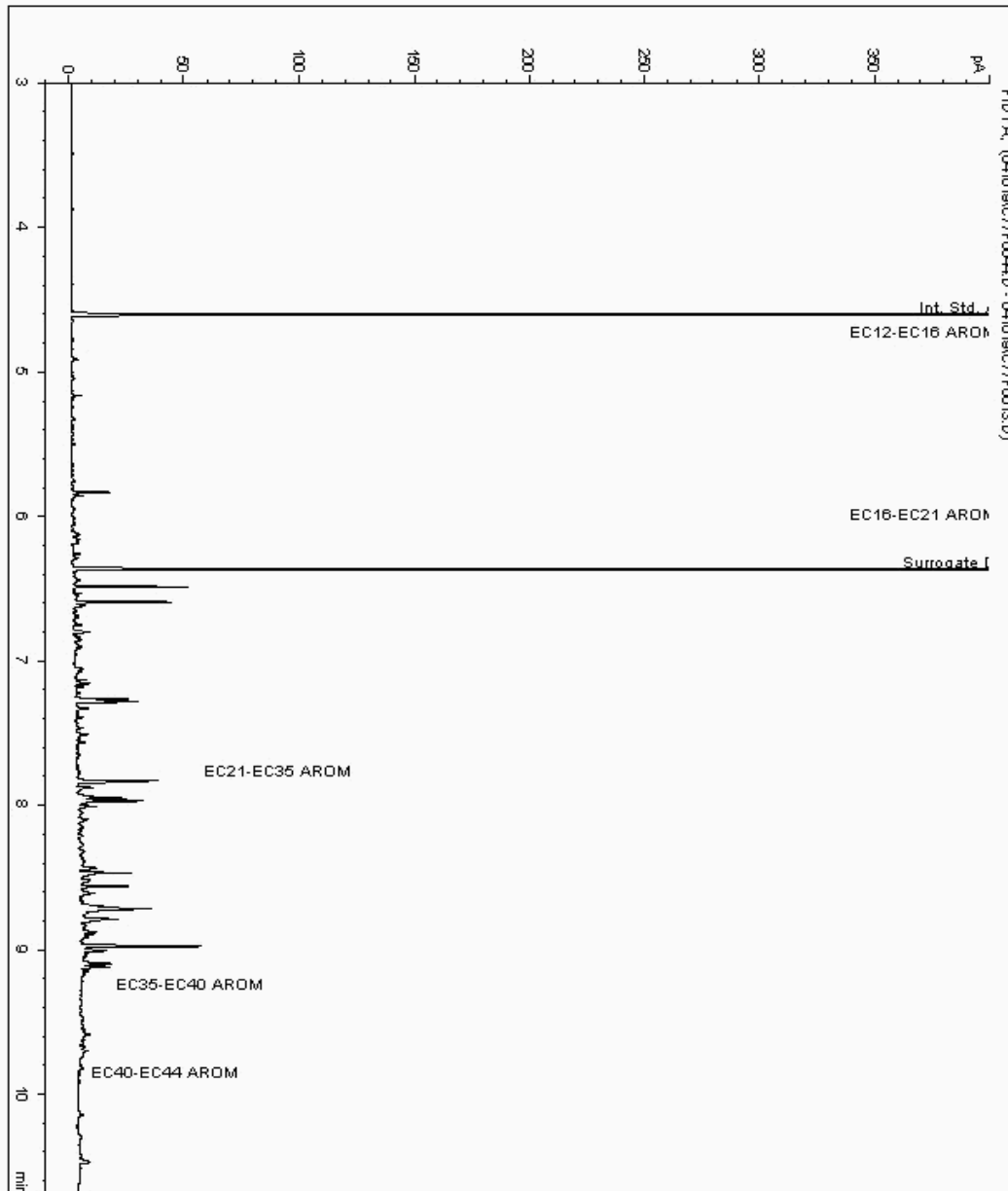
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19727060
Sample ID : SS2

Depth : 0.00 - 0.05

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18533673-
Date Acquired : 4/10/2019 10:39:52 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

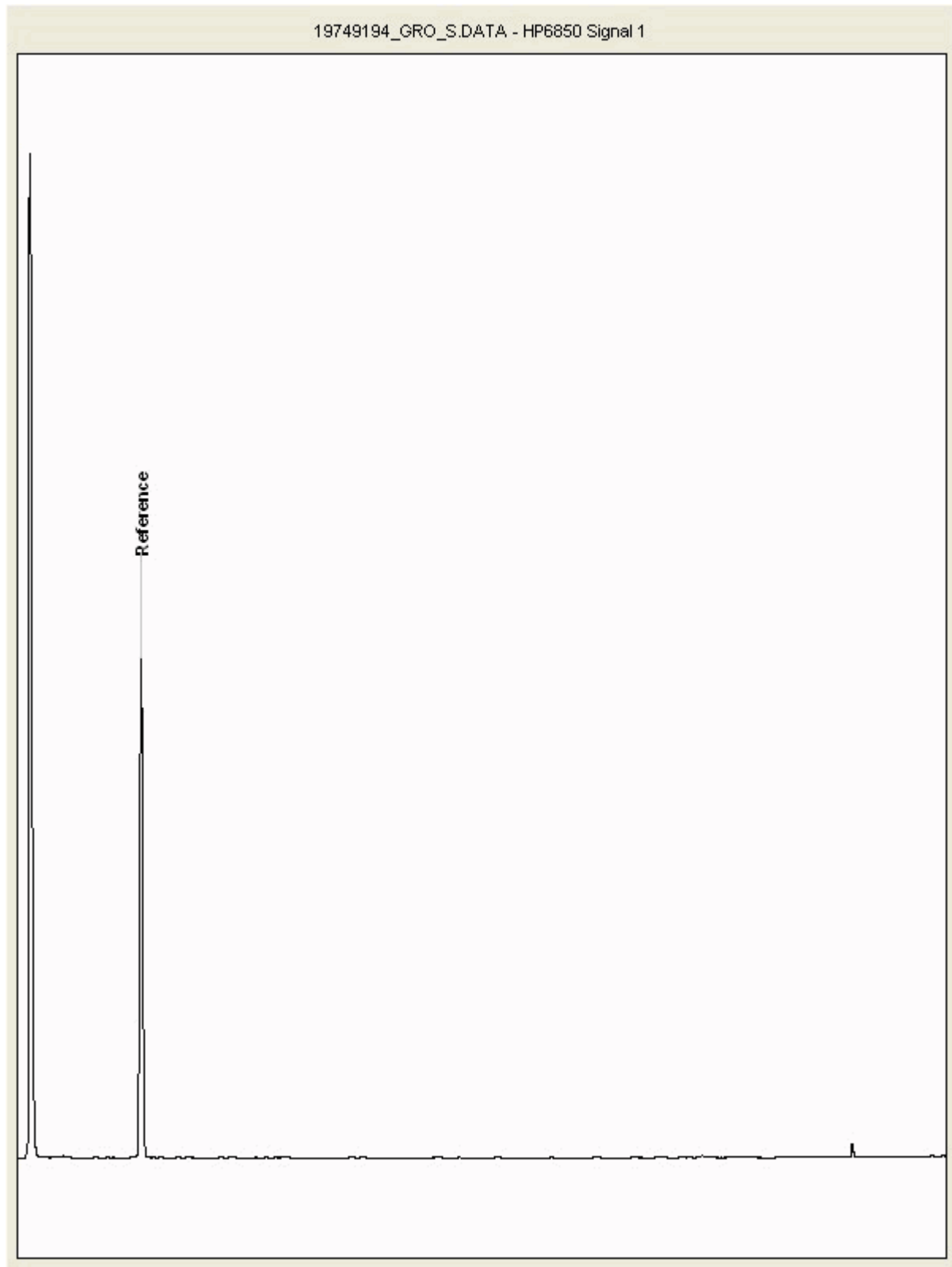
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19749194
Sample ID : SS3

Depth : 0.00 - 0.05





CERTIFICATE OF ANALYSIS

Validated

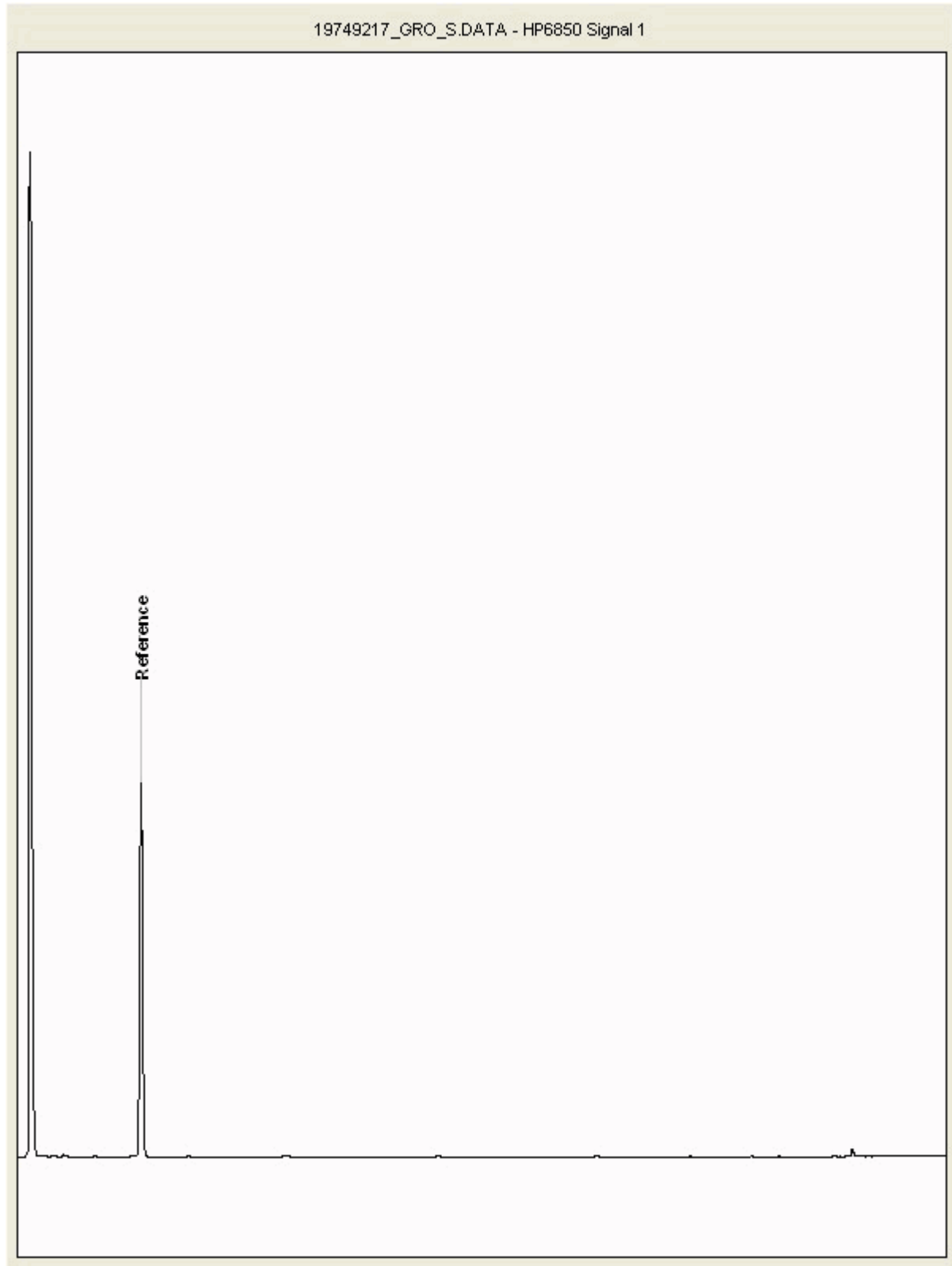
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19749217
Sample ID : SS1

Depth : 0.00 - 0.05





CERTIFICATE OF ANALYSIS

Validated

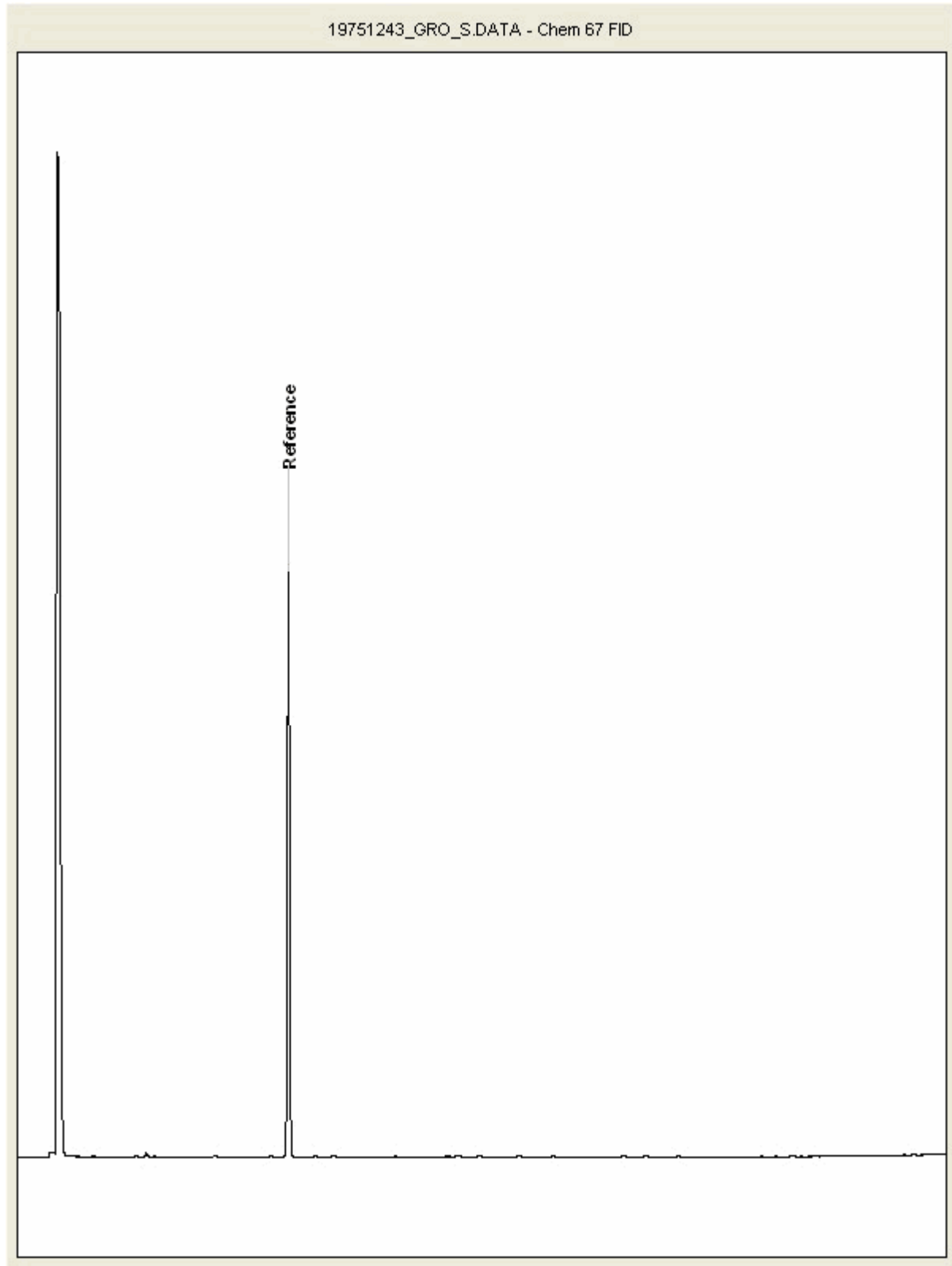
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19751243
Sample ID : WS003

Depth : 0.70 - 0.70





CERTIFICATE OF ANALYSIS

Validated

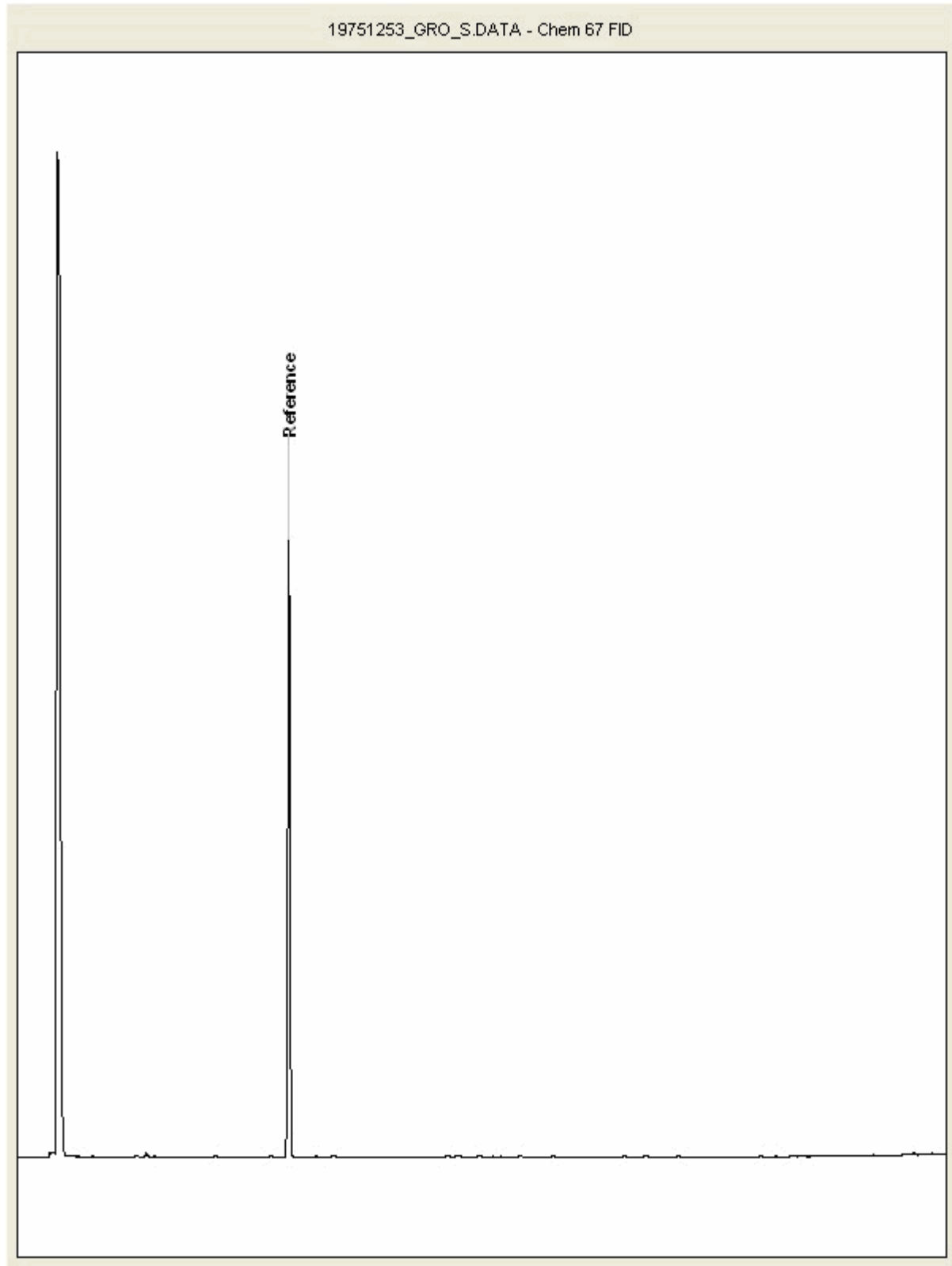
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19751253
Sample ID : WS005

Depth : 0.10 - 0.10





CERTIFICATE OF ANALYSIS

Validated

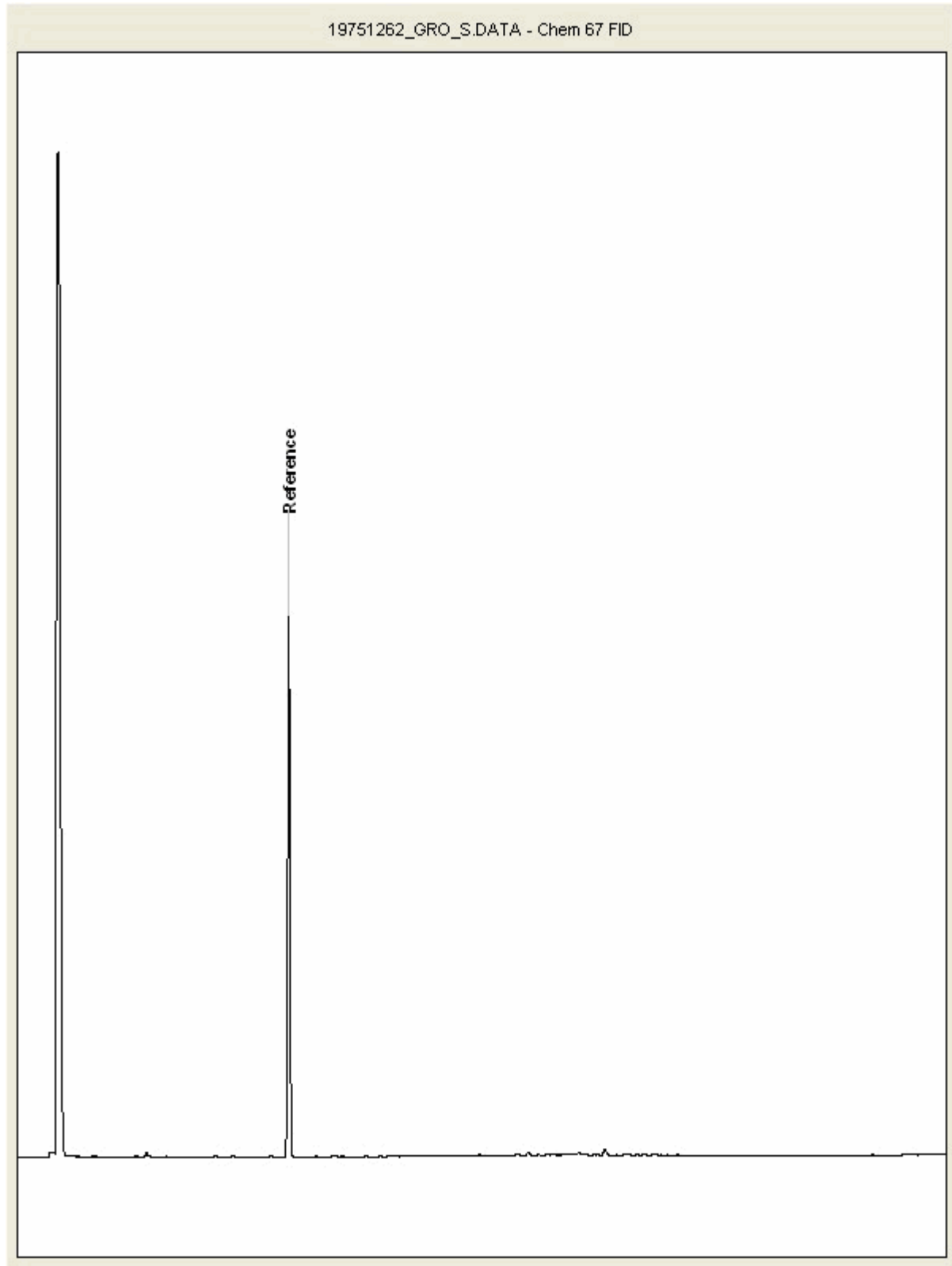
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19751262
Sample ID : WS003

Depth : 0.15 - 0.15





CERTIFICATE OF ANALYSIS

Validated

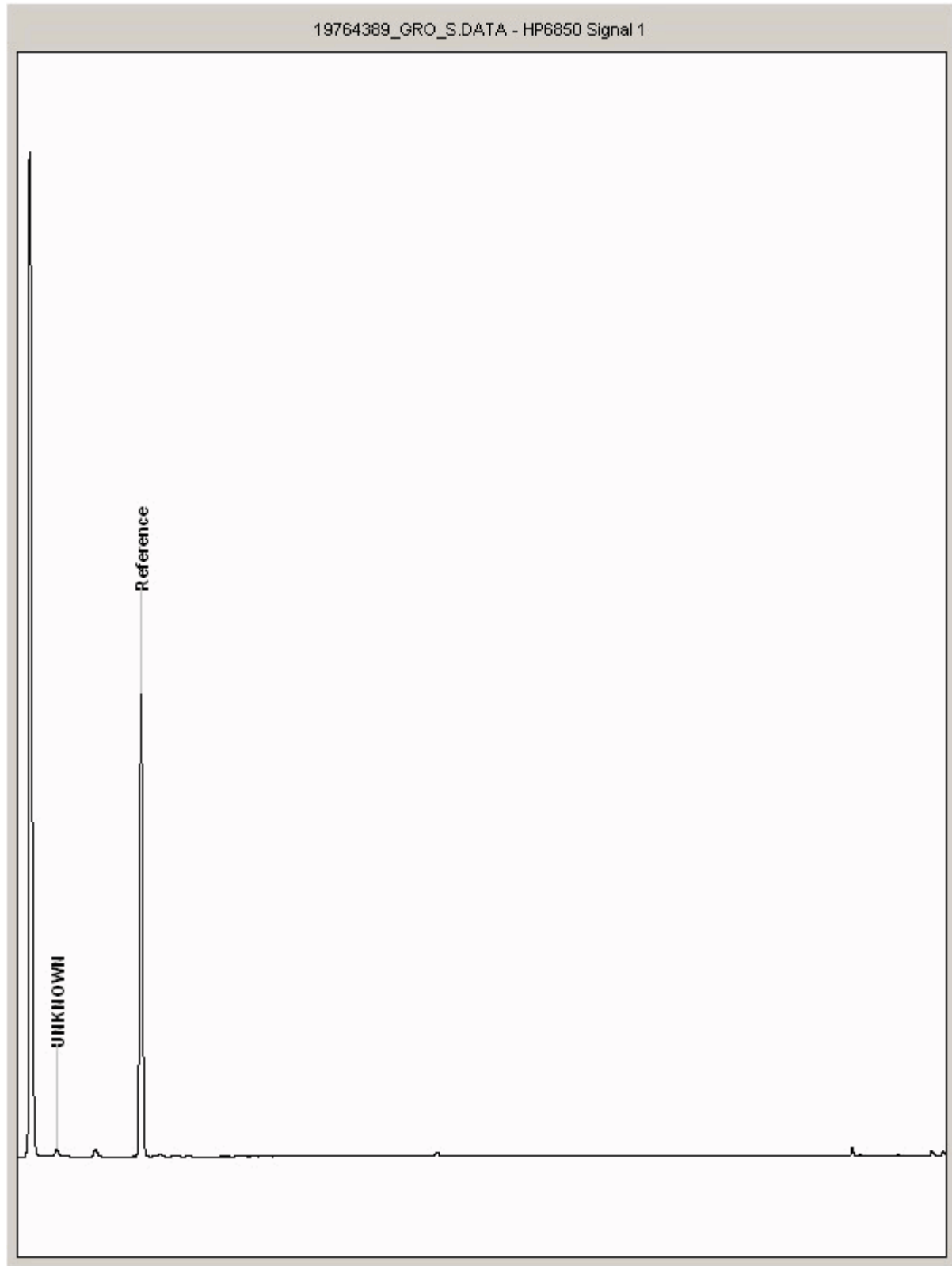
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19764389
Sample ID : BH002

Depth : 1.00 - 1.00





CERTIFICATE OF ANALYSIS

Validated

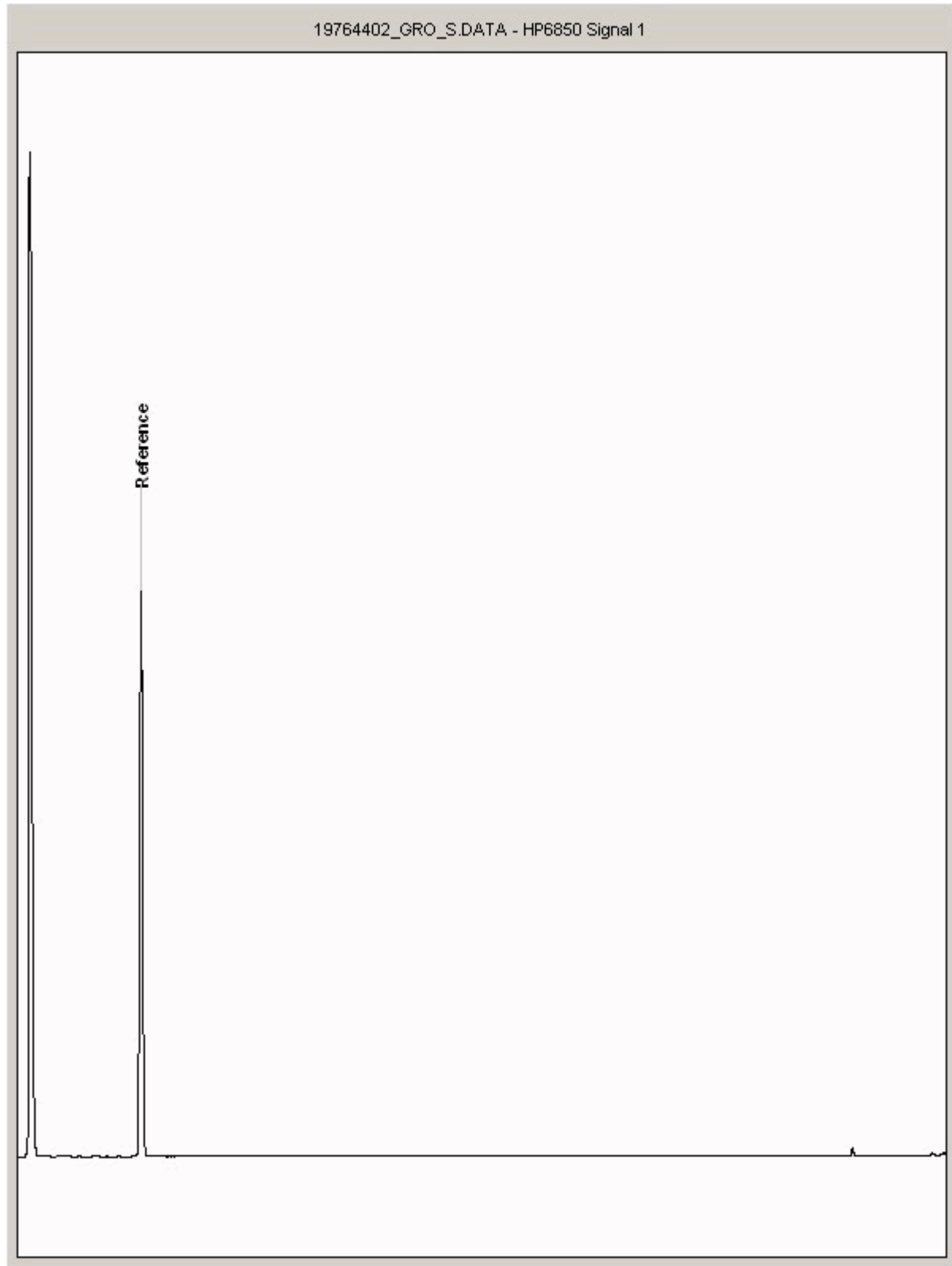
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19764402
Sample ID : BH002

Depth : 0.30 - 0.30





CERTIFICATE OF ANALYSIS

Validated

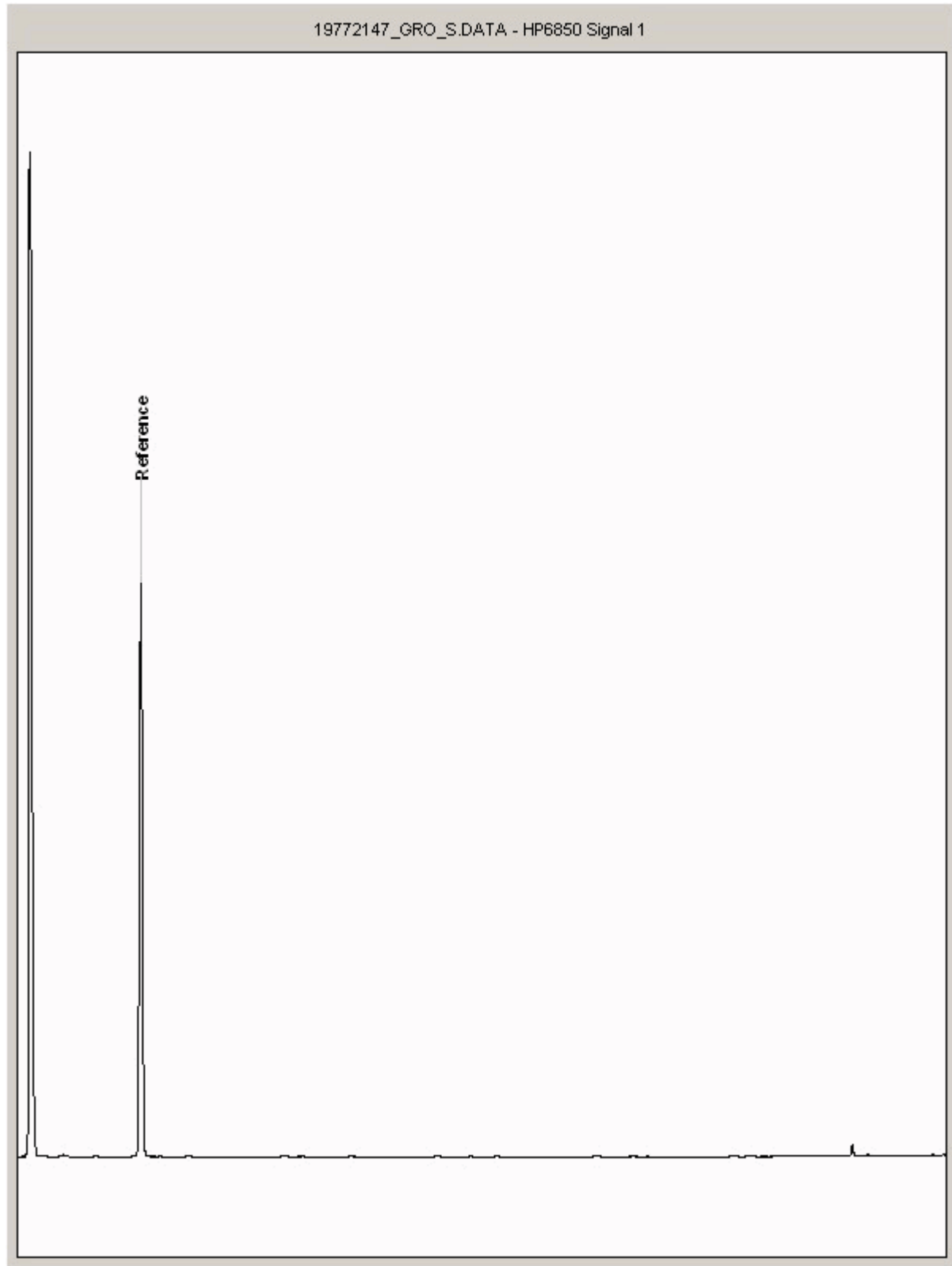
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772147
Sample ID : WS005

Depth : 1.20 - 1.20





CERTIFICATE OF ANALYSIS

Validated

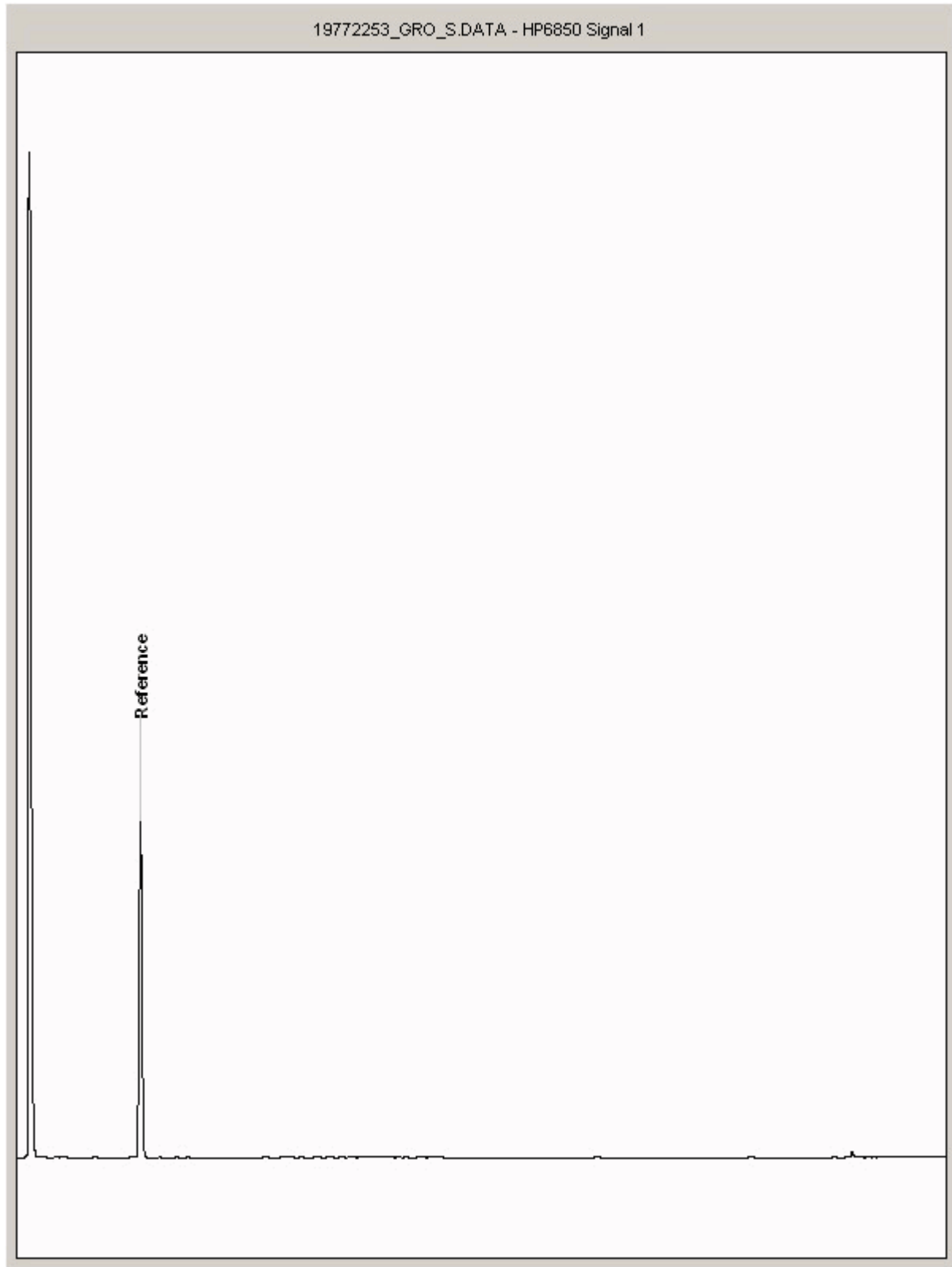
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772253
Sample ID : BH001

Depth : 0.20 - 0.20





CERTIFICATE OF ANALYSIS

Validated

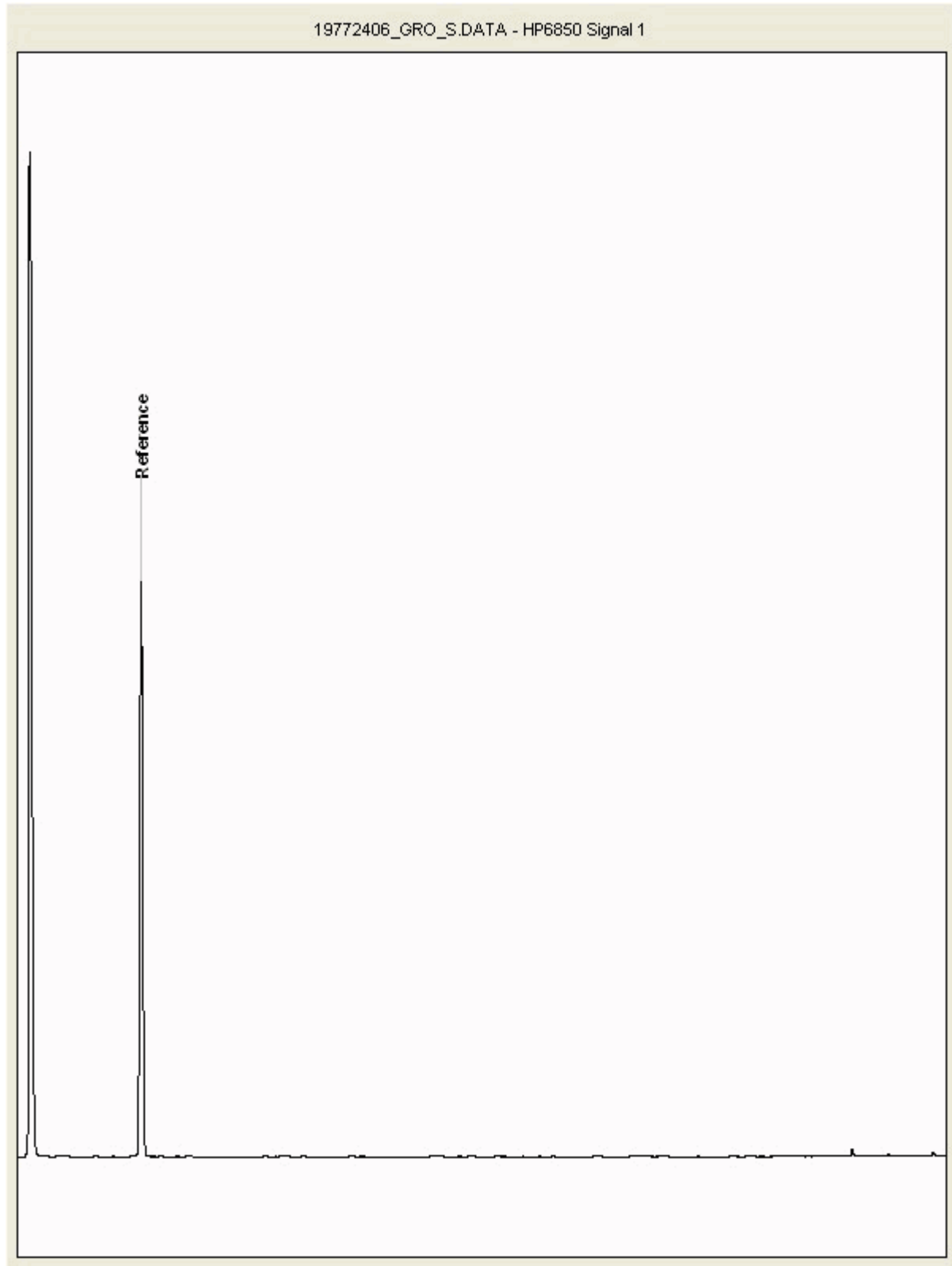
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772406
Sample ID : WS003

Depth : 1.00 - 1.00





CERTIFICATE OF ANALYSIS

Validated

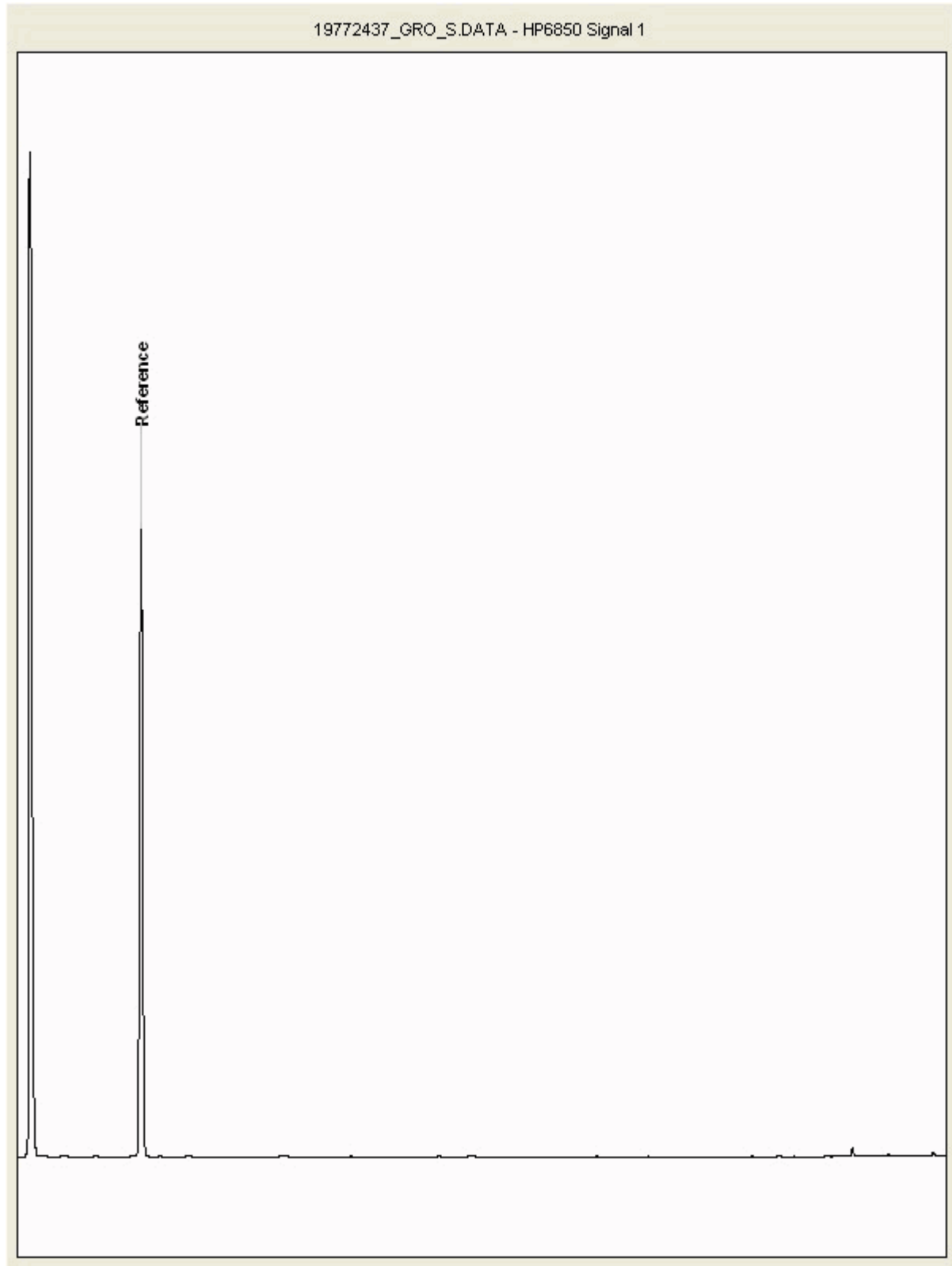
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772437
Sample ID : WS002

Depth : 1.10 - 1.10





CERTIFICATE OF ANALYSIS

Validated

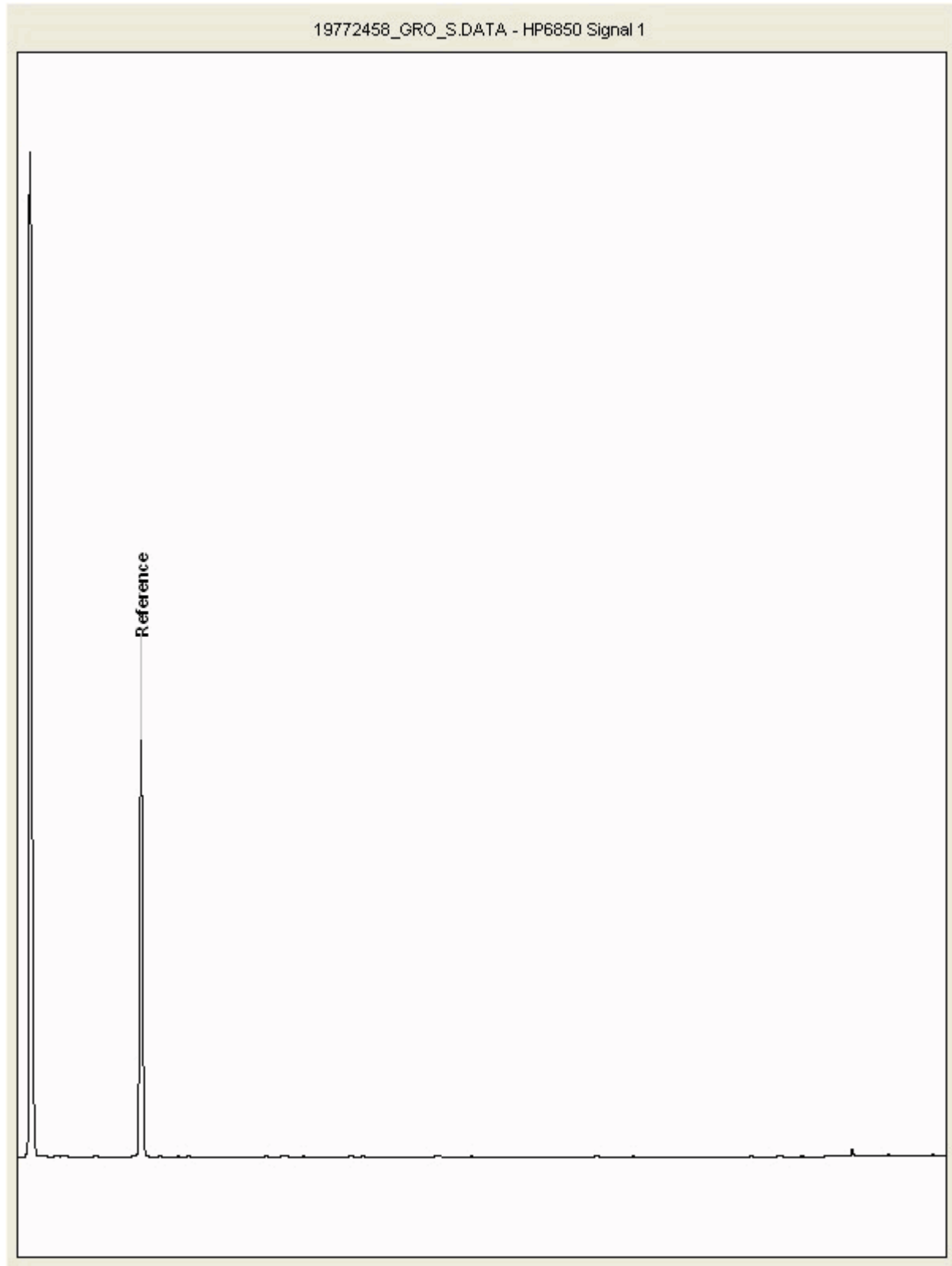
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772458
Sample ID : WS002

Depth : 0.10 - 0.10





CERTIFICATE OF ANALYSIS

Validated

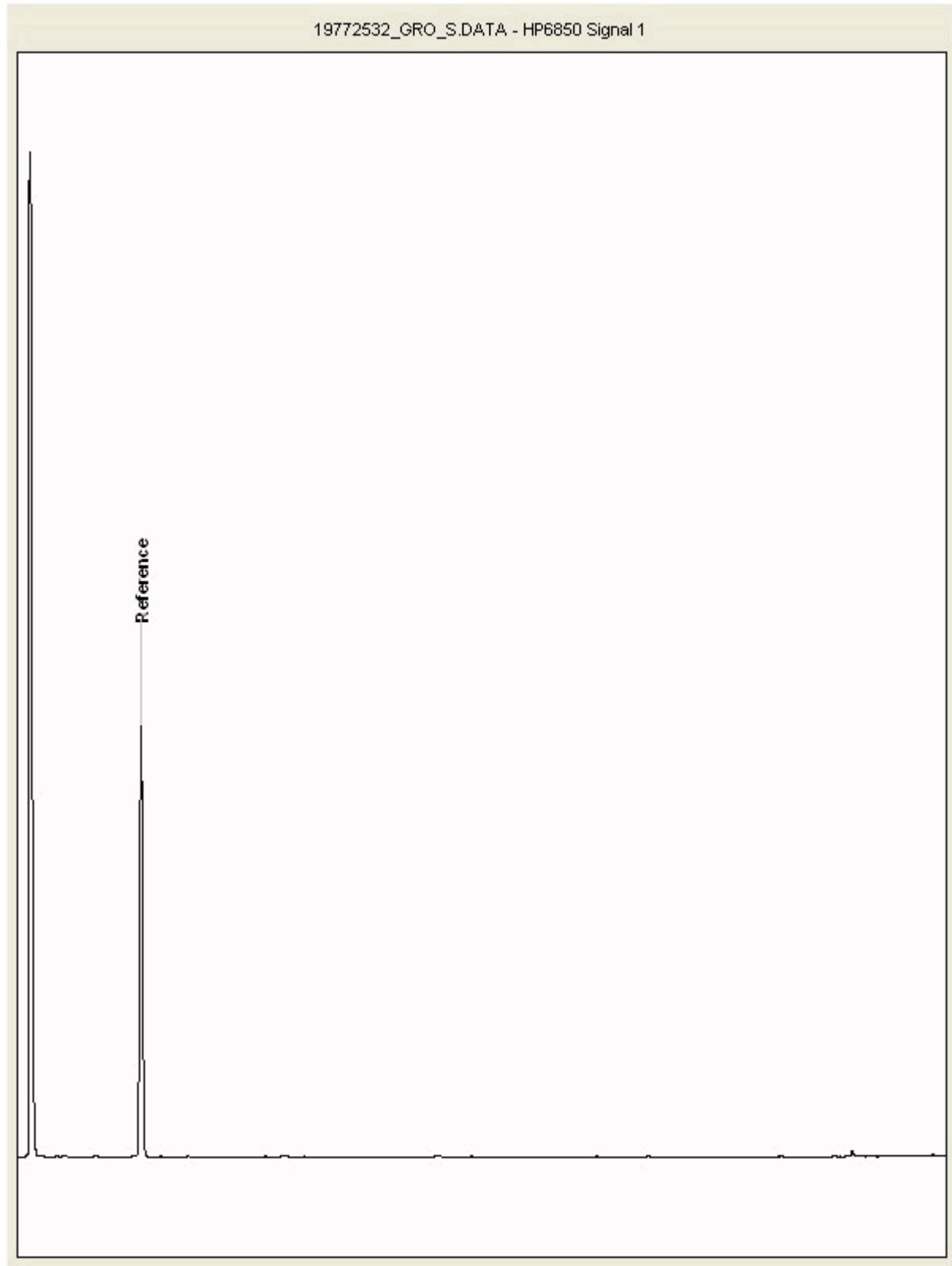
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772532
Sample ID : WS005

Depth : 0.70 - 0.70





CERTIFICATE OF ANALYSIS

Validated

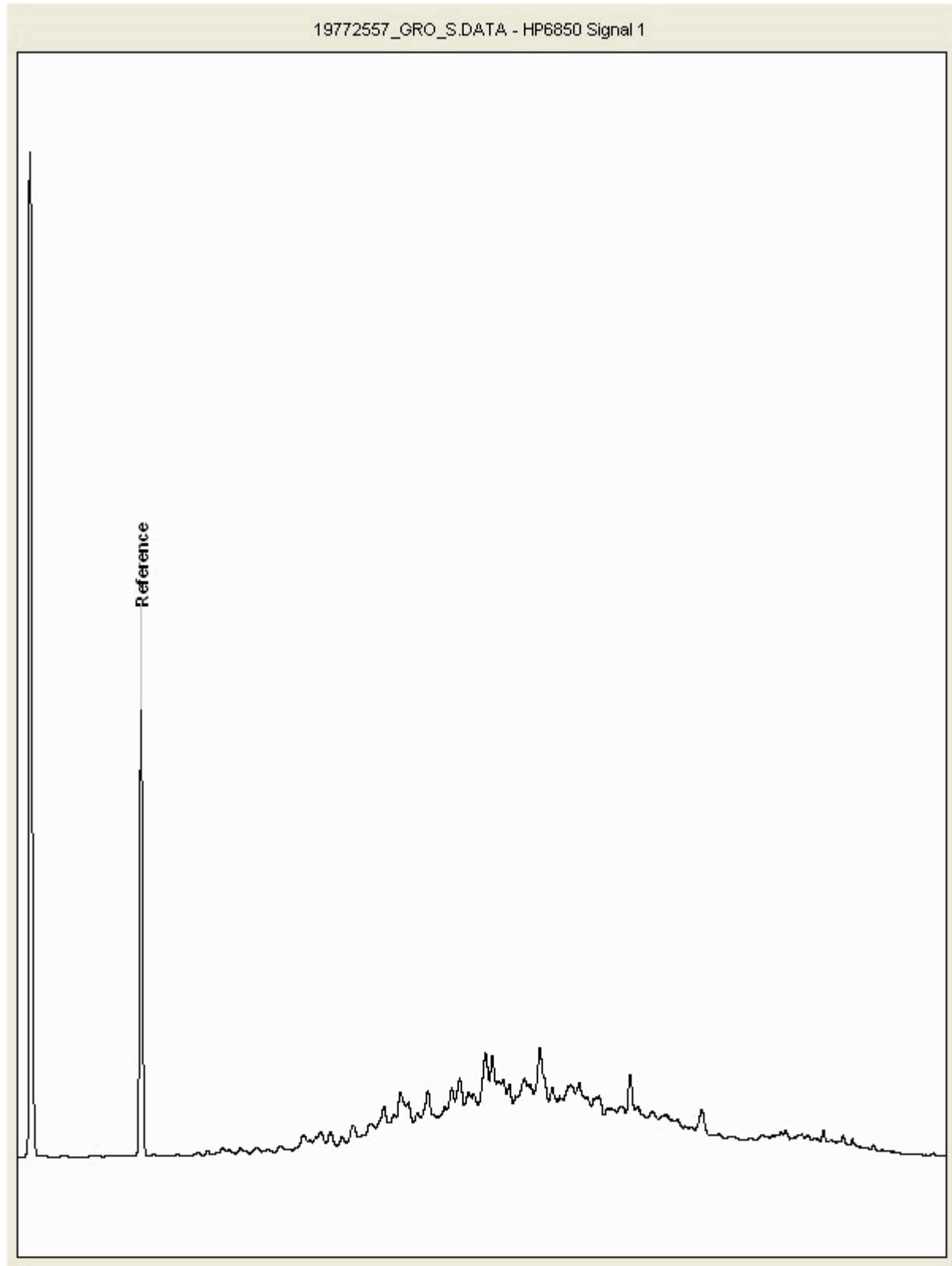
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772557
Sample ID : BH001

Depth : 2.20 - 2.20





CERTIFICATE OF ANALYSIS

Validated

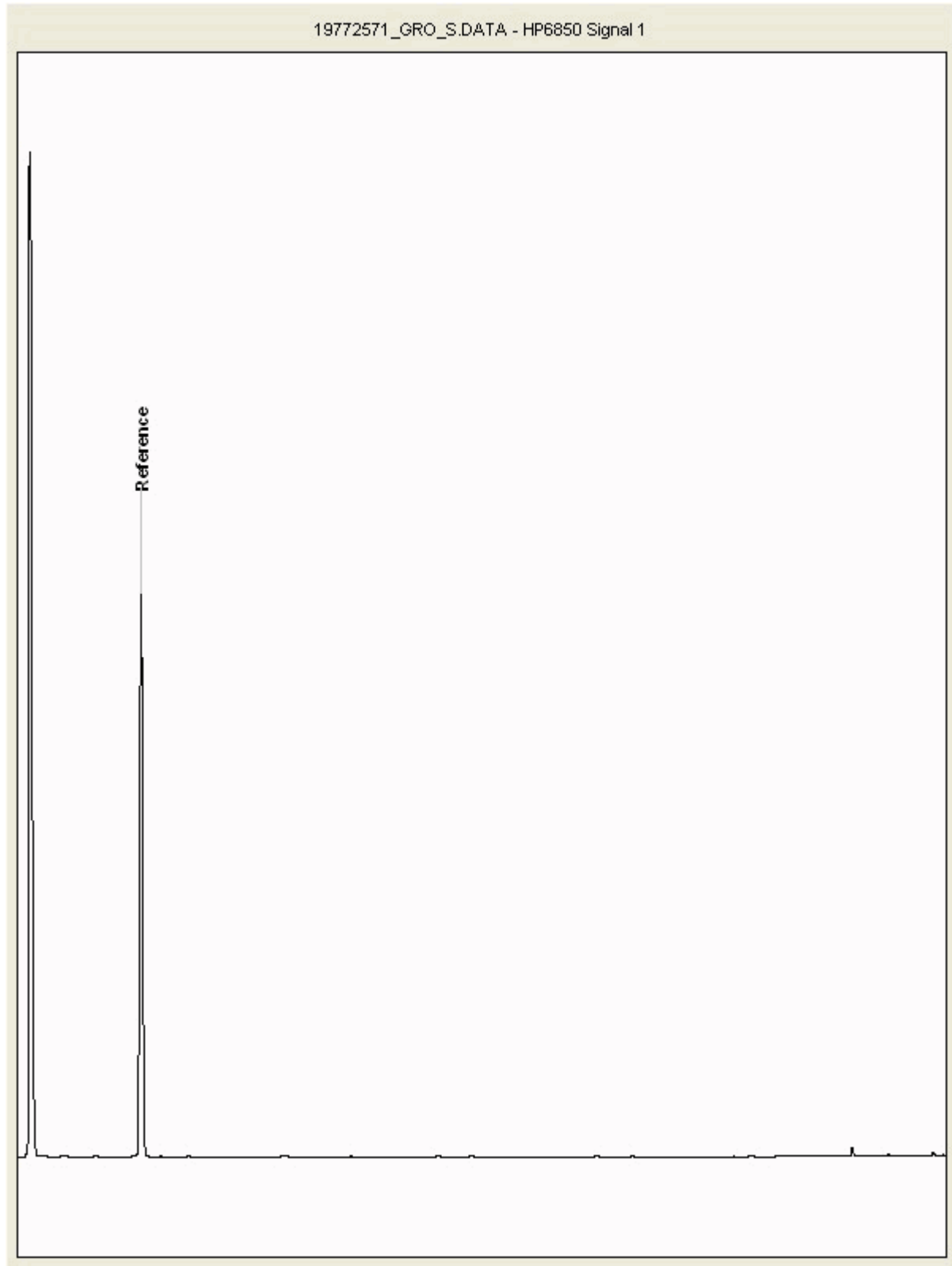
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772571
Sample ID : WS001

Depth : 0.50 - 0.50





CERTIFICATE OF ANALYSIS

Validated

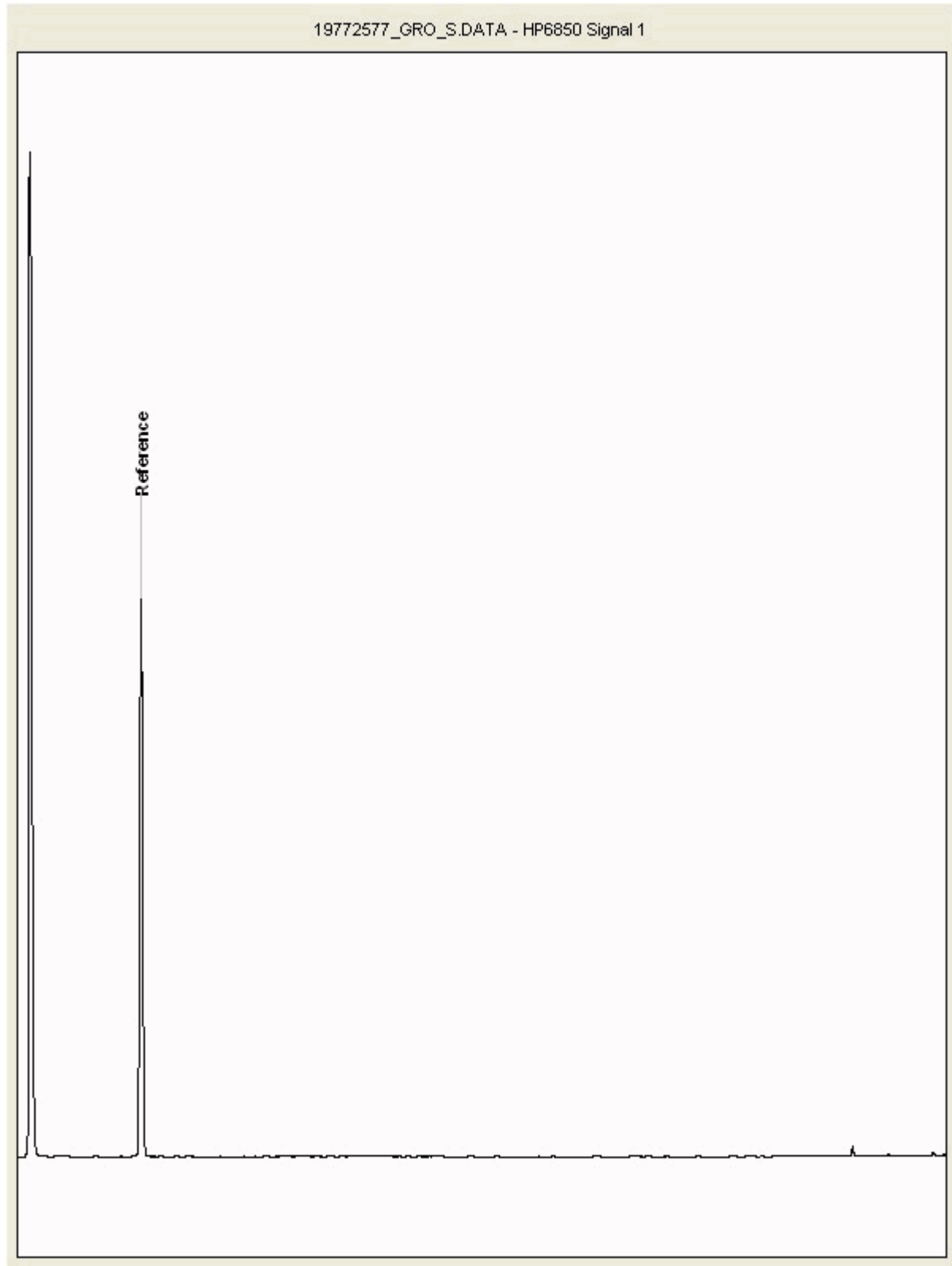
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772577
Sample ID : BH001

Depth : 0.50 - 0.50





CERTIFICATE OF ANALYSIS

Validated

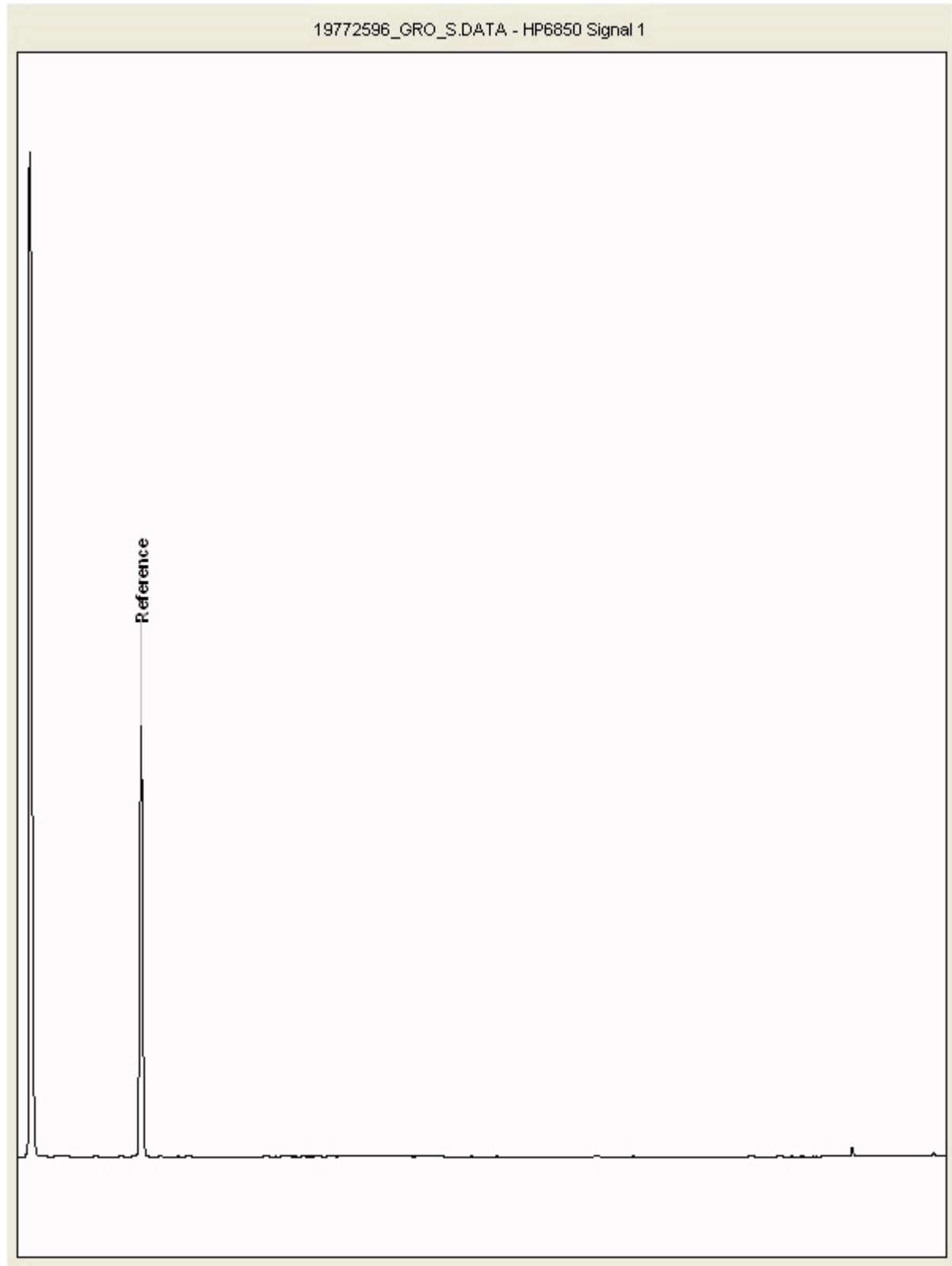
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772596
Sample ID : WS001

Depth : 0.15 - 0.15





CERTIFICATE OF ANALYSIS

Validated

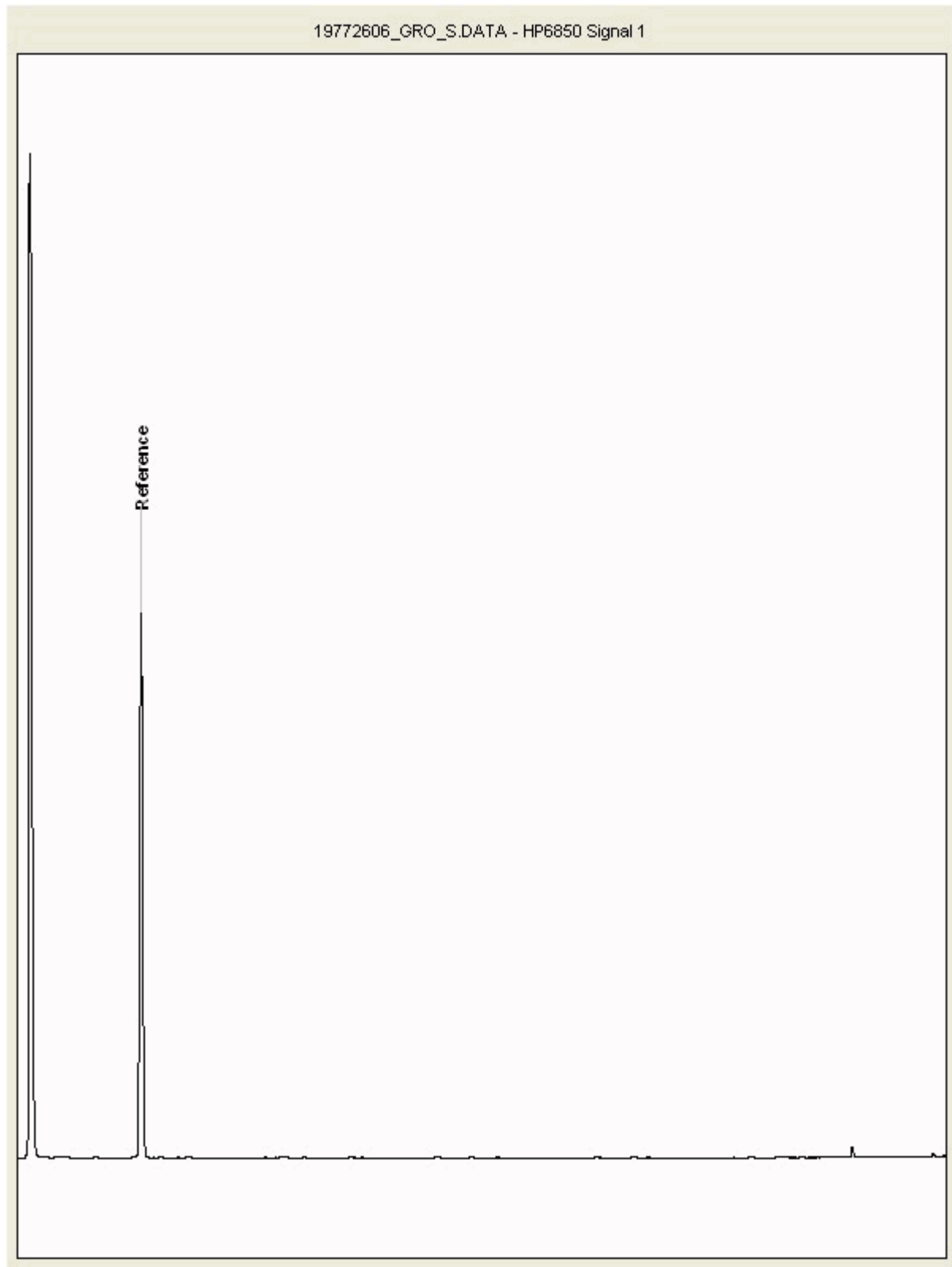
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772606
Sample ID : WS002

Depth : 0.50 - 0.50





CERTIFICATE OF ANALYSIS

Validated

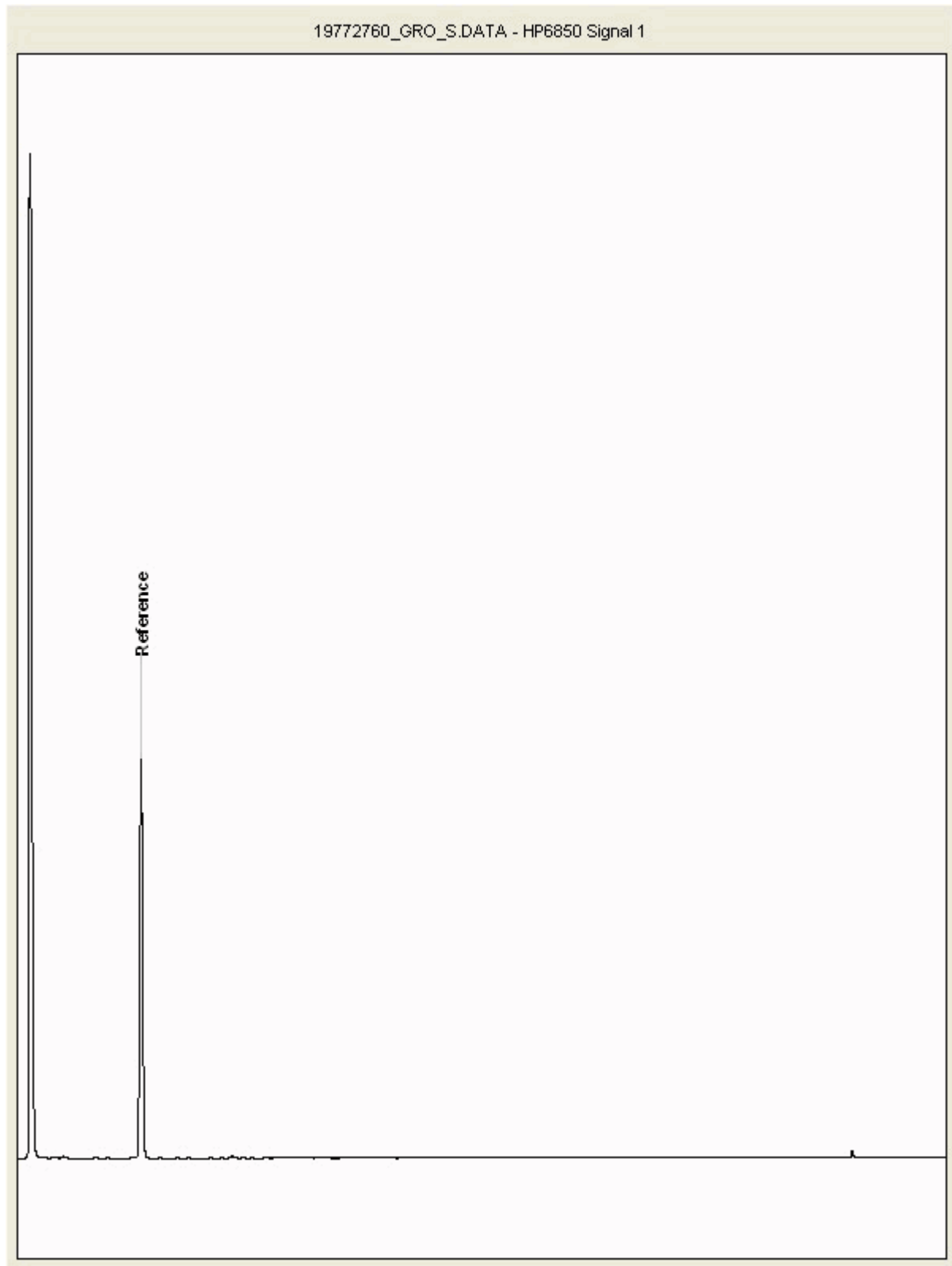
SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19772760
Sample ID : SS2

Depth : 0.00 - 0.05





CERTIFICATE OF ANALYSIS

SDG:	190406-77	Client Reference:	70044279	Report Number:	501562
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	501309

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

General

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
§	Sampled on date not provided
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



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WSP PB BBC
3rd Floor, Kings Orchard,
1 Queen Street
Bristol
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BS2 0HQ

Attention: Emma Waite

CERTIFICATE OF ANALYSIS

Date of report Generation:	18 April 2019
Customer:	H_WSP_BRI
Sample Delivery Group (SDG):	190411-94
Your Reference:	70044279
Location:	George Street Reading
Report No:	501776

We received 9 samples on Thursday April 11, 2019 and 9 of these samples were scheduled for analysis which was completed on Thursday April 18, 2019. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
19761453	WS001	ES	1.60 - 1.70	08/04/2019
19761460	WS001	ES	2.50 - 2.60	08/04/2019
19761467	WS001	ES	3.50 - 3.60	08/04/2019
19761440	WS002	ES	2.00 - 2.00	08/04/2019
19761445	WS002	ES	3.00 - 3.00	08/04/2019
19761476	WS003	ES	1.70 - 1.70	08/04/2019
19761486	WS005	ES	1.80 - 1.80	08/04/2019
19761494	WS005	ES	2.50 - 2.50	08/04/2019
19761503	WS005	ES	3.50 - 3.60	08/04/2019

Maximum Sample/Coolbox Temperature (°C) : 8.6

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number:
Superseded Report:

501776

Results Legend

- X** Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
	19761503	WS005	ES	3.50 - 3.60	60g VOC (ALE215)	S
	19761494	WS005	ES	2.50 - 2.50	250g Amber Jar (ALE210)	S
	19761486	WS005	ES	1.80 - 1.80	250g Amber Jar (ALE210)	S
	19761476	WS003	ES	1.70 - 1.70	250g Amber Jar (ALE210)	S
	19761445	WS002	ES	3.00 - 3.00	250g Amber Jar (ALE210)	S
	19761440	WS002	ES	2.00 - 2.00	60g VOC (ALE215)	S
	19761467	WS001	ES	3.50 - 3.60	250g Amber Jar (ALE210)	S
	19761460	WS001	ES	2.50 - 2.60	60g VOC (ALE215)	S
	19761453	WS001	ES	1.60 - 1.70	250g Amber Jar (ALE210)	S
Ammoniacal N as NH4 in 2:1 extract	All	NDPs: 0 Tests: 6				
Anions by ion Chromatography	All	NDPs: 0 Tests: 6				
Boron Water Soluble	All	NDPs: 0 Tests: 9				
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 6				
Easily Liberated Sulphide	All	NDPs: 0 Tests: 6				
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 6				
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 6				
GRO by GC-FID (S)	All	NDPs: 0 Tests: 6				
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 9				
Metals in solid samples by OES	All	NDPs: 0 Tests: 9				
NO3, NO2 and TON by KONE (s)	All	NDPs: 0 Tests: 6				
PAH by GCMS	All	NDPs: 0 Tests: 9				
pH	All	NDPs: 0 Tests: 9				
Phenols by HPLC (S)	All	NDPs: 0 Tests: 6				
Sample description	All	NDPs: 0 Tests: 9				



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
19761453	WS001	1.60 - 1.70	Light Brown	Silt Loam	Stones	Vegetation
19761460	WS001	2.50 - 2.60	Light Brown	Sandy Clay Loam	Stones	Vegetation
19761467	WS001	3.50 - 3.60	Light Brown	Loamy Sand	Vegetation	Stones
19761440	WS002	2.00 - 2.00	Grey	Sandy Silt Loam	Stones	Vegetation
19761445	WS002	3.00 - 3.00	Dark Brown	Sandy Loam	Vegetation	Stones
19761476	WS003	1.70 - 1.70	Dark Brown	Sand	None	None
19761486	WS005	1.80 - 1.80	Light Brown	Clay Loam	None	None
19761494	WS005	2.50 - 2.50	Dark Brown	Sandy Loam	Stones	Vegetation
19761503	WS005	3.50 - 3.60	Dark Brown	Sand	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94 Client Reference: 70044279 Report Number: 501776
Location: George Street Reading Order Number: 70044279-008 Superseded Report:

Results Legend			Customer Sample Ref.	WS001	WS001	WS001	WS002	WS002	WS003
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.60 - 1.70	2.50 - 2.60	3.50 - 3.60	2.00 - 2.00	3.00 - 3.00	1.70 - 1.70
M	mCERIS accredited.			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
aq	Aqueous / settled sample.			08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
+	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019
(F)	Trigger breach confirmed			190411-94	190411-94	190411-94	190411-94	190411-94	190411-94
1-3+5@	Sample deviation (see appendix)			19761453	19761460	19761467	19761440	19761445	19761476
Component	LOD/Units	Method							
Moisture Content Ratio (% of as received sample)	%	PM024		13	12	10	14	8.8	15
Nitrate as NO3, 2:1 water soluble	<0.5 mg/kg	TM019			<0.5 M	<0.5 M	0.686 M		
Catechol	<0.01 mg/kg	TM062 (S)			<0.01	<0.01	<0.01		
Phenol	<0.01 mg/kg	TM062 (S)			<0.01 M	<0.01 M	<0.01 M		
Cresols	<0.01 mg/kg	TM062 (S)			<0.01 M	<0.01 M	<0.01 M		
Resorcinol	<0.05 mg/kg	TM062 (S)			<0.05	<0.05	<0.05		
Xylenols	<0.015 mg/kg	TM062 (S)			<0.015 M	<0.015 M	<0.015 M		
1-Naphthol	<0.01 mg/kg	TM062 (S)			<0.01	<0.01	<0.01		
2,3,5-Trimethylphenol	<0.01 mg/kg	TM062 (S)			<0.01 M	<0.01 M	<0.01 M		
2-Isopropylphenol	<0.015 mg/kg	TM062 (S)			<0.015 M	<0.015 M	<0.015 M		
Phenols, Total Detected 5 speciated	<0.06 mg/kg	TM062 (S)			<0.06 M	<0.06 M	<0.06 M		
Phenols, Total Detected 8 Speciated	<0.13 mg/kg	TM062 (S)			<0.13	<0.13	<0.13		
pH	1 pH Units	TM133		8.74 M	8.71 M	8.72 M	8.23 M	8.73 M	8.53 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #	<0.6 #
Cyanide, Total	<1 mg/kg	TM153			<1 M	<1 M	<1 M		
Cyanide, Free	<1 mg/kg	TM153			<1 M	<1 M	<1 M		
Cyanide, Complex	<1 mg/kg	TM153			<1	<1	<1		
Sulphide, Easily liberated	<15 mg/kg	TM180			<15 M	<15 M	24.4 @ M		
Arsenic	<0.6 mg/kg	TM181		6.56 M	5.32 M	26.4 M	14.4 M	20.5 M	20.6 M
Barium	<0.6 mg/kg	TM181		15.6 #	15.4 #	19 #	20.6 #	16.9 #	53.3 #
Beryllium	<0.01 mg/kg	TM181		0.105 M	0.12 M	<0.1 M	0.157 M	<0.01 M	0.304 M
Cadmium	<0.02 mg/kg	TM181		0.119 M	0.113 M	0.446 M	0.146 M	<0.02 M	0.108 M
Chromium	<0.9 mg/kg	TM181		2.99 M	3.38 M	<9 M	3.77 M	<0.9 M	12.6 M
Copper	<1.4 mg/kg	TM181		2.88 M	2.3 M	<14 M	4.87 M	4.86 M	11 M
Lead	<0.7 mg/kg	TM181		2.1 M	1.58 M	9.7 M	4.57 M	5.15 M	15 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M	<1.4 M	<0.14 M	<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181		8.19 M	6.54 M	26.5 M	16 M	22 M	29.9 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<10 #	<1 #	<1 #	<1 #
Vanadium	<0.2 mg/kg	TM181		11.8 #	10.8 #	37.5 #	24.4 #	34.8 #	45.6 #
Zinc	<1.9 mg/kg	TM181		16.2 M	14.6 M	50.6 M	32.5 M	39.1 M	45.3 M
Sulphate, Total	<48 mg/kg	TM221			265 M	215 M	294 M		
Boron, water soluble	<1 mg/kg	TM222		<1 M	<1 M	<1 M	<1 M	<1 M	<1 M



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Results Legend			Customer Sample Ref.	WS005	WS005	WS005			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	1.80 - 1.80	2.50 - 2.50	3.50 - 3.60			
M	mCERTS accredited.			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)			
aq	Aqueous / settled sample.			08/04/2019	08/04/2019	08/04/2019			
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			11/04/2019	11/04/2019	11/04/2019			
(F)	Trigger breach confirmed			190411-94	190411-94	190411-94			
1-3+5@	Sample deviation (see appendix)			19761486	19761494	19761503			
				ES	ES	ES			
Component	LOD/Units	Method							
Moisture Content Ratio (% of as received sample)	%	PM024		20	6.5	10			
Nitrate as NO ₃ , 2:1 water soluble	<0.5 mg/kg	TM019		1.1	0.716	0.506			
Catechol	<0.01 mg/kg	TM062 (S)		<0.01	<0.01	<0.01			
Phenol	<0.01 mg/kg	TM062 (S)		<0.01	<0.01	<0.01			
Cresols	<0.01 mg/kg	TM062 (S)		0.0125	<0.01	<0.01			
Resorcinol	<0.05 mg/kg	TM062 (S)		<0.05	<0.05	<0.05			
Xylenols	<0.015 mg/kg	TM062 (S)		<0.015	<0.015	<0.015			
1-Naphthol	<0.01 mg/kg	TM062 (S)		<0.01	<0.01	<0.01			
2,3,5-Trimethylphenol	<0.01 mg/kg	TM062 (S)		<0.01	<0.01	<0.01			
2-Isopropylphenol	<0.015 mg/kg	TM062 (S)		<0.015	<0.015	<0.015			
Phenols, Total Detected 5 speciated	<0.06 mg/kg	TM062 (S)		<0.06	<0.06	<0.06			
Phenols, Total Detected 8 Speciated	<0.13 mg/kg	TM062 (S)		<0.13	<0.13	<0.13			
pH	1 pH Units	TM133		7.14	8.46	8.73			
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6	<0.6	<0.6			
Cyanide, Total	<1 mg/kg	TM153		<1	<1	<1			
Cyanide, Free	<1 mg/kg	TM153		<1	<1	<1			
Cyanide, Complex	<1 mg/kg	TM153		<1	<1	<1			
Sulphide, Easily liberated	<15 mg/kg	TM180		19	36.9	<15			
Arsenic	<0.6 mg/kg	TM181		17	13.4	26.3			
Barium	<0.6 mg/kg	TM181		59.1	11.8	21.8			
Beryllium	<0.01 mg/kg	TM181		0.472	0.0936	0.0939			
Cadmium	<0.02 mg/kg	TM181		0.0585	0.0718	<0.02			
Chromium	<0.9 mg/kg	TM181		17.1	4.64	<0.9			
Copper	<1.4 mg/kg	TM181		11.2	4.1	4.24			
Lead	<0.7 mg/kg	TM181		15.1	3.79	5.66			
Mercury	<0.14 mg/kg	TM181		<0.14	<0.14	<0.14			
Nickel	<0.2 mg/kg	TM181		22.4	11.4	17.2			
Selenium	<1 mg/kg	TM181		<1	<1	<1			
Vanadium	<0.2 mg/kg	TM181		44.8	26.8	34.2			
Zinc	<1.9 mg/kg	TM181		43.9	21.6	31.6			
Sulphate, Total	<48 mg/kg	TM221		244	197	186			
Boron, water soluble	<1 mg/kg	TM222		1.44	<1	<1			



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Semi Volatile Organic Compounds

Results Legend			Customer Sample Ref.	WS001	WS001	WS002	WS005	WS005	WS005
#	ISO17025 accredited.								
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-3+5@	Sample deviation (see appendix)								
Component	LOD/Units	Method	Depth (m)	Sample Type	Date Sampled	Sampled Time	SDG Ref	Lab Sample No.(s)	AGS Reference
Phenol	<0.1 mg/kg	TM157	2.50 - 2.60	Soil/Solid (S)	08/04/2019		190411-94	19761460	ES
Pentachlorophenol	<0.1 mg/kg	TM157	3.50 - 3.60	Soil/Solid (S)	08/04/2019		190411-94	19761467	ES
n-Nitroso-n-dipropylamine	<0.1 mg/kg	TM157	2.00 - 2.00	Soil/Solid (S)	08/04/2019		190411-94	19761440	ES
Nitrobenzene	<0.1 mg/kg	TM157	1.80 - 1.80	Soil/Solid (S)	08/04/2019		190411-94	19761486	ES
Isophorone	<0.1 mg/kg	TM157	2.50 - 2.50	Soil/Solid (S)	08/04/2019		190411-94	19761494	ES
Hexachloroethane	<0.1 mg/kg	TM157	3.50 - 3.60	Soil/Solid (S)	08/04/2019		190411-94	19761503	ES
Hexachlorocyclopentadiene	<0.1 mg/kg	TM157							
Hexachlorobutadiene	<0.1 mg/kg	TM157							
Hexachlorobenzene	<0.1 mg/kg	TM157							
n-Dioctyl phthalate	<0.1 mg/kg	TM157							
Dimethyl phthalate	<0.1 mg/kg	TM157							
Diethyl phthalate	<0.1 mg/kg	TM157							
n-Dibutyl phthalate	<0.1 mg/kg	TM157							
Dibenzofuran	<0.1 mg/kg	TM157							
Carbazole	<0.1 mg/kg	TM157							
Butylbenzyl phthalate	<0.1 mg/kg	TM157							
bis(2-Ethylhexyl) phthalate	<0.1 mg/kg	TM157							
bis(2-Chloroethoxy)methane	<0.1 mg/kg	TM157							
bis(2-Chloroethyl)ether	<0.1 mg/kg	TM157							
Azobenzene	<0.1 mg/kg	TM157							
4-Nitrophenol	<0.1 mg/kg	TM157							
4-Nitroaniline	<0.1 mg/kg	TM157							
4-Methylphenol	<0.1 mg/kg	TM157							
4-Chlorophenylphenylether	<0.1 mg/kg	TM157							
4-Chloroaniline	<0.1 mg/kg	TM157							
4-Chloro-3-methylphenol	<0.1 mg/kg	TM157							
4-Bromophenylphenylether	<0.1 mg/kg	TM157							
3-Nitroaniline	<0.1 mg/kg	TM157							
2-Nitrophenol	<0.1 mg/kg	TM157							
2-Nitroaniline	<0.1 mg/kg	TM157							
2-Methylphenol	<0.1 mg/kg	TM157							
1,2,4-Trichlorobenzene	<0.1 mg/kg	TM157							



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Semi Volatile Organic Compounds

Results Legend			Customer Sample Ref.		WS001	WS001	WS002	WS005	WS005	WS005
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		2.50 - 2.60	3.50 - 3.60	2.00 - 2.00	1.80 - 1.80	2.50 - 2.50	3.50 - 3.60
M	mCERTS accredited.				08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019
aq	Aqueous / settled sample.				Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.									
*	Subcontracted - refer to subcontractor report for accreditation status.				11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery				190411-94	190411-94	190411-94	190411-94	190411-94	190411-94
(F)	Trigger breach confirmed				19761460	19761467	19761440	19761486	19761494	19761503
1-3*5@	Sample deviation (see appendix)				ES	ES	ES	ES	ES	ES
Component	LOD/Units	Method								
2-Chlorophenol	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2,6-Dinitrotoluene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2,4-Dinitrotoluene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2,4-Dimethylphenol	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2,4-Dichlorophenol	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2,4,6-Trichlorophenol	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2,4,5-Trichlorophenol	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
1,4-Dichlorobenzene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
1,3-Dichlorobenzene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
1,2-Dichlorobenzene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2-Chloronaphthalene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
2-Methylnaphthalene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Acenaphthylene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Acenaphthene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	0.314	3.54	<0.1
Anthracene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Benzo(a)anthracene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Benzo(b)fluoranthene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Benzo(k)fluoranthene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Benzo(a)pyrene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Benzo(g,h,i)perylene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Chrysene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Fluoranthene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	0.151	<1	<0.1
Fluorene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	0.717	8.04	<0.1
Indeno(1,2,3-cd)pyrene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Phenanthrene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	0.948	13.7	<0.1
Pyrene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	0.209	1.59	<0.1
Naphthalene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Dibenzo(a,h)anthracene	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1
Bis(2-chloroisopropyl) ether	<0.1 mg/kg	TM157			<0.1	<0.1	<0.1	<0.1	<1	<0.1



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

VOC MS (S)

Results Legend			Customer Sample Ref.	WS001	WS001	WS002	WS005	WS005	WS005
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	2.50 - 2.60	3.50 - 3.60	2.00 - 2.00	1.80 - 1.80	2.50 - 2.50	3.50 - 3.60
M	mCERIS accredited.			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
aq	Aqueous / settled sample.			08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.			11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			190411-94	190411-94	190411-94	190411-94	190411-94	190411-94
(F)	Trigger breach confirmed			19761460	19761467	19761440	19761486	19761494	19761503
1-3+5@	Sample deviation (see appendix)			ES	ES	ES	ES	ES	ES
Component	LOD/Units	Method							
Dibromofluoromethane**	%	TM116		115	116	104	104	119	104
Toluene-d8**	%	TM116		101	105	99.7	96.5	86.6	103
4-Bromofluorobenzene**	%	TM116		101	101	99.3	92.1	70.3	102
Dichlorodifluoromethane	<0.006 mg/kg	TM116		<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M
Chloromethane	<0.007 mg/kg	TM116		<0.07 #	<0.07 #	<0.07 #	<0.07 #	<0.07 #	<0.07 #
Vinyl Chloride	<0.006 mg/kg	TM116		<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M
Bromomethane	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Chloroethane	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Trichlorofluoromethane	<0.006 mg/kg	TM116		<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M
1,1-Dichloroethene	<0.01 mg/kg	TM116		<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
Carbon Disulphide	<0.007 mg/kg	TM116		<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M
Dichloromethane	<0.01 mg/kg	TM116		<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
Methyl Tertiary Butyl Ether	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
trans-1,2-Dichloroethene	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
1,1-Dichloroethane	<0.008 mg/kg	TM116		<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M
cis-1,2-Dichloroethene	<0.006 mg/kg	TM116		<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M	<0.06 M
2,2-Dichloropropane	<0.01 mg/kg	TM116		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromochloromethane	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Chloroform	<0.008 mg/kg	TM116		<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M
1,1,1-Trichloroethane	<0.007 mg/kg	TM116		<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M
1,1-Dichloropropene	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Carbontetrachloride	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
1,2-Dichloroethane	<0.005 mg/kg	TM116		<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M
Benzene	<0.009 mg/kg	TM116		<0.09 M	<0.09 M	<0.09 M	<0.09 M	<0.09 M	<0.09 M
Trichloroethene	<0.009 mg/kg	TM116		<0.09 #	<0.09 #	<0.09 #	<0.09 #	<0.09 #	<0.09 #
1,2-Dichloropropane	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Dibromomethane	<0.009 mg/kg	TM116		<0.09 M	<0.09 M	<0.09 M	<0.09 M	<0.09 M	<0.09 M
Bromodichloromethane	<0.007 mg/kg	TM116		<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M
cis-1,3-Dichloropropene	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Toluene	<0.007 mg/kg	TM116		<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M
trans-1,3-Dichloropropene	<0.01 mg/kg	TM116		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,1,2-Trichloroethane	<0.01 mg/kg	TM116		<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

VOC MS (S)

Results Legend			Customer Sample Ref. Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	WS001	WS001	WS002	WS005	WS005	WS005
#	ISO17025 accredited.			2.50 - 2.60	3.50 - 3.60	2.00 - 2.00	1.80 - 1.80	2.50 - 2.50	3.50 - 3.60
M	mCERTS accredited.			Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
aq	Aqueous / settled sample.			08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019	08/04/2019
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019	11/04/2019
				190411-94	190411-94	190411-94	190411-94	190411-94	190411-94
(F)	Trigger breach confirmed			19761460	19761467	19761440	19761486	19761494	19761503
1-3+5@	Sample deviation (see appendix)		ES	ES	ES	ES	ES	ES	
Component	LOD/Units	Method							
1,3-Dichloropropane	<0.007 mg/kg	TM116	<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M	<0.07 M
Tetrachloroethene	<0.005 mg/kg	TM116	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M
Dibromochloromethane	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
1,2-Dibromoethane	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Chlorobenzene	<0.005 mg/kg	TM116	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M
1,1,1,2-Tetrachloroethane	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Ethylbenzene	<0.004 mg/kg	TM116	<0.04 M	<0.04 M	<0.04 M	<0.04 M	<0.04 M	<0.04 M	<0.04 M
p/m-Xylene	<0.01 mg/kg	TM116	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
o-Xylene	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Styrene	<0.01 mg/kg	TM116	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
Bromoform	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Isopropylbenzene	<0.005 mg/kg	TM116	<0.05 #	<0.05 #	<0.05 #	<0.05 #	1.72 #	<0.05 #	<0.05 #
1,1,2,2-Tetrachloroethane	<0.01 mg/kg	TM116	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
1,2,3-Trichloropropane	<0.016 mg/kg	TM116	<0.16 M	<0.16 M	<0.16 M	<0.16 M	<0.16 M	<0.16 M	<0.16 M
Bromobenzene	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
Propylbenzene	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	3.09 M	<0.1 M	<0.1 M
2-Chlorotoluene	<0.009 mg/kg	TM116	<0.09 M	<0.09 M	<0.09 M	<0.09 M	<0.09 M	<0.09 M	<0.09 M
1,3,5-Trimethylbenzene	<0.008 mg/kg	TM116	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M
4-Chlorotoluene	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
tert-Butylbenzene	<0.014 mg/kg	TM116	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
1,2,4-Trimethylbenzene	<0.009 mg/kg	TM116	<0.09 #	<0.09 #	<0.09 #	<0.09 #	1.85 #	<0.09 #	<0.09 #
sec-Butylbenzene	<0.01 mg/kg	TM116	<0.1	<0.1	<0.1	<0.1	5.15	<0.1	<0.1
4-Isopropyltoluene	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
1,3-Dichlorobenzene	<0.008 mg/kg	TM116	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M	<0.08 M
1,4-Dichlorobenzene	<0.005 mg/kg	TM116	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M	<0.05 M
n-Butylbenzene	<0.011 mg/kg	TM116	<0.11	<0.11	<0.11	<0.11	5.05	<0.11	<0.11
1,2-Dichlorobenzene	<0.01 mg/kg	TM116	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M	<0.1 M
1,2-Dibromo-3-chloropropane	<0.014 mg/kg	TM116	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
Tert-amyl methyl ether	<0.01 mg/kg	TM116	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
1,2,4-Trichlorobenzene	<0.02 mg/kg	TM116	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hexachlorobutadiene	<0.02 mg/kg	TM116	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	<0.013 mg/kg	TM116	<0.13 M	<0.13 M	<0.13 M	<0.13 M	<0.13 M	<0.13 M	<0.13 M



CERTIFICATE OF ANALYSIS

Validated

SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Table of Results - Appendix

Method No	Reference	Description
PM001		Preparation of Samples for Metals Analysis
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM019	Modified: US EPA Method 9056	Determination of Anions in Soils using Ion Chromatography
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM133	BS 1377: Part 3 1990:BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM157	HP 6890 Gas Chromatograph (GC) system and HP 5973 Mass Selective Detector (MSD).	Determination of SVOC in Soils by GC-MS extracted by sonication in DCM/Acetone
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer
TM243		Mixed Anions In Soils By Kone
TM248	In-House Method	Determination of Ammonium BRE (2:1 Extract) on solids

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94 Client Reference: 70044279 Report Number: 501776
Location: George Street Reading Order Number: 70044279-008 Superseded Report:

Test Completion Dates

Lab Sample No(s)	19761453	19761460	19761467	19761440	19761445	19761476	19761486	19761494	19761503
Customer Sample Ref.	WS001	WS001	WS001	WS002	WS002	WS003	WS005	WS005	WS005
AGS Ref.	ES	ES	ES	ES	ES	ES	ES	ES	ES
Depth	1.60 - 1.70	2.50 - 2.60	3.50 - 3.60	2.00 - 2.00	3.00 - 3.00	1.70 - 1.70	1.80 - 1.80	2.50 - 2.50	3.50 - 3.60
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Ammoniacal N as NH4 in 2:1 extract		15-Apr-2019	15-Apr-2019	15-Apr-2019			15-Apr-2019	15-Apr-2019	15-Apr-2019
Anions by ion Chromatography		18-Apr-2019	18-Apr-2019	18-Apr-2019			18-Apr-2019	18-Apr-2019	18-Apr-2019
Boron Water Soluble	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019
Cyanide Comp/Free/Total/Thiocyanate		15-Apr-2019	15-Apr-2019	15-Apr-2019			16-Apr-2019	15-Apr-2019	15-Apr-2019
Easily Liberated Sulphide		12-Apr-2019	12-Apr-2019	15-Apr-2019			15-Apr-2019	15-Apr-2019	15-Apr-2019
EPH CWG (Aliphatic) GC (S)		15-Apr-2019	15-Apr-2019	15-Apr-2019			16-Apr-2019	16-Apr-2019	16-Apr-2019
EPH CWG (Aromatic) GC (S)		15-Apr-2019	15-Apr-2019	15-Apr-2019			16-Apr-2019	16-Apr-2019	16-Apr-2019
GRO by GC-FID (S)		15-Apr-2019	16-Apr-2019	16-Apr-2019			17-Apr-2019	16-Apr-2019	16-Apr-2019
Hexavalent Chromium (s)	17-Apr-2019	17-Apr-2019	17-Apr-2019	17-Apr-2019	17-Apr-2019	17-Apr-2019	17-Apr-2019	17-Apr-2019	17-Apr-2019
Metals in solid samples by OES	16-Apr-2019	16-Apr-2019	16-Apr-2019	16-Apr-2019	16-Apr-2019	16-Apr-2019	16-Apr-2019	16-Apr-2019	16-Apr-2019
NO3, NO2 and TON by KONE (s)		17-Apr-2019	17-Apr-2019	17-Apr-2019			17-Apr-2019	17-Apr-2019	17-Apr-2019
PAH by GCMS	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	16-Apr-2019	15-Apr-2019	17-Apr-2019	16-Apr-2019
pH	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019	15-Apr-2019
Phenols by HPLC (S)		15-Apr-2019	15-Apr-2019	15-Apr-2019			15-Apr-2019	16-Apr-2019	15-Apr-2019
Sample description	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019	11-Apr-2019
Semi Volatile Organic Compounds		18-Apr-2019	18-Apr-2019	18-Apr-2019			18-Apr-2019	18-Apr-2019	18-Apr-2019
Total Sulphate		17-Apr-2019	17-Apr-2019	17-Apr-2019			17-Apr-2019	17-Apr-2019	17-Apr-2019
TPH CWG GC (S)		15-Apr-2019	16-Apr-2019	16-Apr-2019			17-Apr-2019	16-Apr-2019	17-Apr-2019
VOC MS (S)		15-Apr-2019	15-Apr-2019	16-Apr-2019			16-Apr-2019	15-Apr-2019	16-Apr-2019



CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Chromatogram

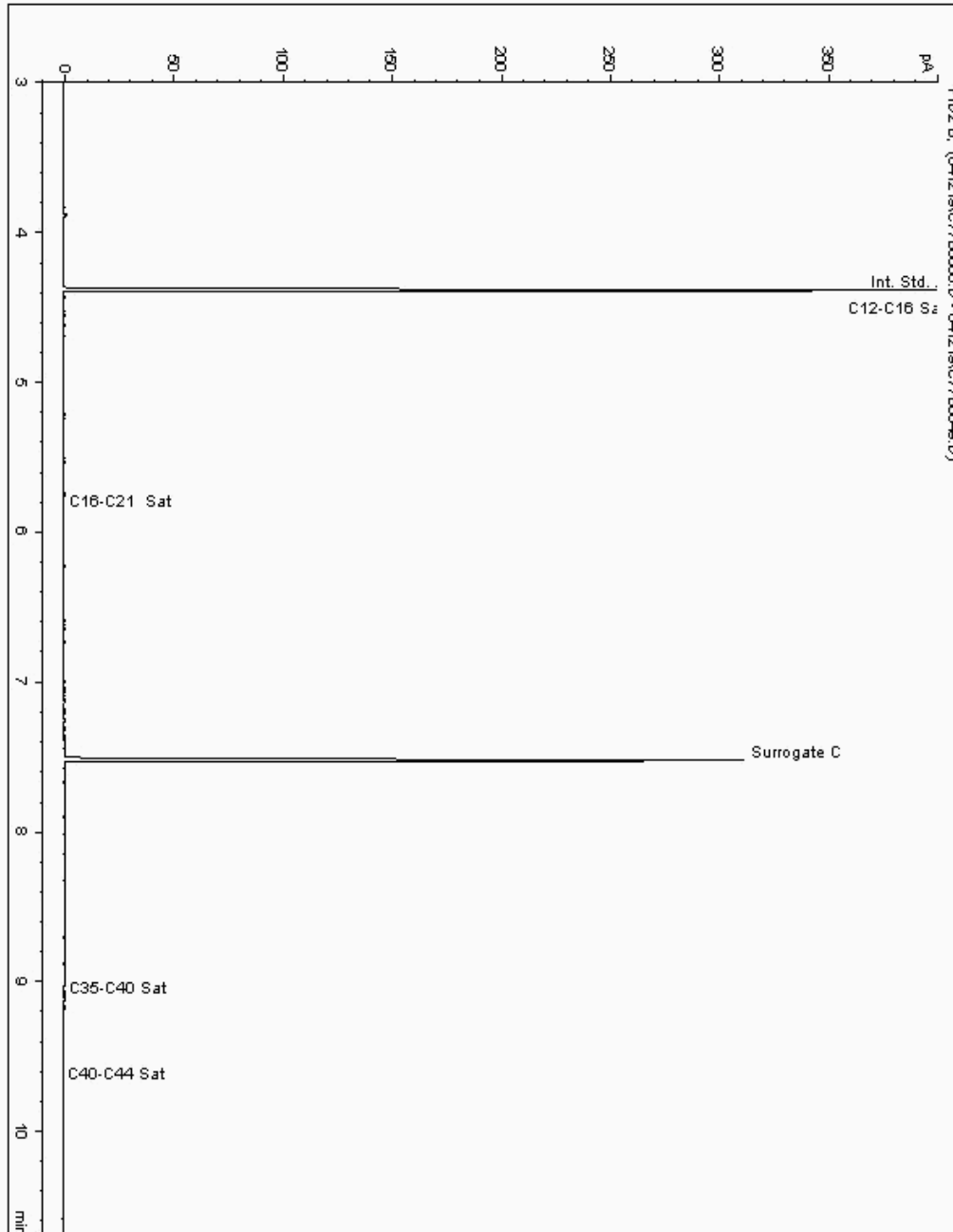
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19762595
Sample ID : WS001

Depth : 3.50 - 3.60

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18564992-
Date Acquired : 15/04/2019 19:51:03 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

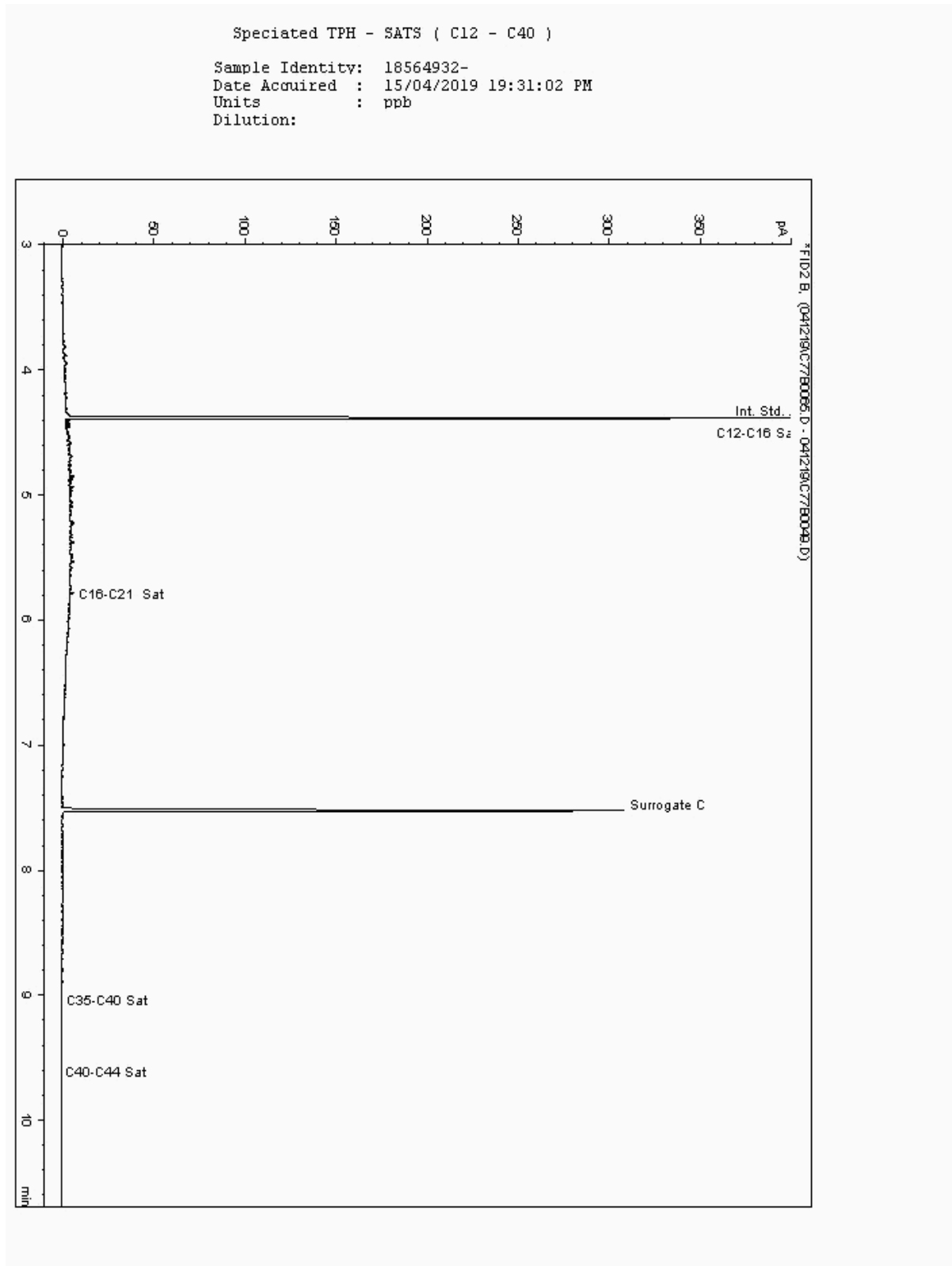
SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19762862
Sample ID : WS001

Depth : 2.50 - 2.60





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

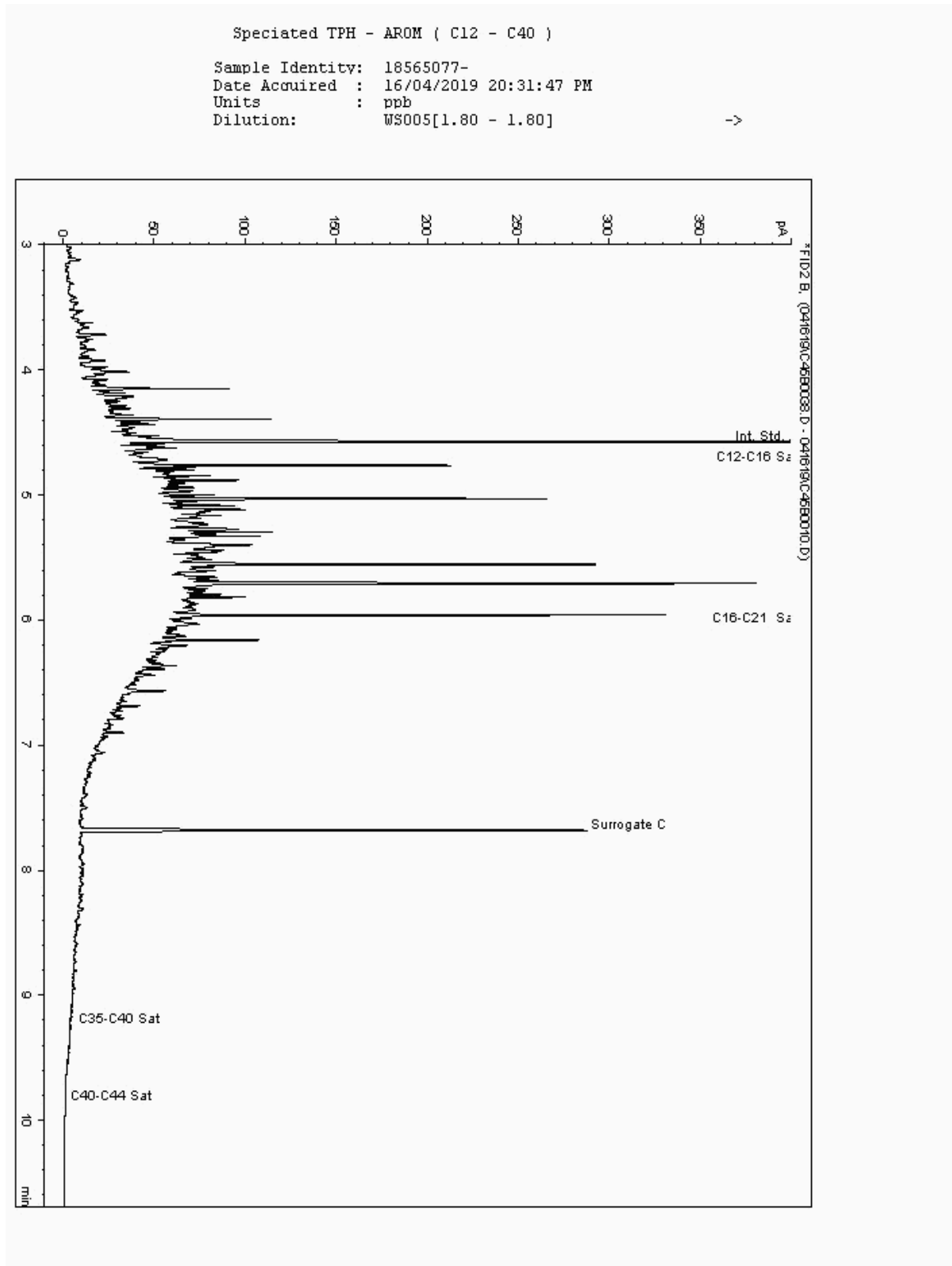
Report Number: 501776
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19762870
Sample ID : WS005

Depth : 1.80 - 1.80





CERTIFICATE OF ANALYSIS

Validated

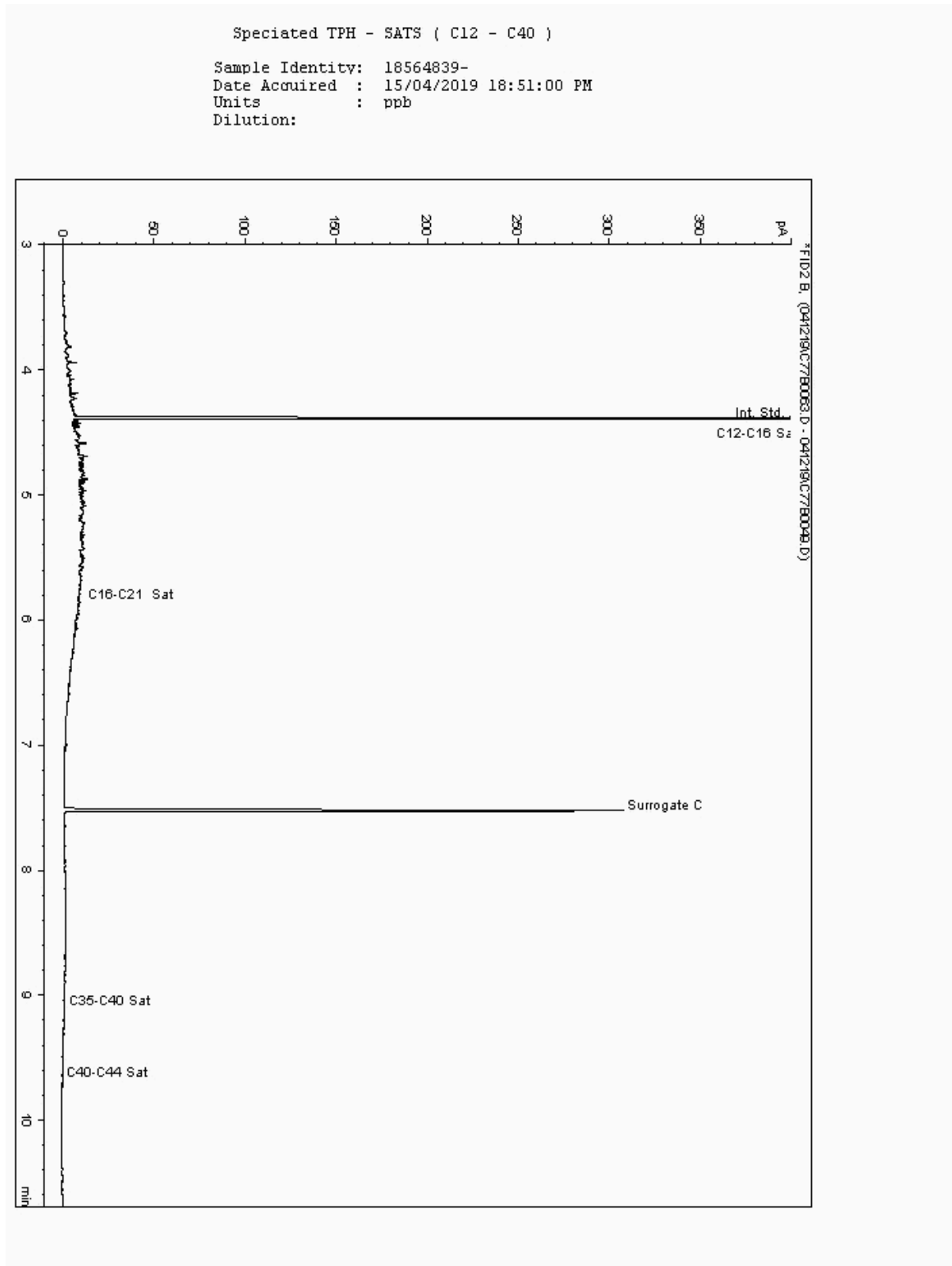
SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19763356
Sample ID : WS002

Depth : 2.00 - 2.00





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

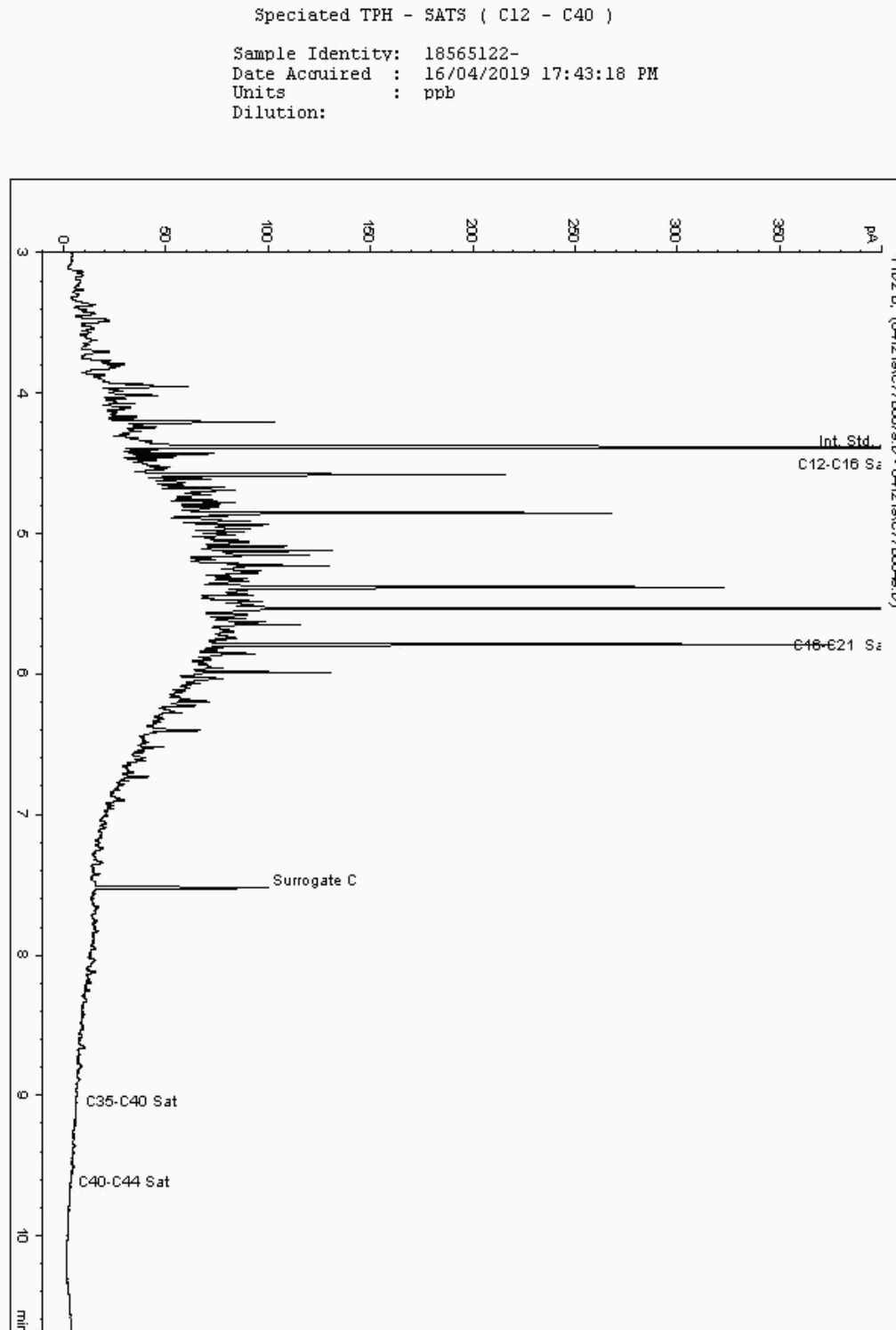
Report Number: 501776
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 19764353
Sample ID : WS005

Depth : 2.50 - 2.50





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aliphatic) GC (S)

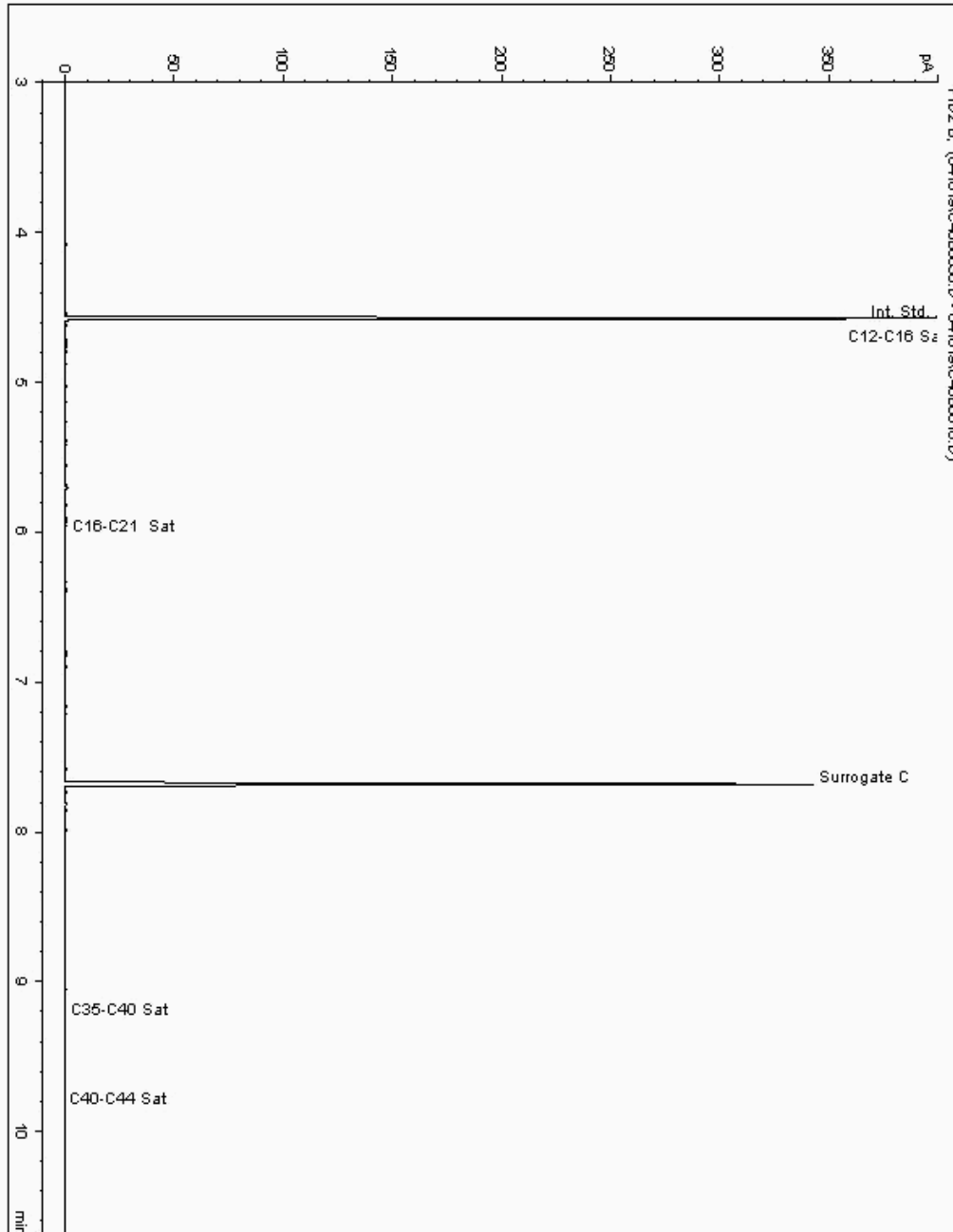
Sample No : 19764680
Sample ID : WS005

Depth : 3.50 - 3.60

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18565160-
Date Acquired : 16/04/2019 18:15:16 PM
Units : ppb
Dilution: WS005[3.50 - 3.60]

->





CERTIFICATE OF ANALYSIS

Validated

SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

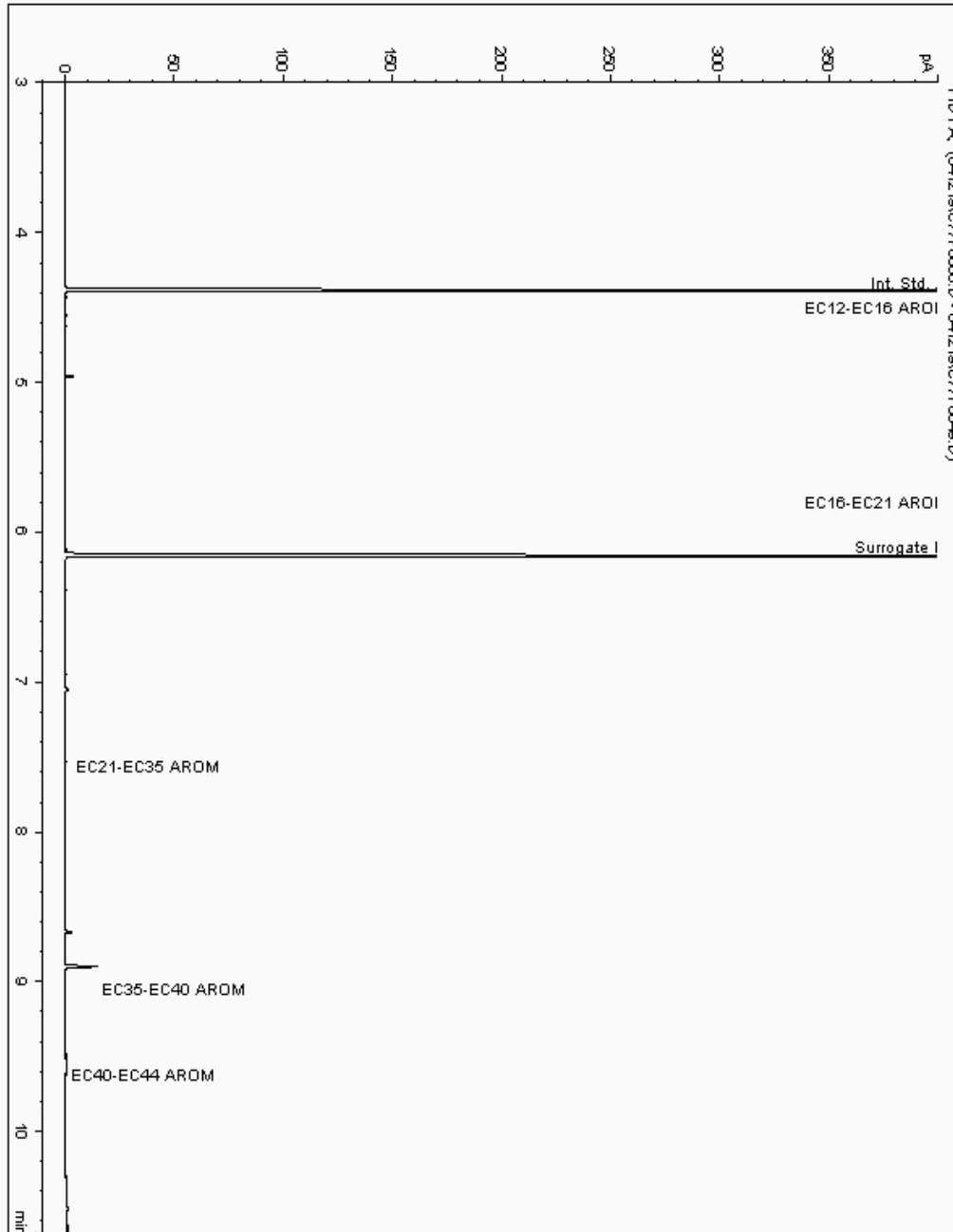
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19762595
Sample ID : WS001

Depth : 3.50 - 3.60

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18564993-
Date Acquired : 15/04/2019 19:51:03 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Chromatogram

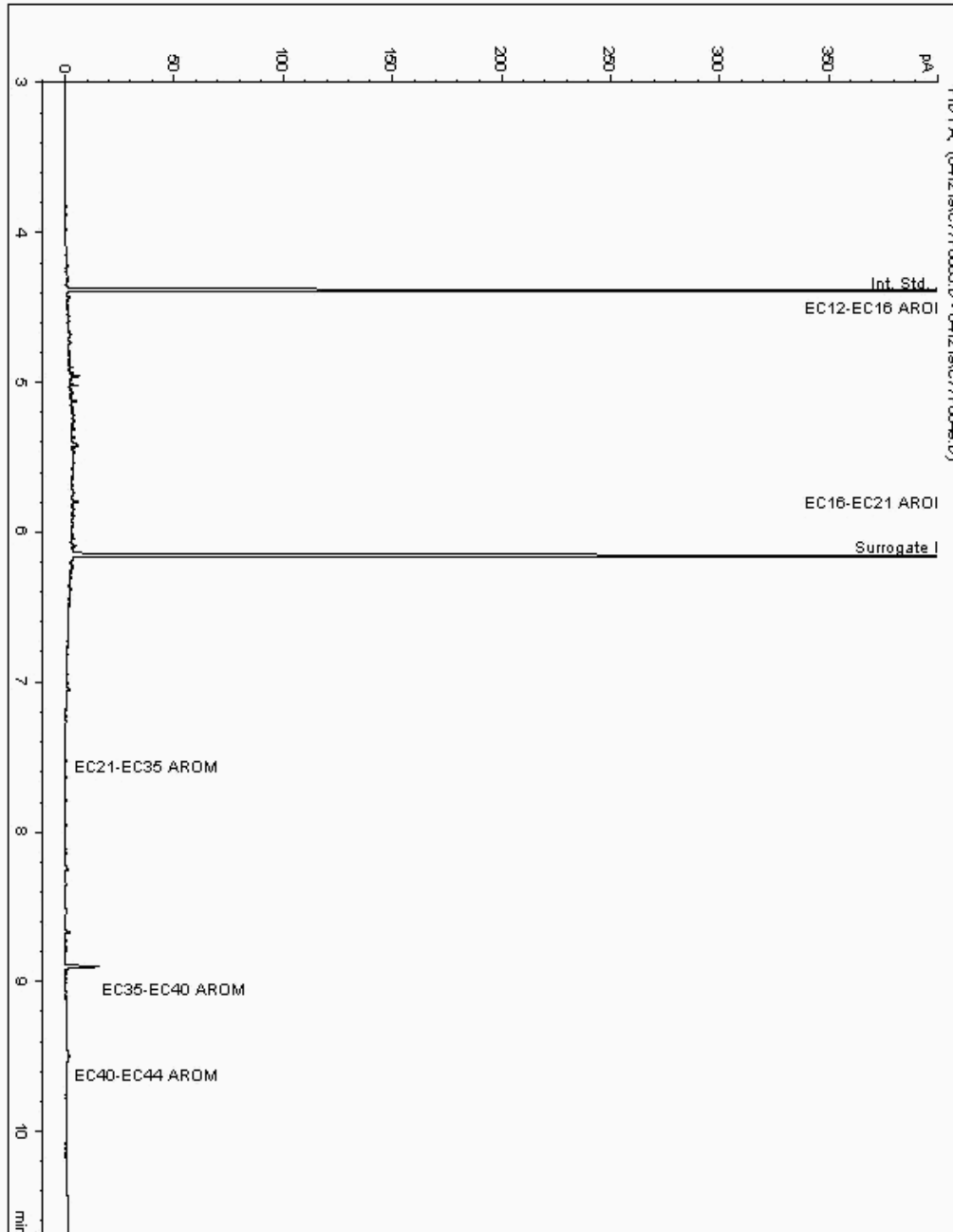
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19762862
Sample ID : WS001

Depth : 2.50 - 2.60

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18564933-
Date Acquired : 15/04/2019 19:31:02 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

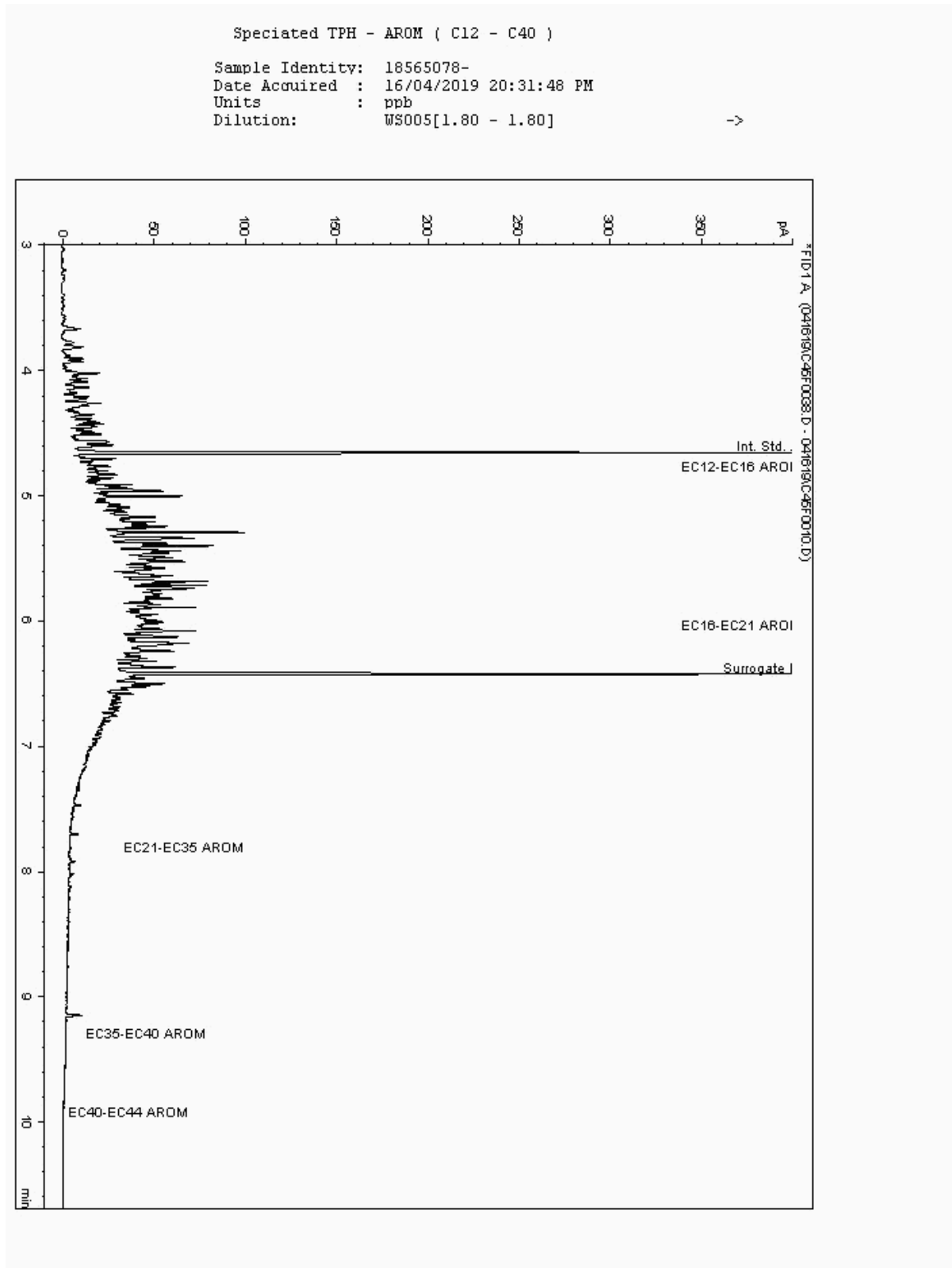
Report Number: 501776
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19762870
Sample ID : WS005

Depth : 1.80 - 1.80





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 501776
Superseded Report:

Chromatogram

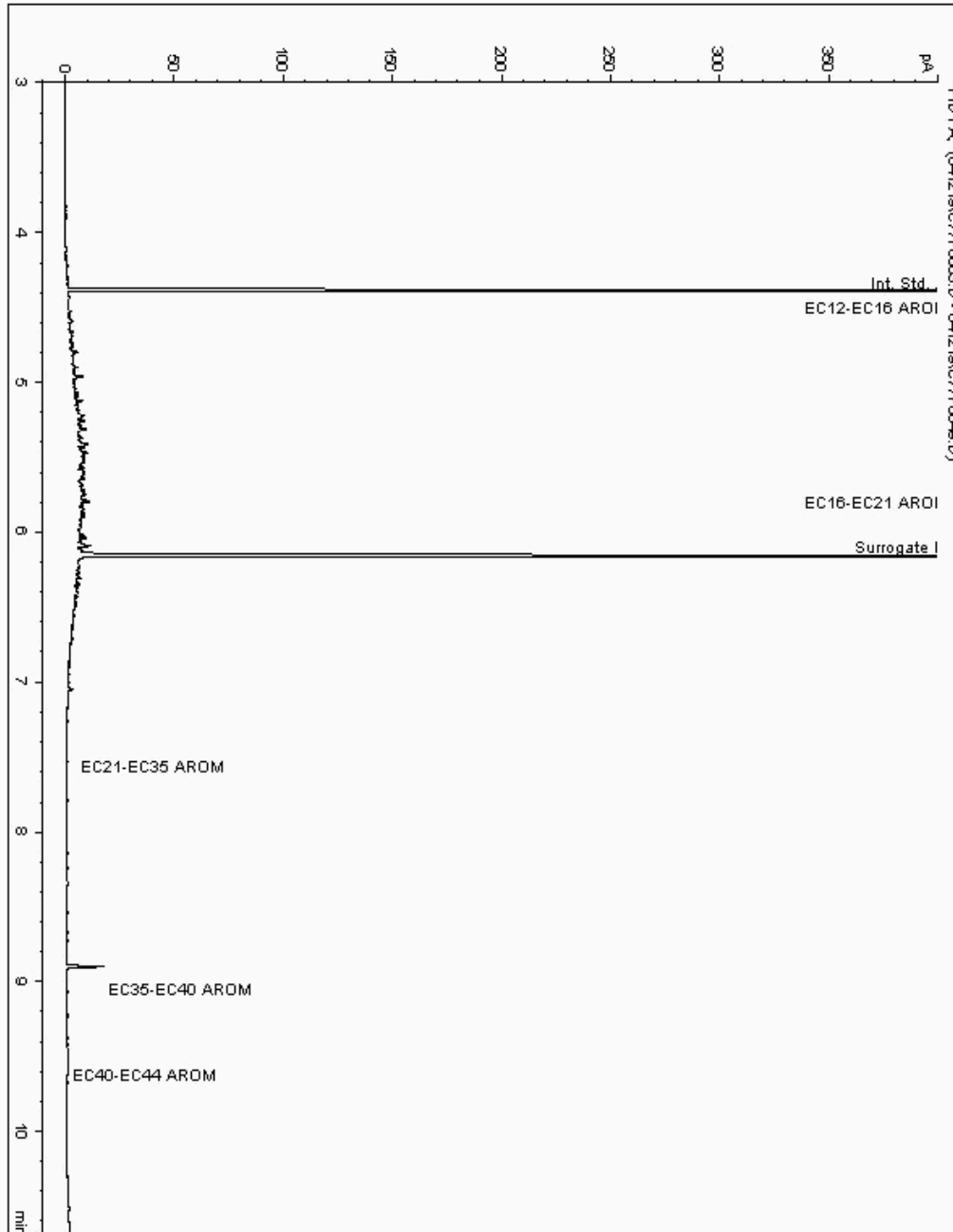
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19763356
Sample ID : WS002

Depth : 2.00 - 2.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18564840-
Date Acquired : 15/04/2019 18:51:00 PM
Units : ppb
Dilution:





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

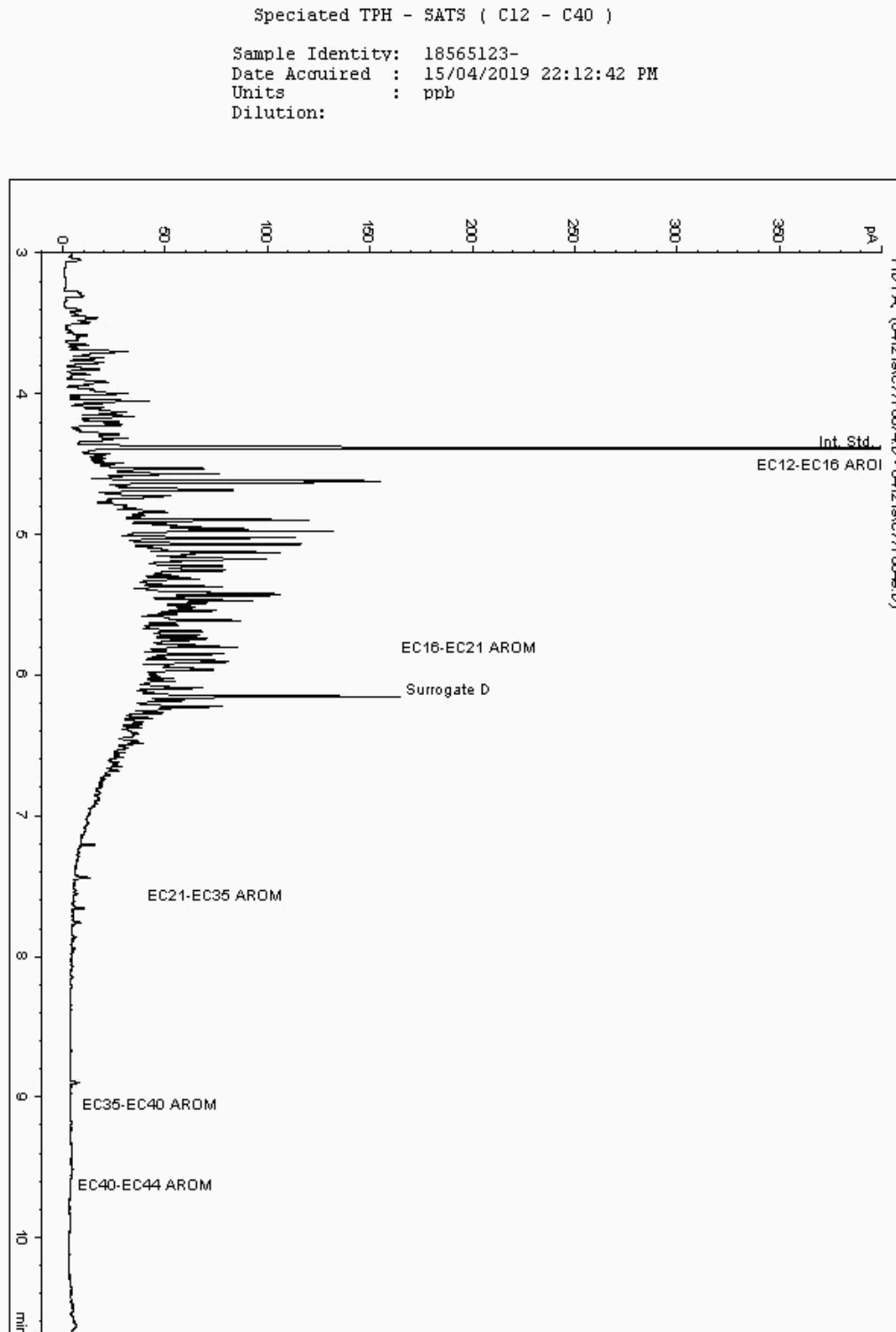
Report Number: 501776
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19764353
Sample ID : WS005

Depth : 2.50 - 2.50





CERTIFICATE OF ANALYSIS

Validated

SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

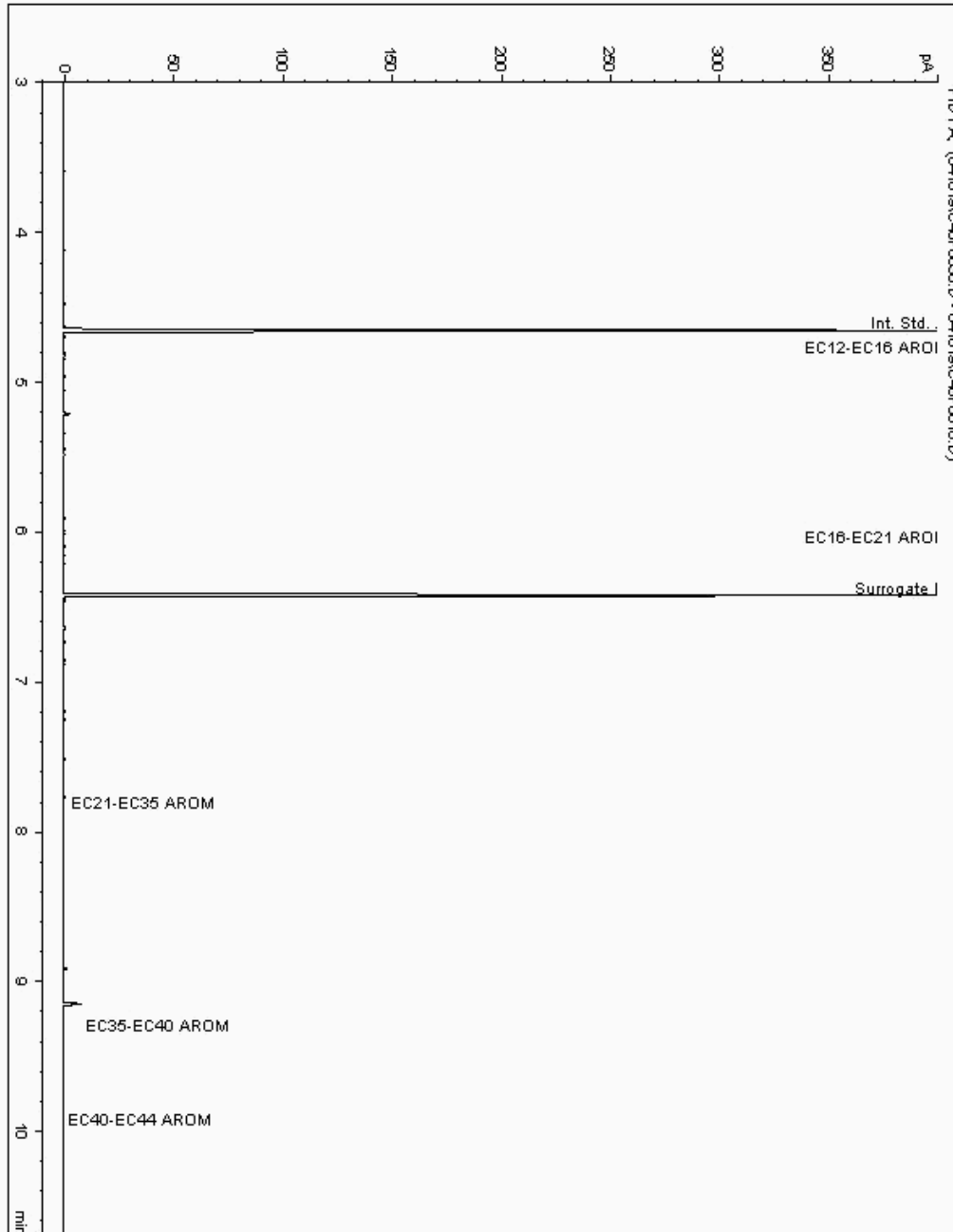
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 19764680
Sample ID : WS005

Depth : 3.50 - 3.60

Speciated TPH - AROM (C12 - C40)

Sample Identity: 18565161-
Date Acquired : 16/04/2019 18:15:16 PM
Units : ppb
Dilution: WS005[3.50 - 3.60] ->





CERTIFICATE OF ANALYSIS

Validated

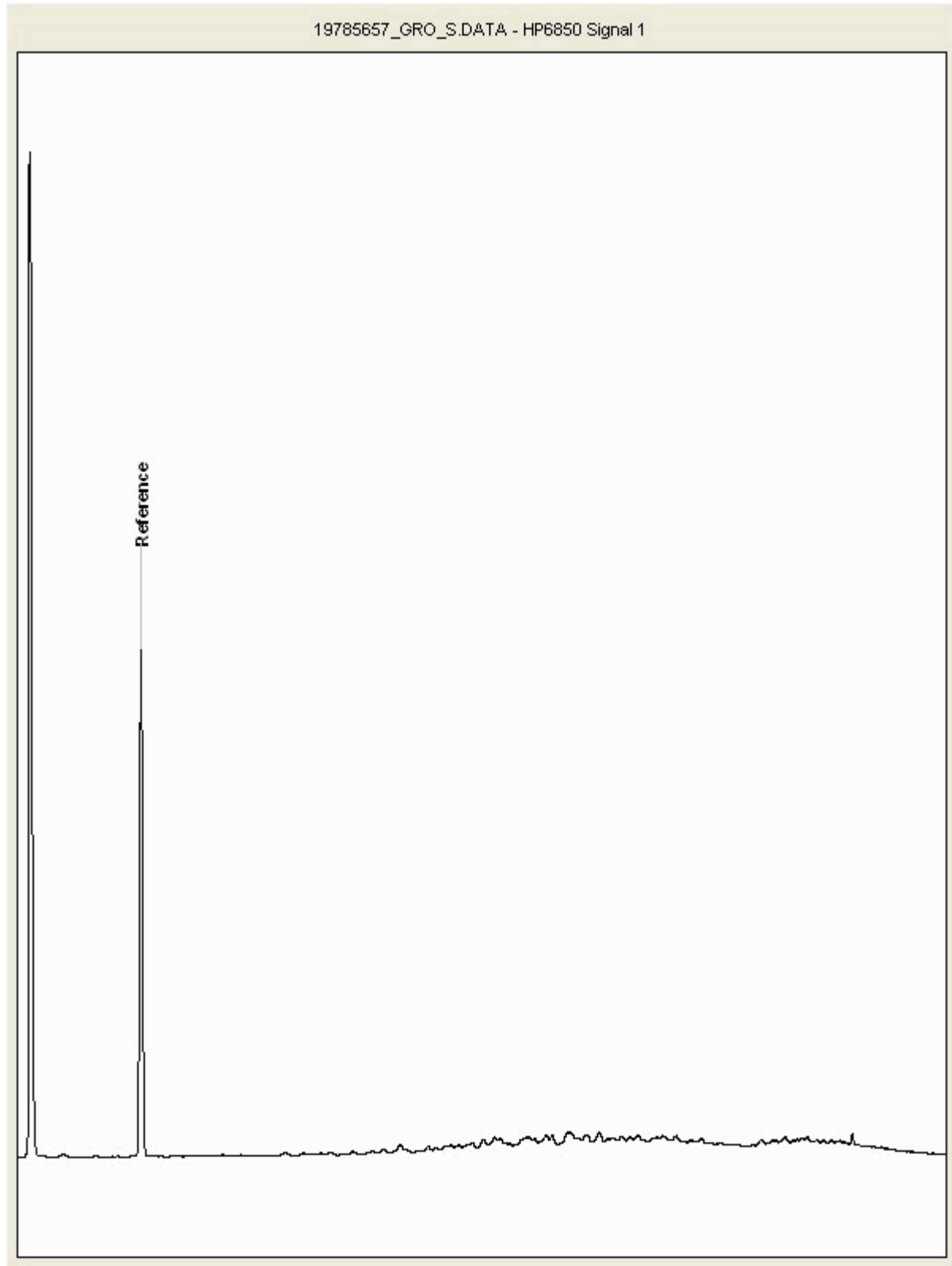
SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19785657
Sample ID : WS001

Depth : 2.50 - 2.60





CERTIFICATE OF ANALYSIS

Validated

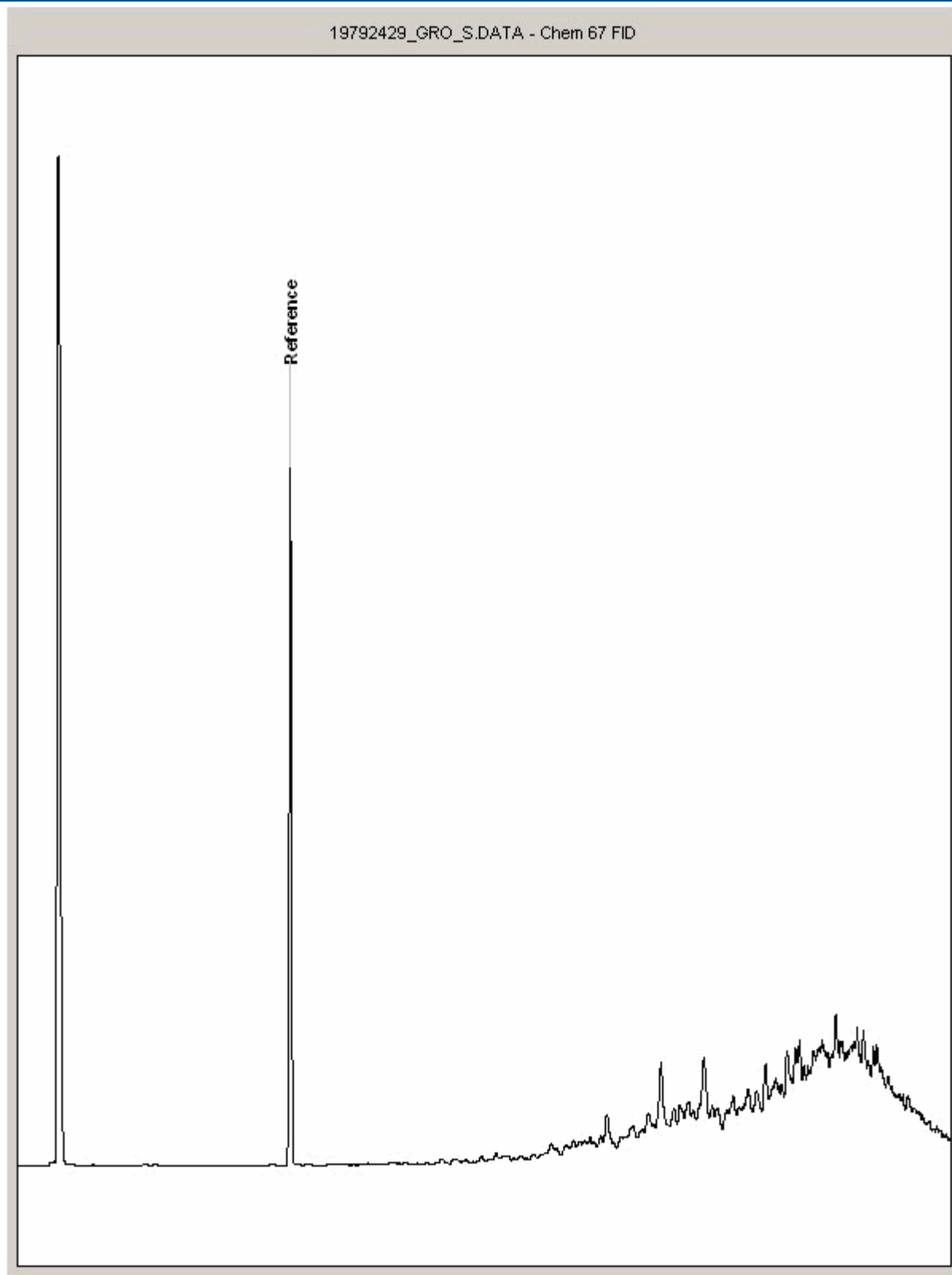
SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19792429
Sample ID : WS002

Depth : 2.00 - 2.00





CERTIFICATE OF ANALYSIS

Validated

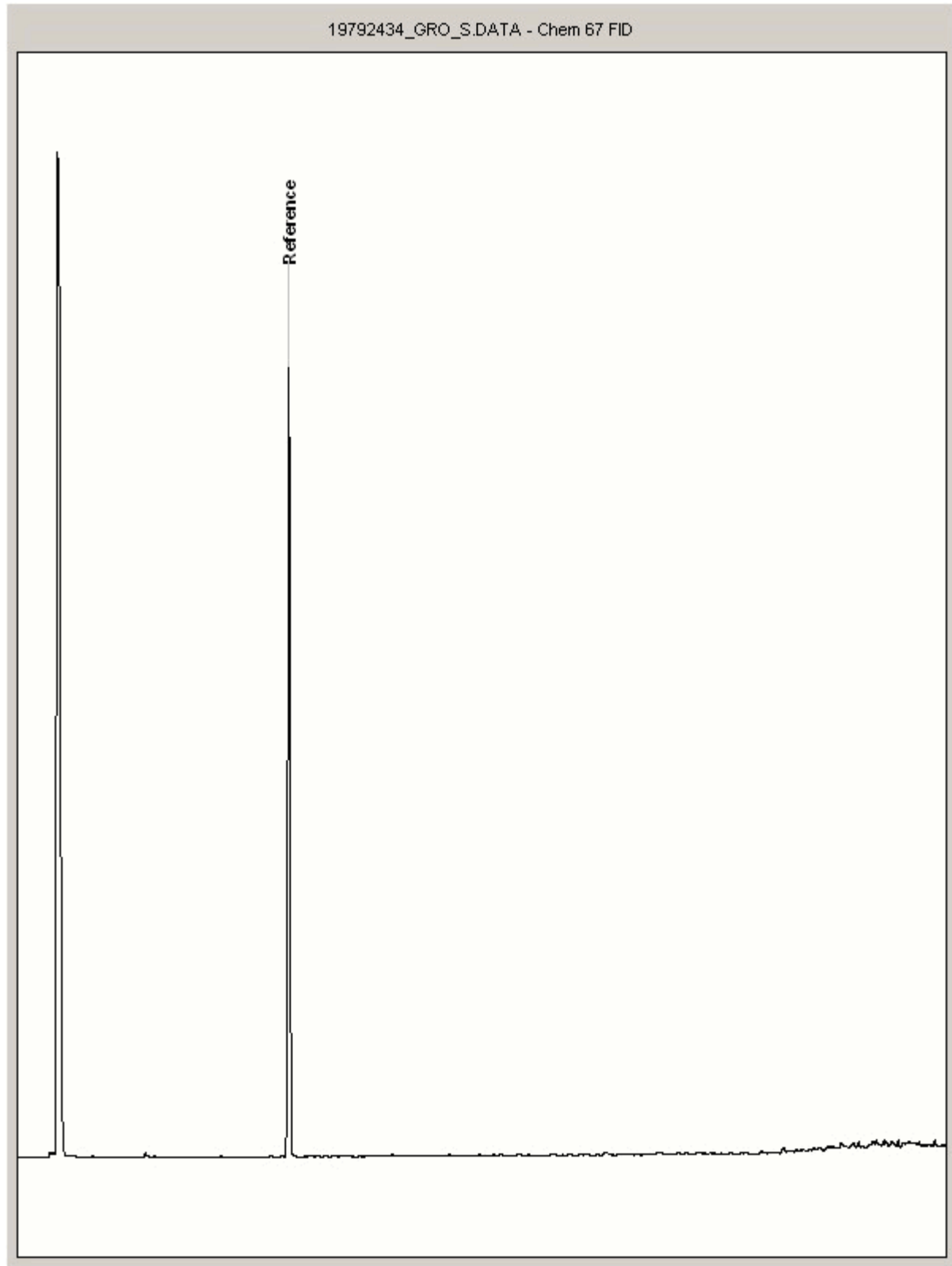
SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19792434
Sample ID : WS005

Depth : 3.50 - 3.60





CERTIFICATE OF ANALYSIS

Validated

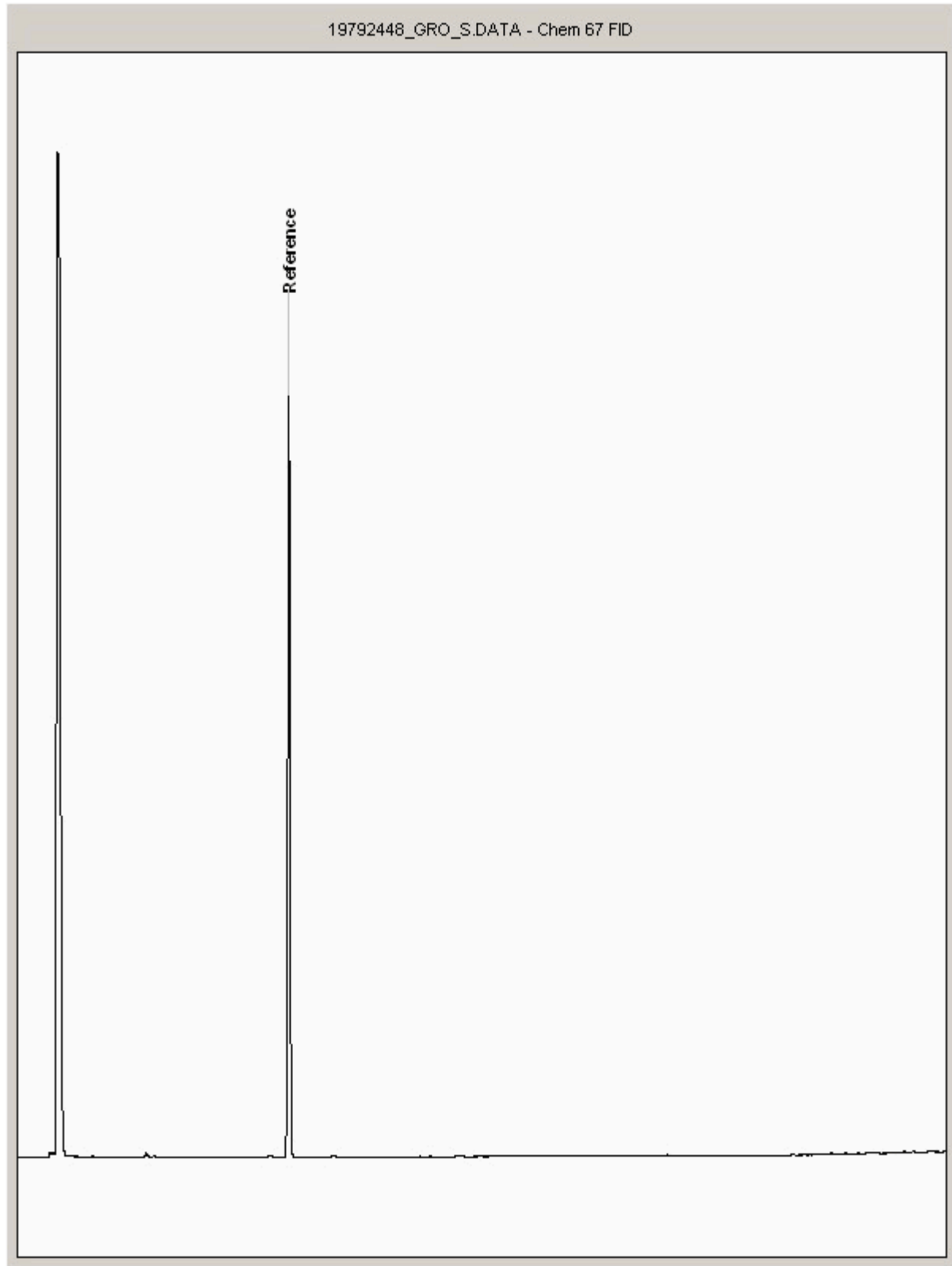
SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19792448
Sample ID : WS001

Depth : 3.50 - 3.60





CERTIFICATE OF ANALYSIS

Validated

SDG: 190411-94
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

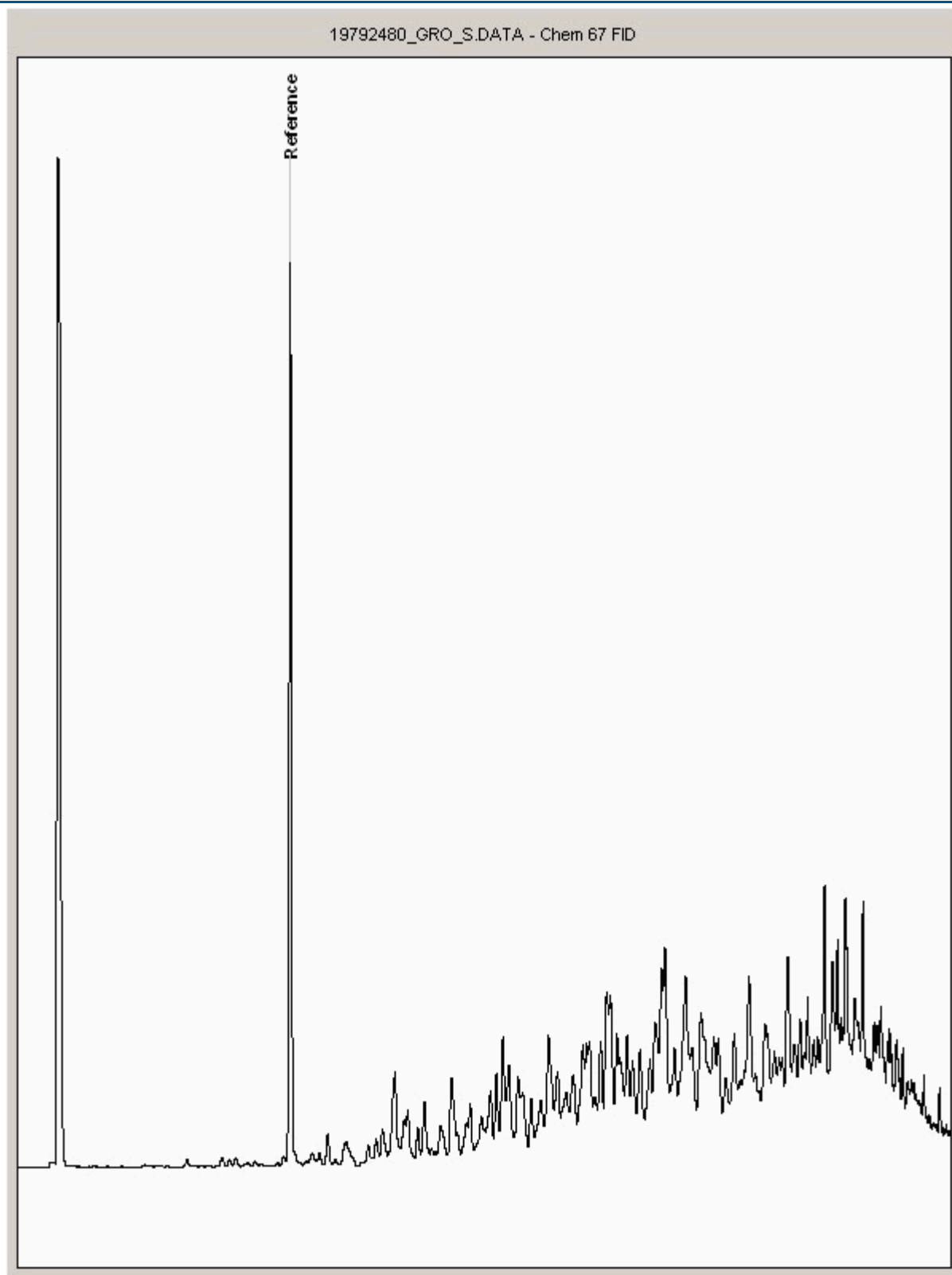
Report Number: 501776
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19792480
Sample ID : WS005

Depth : 2.50 - 2.50





CERTIFICATE OF ANALYSIS

Validated

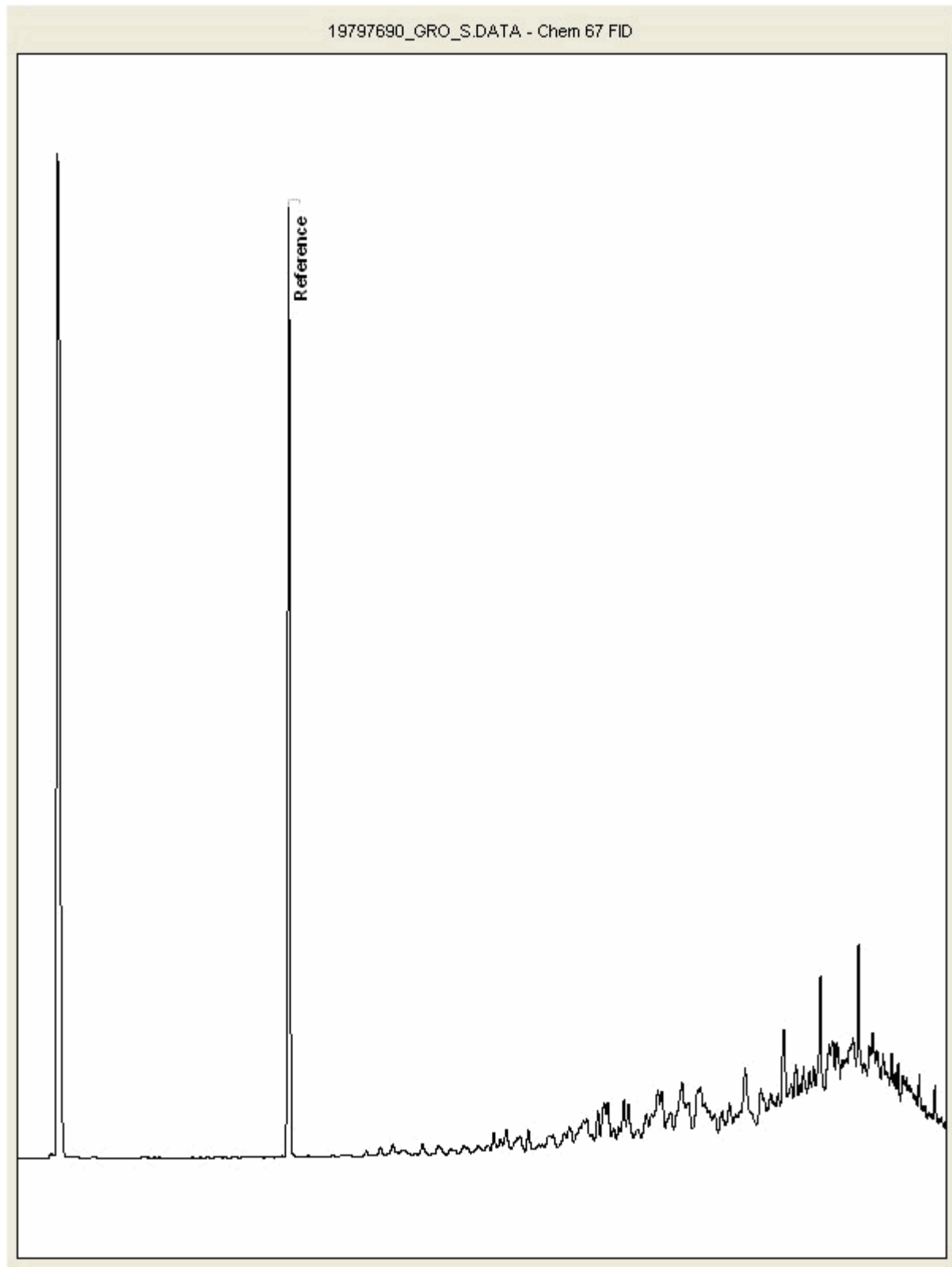
SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 19797690
Sample ID : WS005

Depth : 1.80 - 1.80





CERTIFICATE OF ANALYSIS

SDG:	190411-94	Client Reference:	70044279	Report Number:	501776
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

General

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
§	Sampled on date not provided
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



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Deeside
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Tel: (01244) 528700

Fax: (01244) 528701

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

WSP PB BBC
3rd Floor, Kings Orchard,
1 Queen Street
Bristol
Gloucestershire
BS2 0HQ

Attention: Emma Waite

CERTIFICATE OF ANALYSIS

Date of report Generation:	29 April 2019
Customer:	H_WSP_BRI
Sample Delivery Group (SDG):	190418-111
Your Reference:	70044279
Location:	George Street Reading
Report No:	502893

We received 6 samples on Thursday April 18, 2019 and 5 of these samples were scheduled for analysis which was completed on Monday April 29, 2019. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111 **Client Reference:** 70044279 **Report Number:** 502893
Location: George Street Reading **Order Number:** 70044279-008 **Superseded Report:**

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
19817683	BH001	EW	0.00 - 0.00	17/04/2019
19817670	BH002	EW	0.00 - 0.00	17/04/2019
19817715	NO ID			
19817639	WS002	EW	0.00 - 0.00	17/04/2019
19817653	WS003	EW	0.00 - 0.00	17/04/2019
19817700	WS005	EW	0.00 - 0.00	17/04/2019

Maximum Sample/Coolbox Temperature (°C) : 8.4

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.

[illegible]



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111 Client Reference: 70044279 Report Number: 502893
Location: George Street Reading Order Number: 70044279-008 Superseded Report:

Results Legend

- X** Test
N No Determination Possible

Sample Types -

- S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

VOC MS (W)

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type	VOC MS (W)
19817653	WS003	EW	0.00 - 0.00	500ml Plastic (ALE208)	GW	
19817639	WS002	EW	0.00 - 0.00	Vial (ALE297)	GW	X
19817670	BH002	EW	0.00 - 0.00	NaOH (ALE245)	GW	X
19817683	BH001	EW	0.00 - 0.00	NaOH (ALE245)	GW	X
				500ml Plastic (ALE208)	GW	
				250ml Amber Gl. PTFE/PE	GW	
				Vial (ALE297)	GW	
				NaOH (ALE245)	GW	
				NaOH (ALE245)	GW	
				HNO3 Filtered (ALE204)	GW	
				H2SO4 (ALE244)	GW	
				500ml Plastic (ALE208)	GW	
				250ml Amber Gl. PTFE/PE	GW	
				Vial (ALE297)	GW	
				NaOH (ALE245)	GW	
				NaOH (ALE245)	GW	
				HNO3 Filtered (ALE204)	GW	
				H2SO4 (ALE244)	GW	
				500ml Plastic (ALE208)	GW	
				250ml Amber Gl. PTFE/PE	GW	
				Vial (ALE297)	GW	
				NaOH (ALE245)	GW	
				NaOH (ALE245)	GW	
				HNO3 Filtered (ALE204)	GW	
				H2SO4 (ALE244)	GW	
				500ml Plastic (ALE208)	GW	
				250ml Amber Gl. PTFE/PE	GW	
				Vial (ALE297)	GW	
				NaOH (ALE245)	GW	
				NaOH (ALE245)	GW	
				HNO3 Filtered (ALE204)	GW	
				H2SO4 (ALE244)	GW	
				500ml Plastic (ALE208)	GW	
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				H2SO4 (ALE244)	GW	
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				500ml Plastic (ALE208)	GW	
				250ml Amber Gl. PTFE/PE	GW	
				Vial (ALE297)	GW	
				NaOH (ALE245)	GW	
				NaOH (ALE245)	GW	
				HNO3 Filtered (ALE204)	GW	</

19817700	WS005	EW	0.00 - 0.00	Vial (ALE297)	GW		X
				NaOH (ALE245)	GW		
				HNO3 Filtered (ALE204)	GW		
				H2SO4 (ALE244)	GW		
				500ml Plastic (ALE208)	GW		
				250ml Amber Gl. PTFE/PE	GW		
19817653	WS003	EW	0.00 - 0.00	Vial (ALE297)	GW		X
				NaOH (ALE245)	GW		
				HNO3 Filtered (ALE204)	GW		
				H2SO4 (ALE244)	GW		



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111 Client Reference: 70044279 Report Number: 502893
Location: George Street Reading Order Number: 70044279-008 Superseded Report:

Results Legend			Customer Sample Ref.	BH001	BH002	WS002	WS003	WS005	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	
aq	Aqueous / settled sample.			17/04/2019	17/04/2019	17/04/2019	17/04/2019	17/04/2019	
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			18/04/2019	18/04/2019	18/04/2019	18/04/2019	18/04/2019	
(F)	Trigger breach confirmed			190418-111	190418-111	190418-111	190418-111	190418-111	
1-3+5@	Sample deviation (see appendix)			19817683	19817670	19817639	19817653	19817700	
				EW	EW	EW	EW	EW	
Component	LOD/Units	Method							
Ammoniacal Nitrogen as NH4	<300 µg/l	TM099		<300 #	<300 #	<300 #	<300 #	1450 #	
Arsenic (diss.filt)	<0.5 µg/l	TM152		0.648 #	<0.5 #	<0.5 #	<0.5 #	5.22 #	
Barium (diss.filt)	<0.2 µg/l	TM152		69 #	52.9 #	53 #	51.8 #	95.4 #	
Beryllium (diss.filt)	<0.1 µg/l	TM152		<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	
Boron (diss.filt)	<10 µg/l	TM152		214 #	203 #	179 #	184 #	375 #	
Cadmium (diss.filt)	<0.08 µg/l	TM152		<0.08 #	<0.08 #	<0.08 #	<0.08 #	<0.08 #	
Chromium (diss.filt)	<1 µg/l	TM152		4.51 #	3.72 #	7.68 #	6.34 #	<1 #	
Copper (diss.filt)	<0.3 µg/l	TM152		<0.3 #	<0.3 #	<0.3 #	<0.3 #	<0.3 #	
Lead (diss.filt)	<0.2 µg/l	TM152		<0.2 #	0.294 #	<0.2 #	<0.2 #	<0.2 #	
Nickel (diss.filt)	<0.4 µg/l	TM152		11.8 #	7.98 #	6.97 #	4.31 #	15.6 #	
Selenium (diss.filt)	<1 µg/l	TM152		<1 #	<1 #	<1 #	2.43 #	2.45 #	
Vanadium (diss.filt)	<1 µg/l	TM152		<1 #	<1 #	<1 #	<1 #	<1 #	
Zinc (diss.filt)	<1 µg/l	TM152		7.18 #	14.4 #	4.72 #	1.65 #	2.75 #	
Hardness, Total as CaCO3	<650 µg/l	TM152		409000	401000	405000	384000	555000	
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01 #	0.0163 #	<0.01 #	<0.01 #	<0.01 #	
Sulphate as %SO4	<0.0002 %	TM184		0.00984 #	0.0082 #	0.00792 #	0.00819 #	0.0208 #	
Nitrate as N	<20 µg/l	TM226		5950 #	6050 #	4760 #	4960 #	910 #	
Cyanide, Total	<50 µg/l	TM227		<50 #	<50 #	<50 #	<50 #	<50 #	
Cyanide, Free	<50 µg/l	TM227		<50 #	<50 #	<50 #	<50 #	<50 #	
Cyanide, Complex	<50 µg/l	TM227		<50 #	<50 #	<50 #	<50 #	<50 #	
Chromium, Hexavalent	<30 µg/l	TM241		<30 #	<30 #	<30 #	<30 #	<30 #	
Resorcinol (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	<0.5	
Catechol (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	<0.5	
Phenol (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	<0.5	
Cresols (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	<0.5	
Xylenols (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	<0.5	
1-Naphthol (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	<0.5	
2,3,5-Trimethylphenol (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	<0.5	
2-Isopropylphenol (low level)	<0.5 µg/l	TM255		<0.5	<0.5	<0.5	<0.5	1.77	
pH	<1 pH Units	TM256		7.72 #	7.81 #	8.08 #	8.01 #	7.76 #	



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 502893
Superseded Report:

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.	BH001	WS002	WS005			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)			
aq	Aqueous / settled sample.			17/04/2019	17/04/2019	17/04/2019			
dis.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
+	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			18/04/2019	18/04/2019	18/04/2019			
(F)	Trigger breach confirmed			190418-111	190418-111	190418-111			
1-3+5@	Sample deviation (see appendix)			19817683	19817639	19817700			
				EW	EW	EW			
Component	LOD/Units	Method							
1,2,4-Trichlorobenzene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
1,2-Dichlorobenzene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
1,3-Dichlorobenzene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
1,4-Dichlorobenzene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2,4,5-Trichlorophenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2,4,6-Trichlorophenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2,4-Dichlorophenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2,4-Dimethylphenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2,4-Dinitrotoluene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2,6-Dinitrotoluene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2-Chloronaphthalene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2-Chlorophenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2-Methylnaphthalene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2-Methylphenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2-Nitroaniline (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
2-Nitrophenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
3-Nitroaniline (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
4-Bromophenylphenylether (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
4-Chloro-3-methylphenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
4-Chloroaniline (aq)	<1 µg/l	TM176	<1	<1	<1				
4-Chlorophenylphenylether (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
4-Methylphenol (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
4-Nitroaniline (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
4-Nitrophenol (aq)	<1 µg/l	TM176	<1	<1	<1				
Azobenzene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
Acenaphthylene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
Acenaphthene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	1.3 ♦ #				
Anthracene (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
bis(2-Chloroethyl)ether (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
bis(2-Chloroethoxy)methane (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				
bis(2-Ethylhexyl) phthalate (aq)	<2 µg/l	TM176	<2 ♦ #	<2 #	<2 ♦ #				
Butylbenzyl phthalate (aq)	<1 µg/l	TM176	<1 ♦ #	<1 #	<1 ♦ #				



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street ReadingClient Reference: 70044279
Order Number: 70044279-008Report Number: 502893
Superseded Report:

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.	BH001 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817683 EW	WS002 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817639 EW	WS005 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817700 EW			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
+	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-3+5@	Sample deviation (see appendix)								
Component	LOD/Units	Method							
Benzo(a)anthracene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Benzo(b)fluoranthene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Benzo(k)fluoranthene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Benzo(a)pyrene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Benzo(g,h,i)perylene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Carbazole (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Chrysene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Dibenzofuran (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
n-Dibutyl phthalate (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Diethyl phthalate (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Dibenzo(a,h)anthracene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Dimethyl phthalate (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
n-Dioctyl phthalate (aq)	<5 µg/l	TM176	<5 ◆ #	<5 #	<5 ◆ #				
Fluoranthene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Fluorene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Hexachlorobenzene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Hexachlorobutadiene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Pentachlorophenol (aq)	<1 µg/l	TM176	<1	<1	<1				
Phenol (aq)	<1 µg/l	TM176	<1	<1	<1				
n-Nitroso-n-dipropylamine (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Hexachloroethane (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Nitrobenzene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Naphthalene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Isophorone (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Hexachlorocyclopentadiene (aq)	<1 µg/l	TM176	<1	<1	<1				
Phenanthrene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Indeno(1,2,3-cd)pyrene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				
Pyrene (aq)	<1 µg/l	TM176	<1 ◆ #	<1 #	<1 ◆ #				



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 502893
Superseded Report:

VOC MS (W)

Results Legend			Customer Sample Ref.	BH001 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817683 EW	BH002 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817670 EW	WS002 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817639 EW	WS003 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817653 EW	WS005 0.00 - 0.00 Ground Water (GW) 17/04/2019 18/04/2019 190418-111 19817700 EW
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-3+5@	Sample deviation (see appendix)							
Component	LOD/Units	Method						
Dibromofluoromethane**	%	TM208	109			110		111
Toluene-d8**	%	TM208	101			101		100
4-Bromofluorobenzene**	%	TM208	97.8			97.1		96.5
Dichlorodifluoromethane	<1 µg/l	TM208	<1			<1		<1
Chloromethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Vinyl chloride	<1 µg/l	TM208	<1 #			<1 #		<1 #
Bromomethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Chloroethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Trichlorofluoromethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
1,1-Dichloroethene	<1 µg/l	TM208	<1 #			<1 #		<1 #
Carbon disulphide	<1 µg/l	TM208	<1 #			<1 #		<1 #
Dichloromethane	<3 µg/l	TM208	<3 #			<3 #		<3 #
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208	<1 #	<1 #		<1 #	<1 #	<1 #
trans-1,2-Dichloroethene	<1 µg/l	TM208	<1 #			<1 #		<1 #
1,1-Dichloroethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
cis-1,2-Dichloroethene	<1 µg/l	TM208	<1 #			<1 #		<1 #
2,2-Dichloropropane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Bromochloromethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Chloroform	<1 µg/l	TM208	<1 #			<1 #		<1 #
1,1,1-Trichloroethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
1,1-Dichloropropene	<1 µg/l	TM208	<1 #			<1 #		<1 #
Carbontetrachloride	<1 µg/l	TM208	<1 #			<1 #		<1 #
1,2-Dichloroethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Benzene	<1 µg/l	TM208	<1 #	<1 #		<1 #	<1 #	<1 #
Trichloroethene	<1 µg/l	TM208	<1 #			<1 #		<1 #
1,2-Dichloropropane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Dibromomethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
Bromodichloromethane	<1 µg/l	TM208	<1 #			<1 #		<1 #
cis-1,3-Dichloropropene	<1 µg/l	TM208	<1 #			<1 #		<1 #
Toluene	<1 µg/l	TM208	<1 #	<1 #		<1 #	<1 #	<1 #
trans-1,3-Dichloropropene	<1 µg/l	TM208	<1 #			<1 #		<1 #
1,1,2-Trichloroethane	<1 µg/l	TM208	<1 #			<1 #		<1 #



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 502893
Superseded Report:

VOC MS (W)

Results Legend			Customer Sample Ref.	BH001	BH002	WS002	WS003	WS005	
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-3+5@	Sample deviation (see appendix)								
Component	LOD/Units	Method							
1,3-Dichloropropane	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Tetrachloroethene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Dibromochloromethane	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,2-Dibromoethane	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Chlorobenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,1,1,2-Tetrachloroethane	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Ethylbenzene	<1 µg/l	TM208	<1 #		<1 #	<1 #	<1 #	<1 #	
m,p-Xylene	<1 µg/l	TM208	<1 #		<1 #	<1 #	<1 #	<1 #	
o-Xylene	<1 µg/l	TM208	<1 #		<1 #	<1 #	<1 #	<1 #	
Styrene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Bromoform	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Isopropylbenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,1,2,2-Tetrachloroethane	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,2,3-Trichloropropane	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Bromobenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Propylbenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
2-Chlorotoluene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,3,5-Trimethylbenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
4-Chlorotoluene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
tert-Butylbenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,2,4-Trimethylbenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
sec-Butylbenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
4-iso-Propyltoluene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,3-Dichlorobenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,4-Dichlorobenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
n-Butylbenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,2-Dichlorobenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,2-Dibromo-3-chloropropane	<1 µg/l	TM208	<1 #			<1 #		<1 #	
1,2,4-Trichlorobenzene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
Hexachlorobutadiene	<1 µg/l	TM208	<1 #			<1 #		<1 #	
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208	<1 #		<1 #	<1 #	<1 #	<1 #	
Naphthalene	<1 µg/l	TM208	<1 #			<1 #		<1 #	



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111 **Client Reference:** 70044279 **Report Number:** 502893
Location: George Street Reading **Order Number:** 70044279-008 **Superseded Report:**

Table of Results - Appendix

Method No	Reference	Description
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID
TM176	EPA 8270D Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Determination of SVOCs in Water by GCMS
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM226	In-House Method	Determination of Anions in Waters using Ion Chromatography
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser
TM245	By GC-FID	Determination of GRO by Headspace in waters
TM255		Determination of Low Level Phenols in Waters and Leachates by HPLC
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).



CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 502893
Superseded Report:

Test Completion Dates

Lab Sample No(s)	19817683	19817670	19817639	19817653	19817700
Customer Sample Ref.	BH001	BH002	WS002	WS003	WS005
AGS Ref.	EW	EW	EW	EW	EW
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Ammoniacal Nitrogen	18-Apr-2019	20-Apr-2019	18-Apr-2019	18-Apr-2019	18-Apr-2019
Anions by ion Chromatography	25-Apr-2019	26-Apr-2019	26-Apr-2019	25-Apr-2019	25-Apr-2019
Anions by Kone (w)	24-Apr-2019	24-Apr-2019	24-Apr-2019	24-Apr-2019	24-Apr-2019
Cyanide Comp/Free/Total/Thiocyanate	29-Apr-2019	29-Apr-2019	29-Apr-2019	29-Apr-2019	29-Apr-2019
Dissolved Metals by ICP-MS	29-Apr-2019	29-Apr-2019	29-Apr-2019	29-Apr-2019	29-Apr-2019
EPH CWG (Aliphatic) Aqueous GC (W)	27-Apr-2019	29-Apr-2019	26-Apr-2019	29-Apr-2019	29-Apr-2019
EPH CWG (Aromatic) Aqueous GC (W)	27-Apr-2019	29-Apr-2019	26-Apr-2019	29-Apr-2019	29-Apr-2019
GRO by GC-FID (W)	25-Apr-2019	25-Apr-2019	25-Apr-2019	25-Apr-2019	25-Apr-2019
Hexavalent Chromium (w)	19-Apr-2019	19-Apr-2019	19-Apr-2019	19-Apr-2019	19-Apr-2019
Low Level Phenols by HPLC (W)	26-Apr-2019	26-Apr-2019	26-Apr-2019	26-Apr-2019	26-Apr-2019
Mercury Dissolved	24-Apr-2019	24-Apr-2019	24-Apr-2019	24-Apr-2019	24-Apr-2019
PAH Spec MS - Aqueous (W)	26-Apr-2019	29-Apr-2019	26-Apr-2019	29-Apr-2019	29-Apr-2019
pH Value	26-Apr-2019	26-Apr-2019	29-Apr-2019	26-Apr-2019	26-Apr-2019
SVOC MS (W) - Aqueous	29-Apr-2019		29-Apr-2019		29-Apr-2019
TPH CWG (W)	27-Apr-2019	29-Apr-2019	26-Apr-2019	29-Apr-2019	29-Apr-2019
VOC MS (W)	25-Apr-2019	25-Apr-2019	25-Apr-2019	25-Apr-2019	25-Apr-2019



CERTIFICATE OF ANALYSIS

Validated

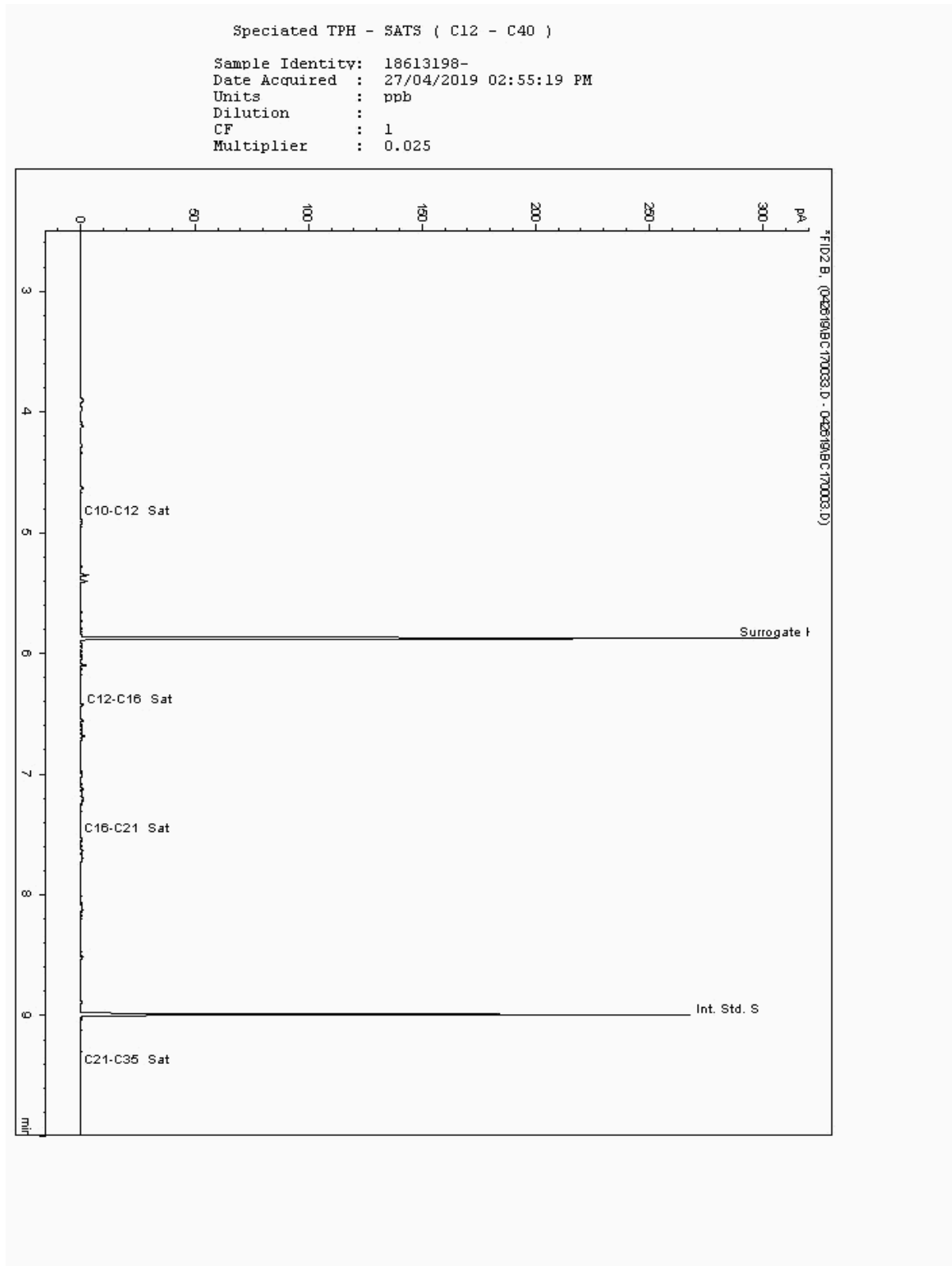
SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 19818308
Sample ID : WS003

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 502893
Superseded Report:

Chromatogram

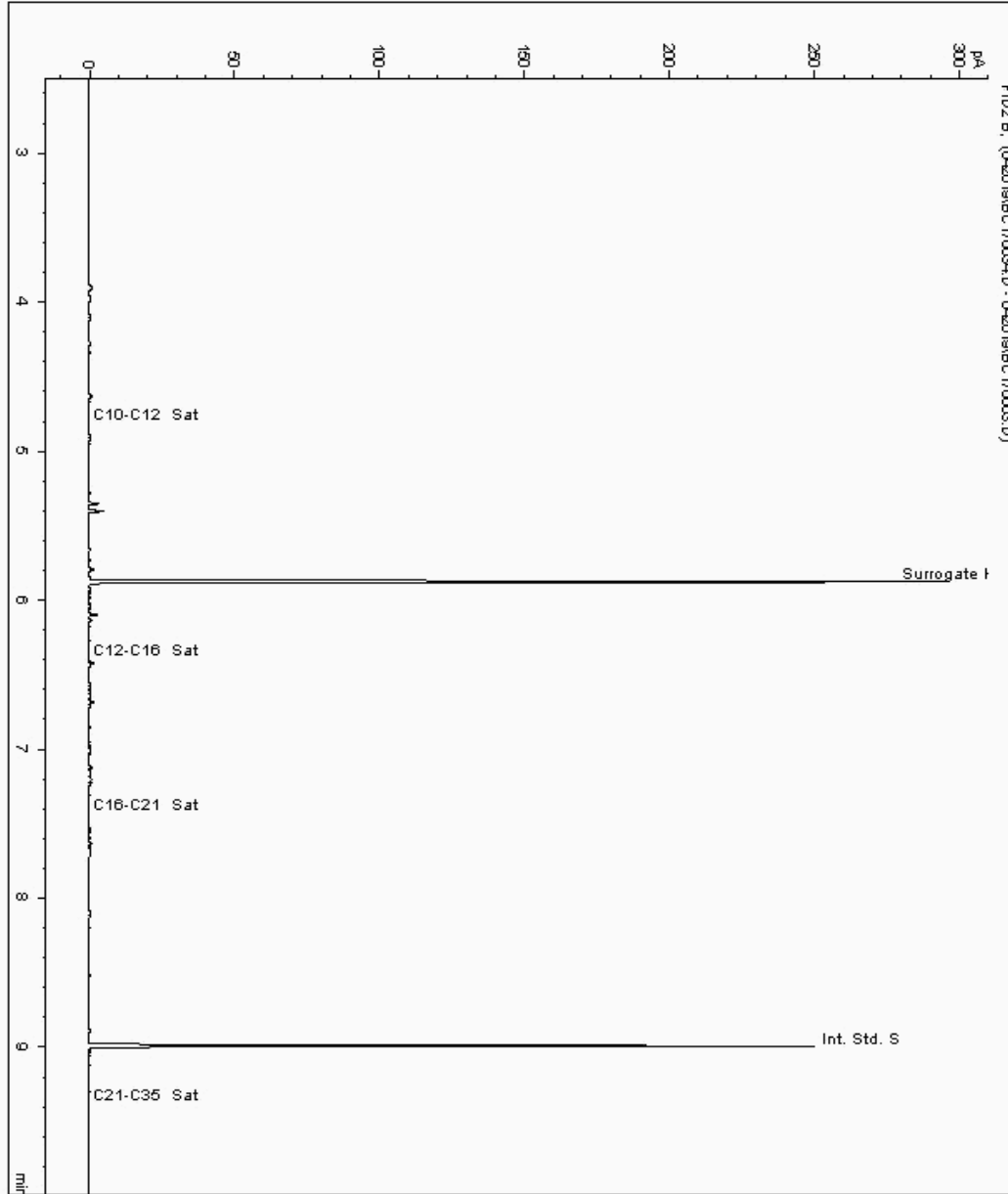
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 19818327
Sample ID : BH002

Depth : 0.00 - 0.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18613215-
Date Acquired : 27/04/2019 03:19:33 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 502893
Superseded Report:

Chromatogram

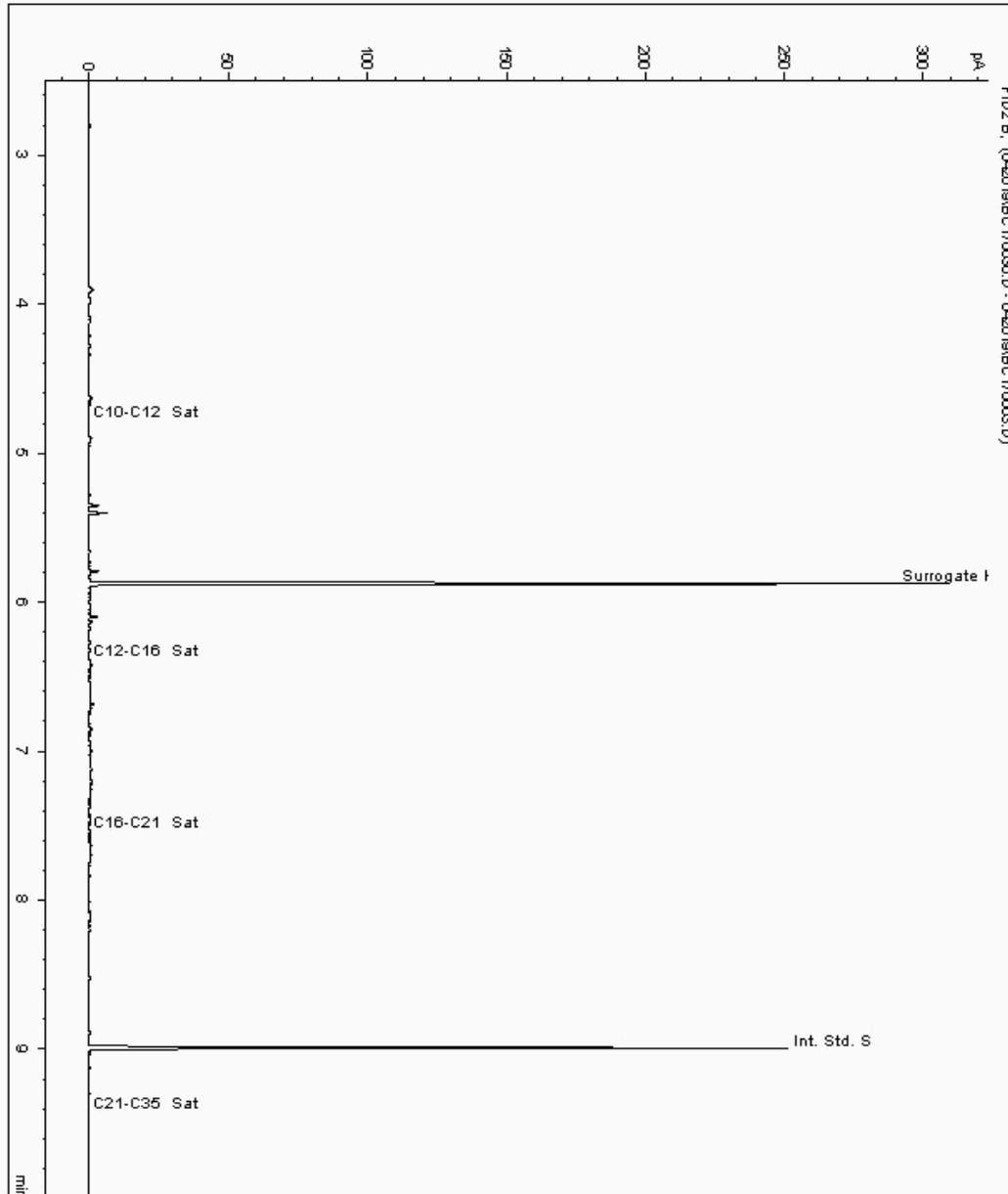
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 19818357
Sample ID : WS005

Depth : 0.00 - 0.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18613254-
Date Acquired : 27/04/2019 01:42:32 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.030





CERTIFICATE OF ANALYSIS

Validated

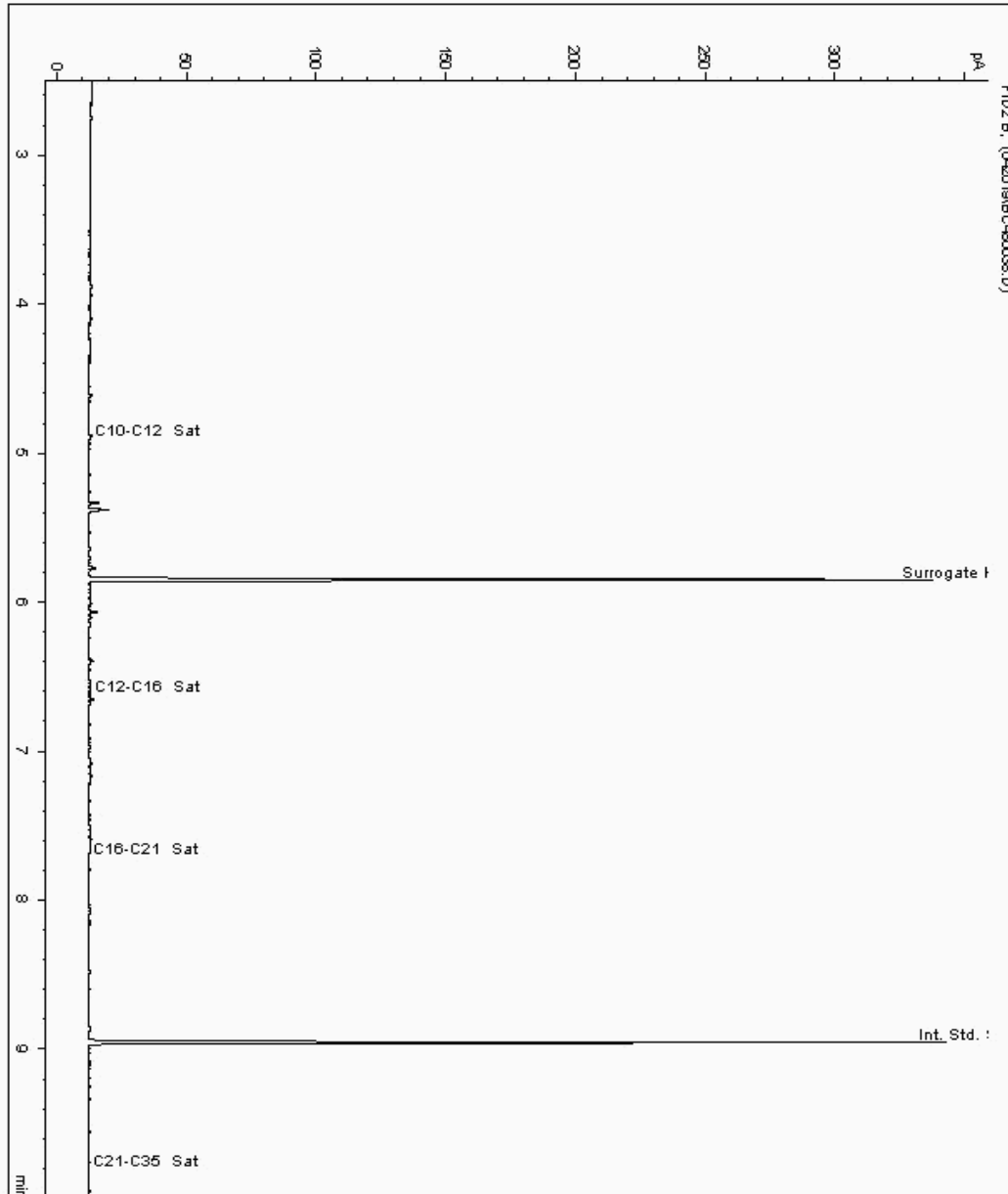
SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) Sample No : 19818382 Depth : 0.00 - 0.00
Sample ID : BH001

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18613235-
Date Acquired : 27/04/2019 03:58:24 PM
Units : ppb
Dilution : SE BH001[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





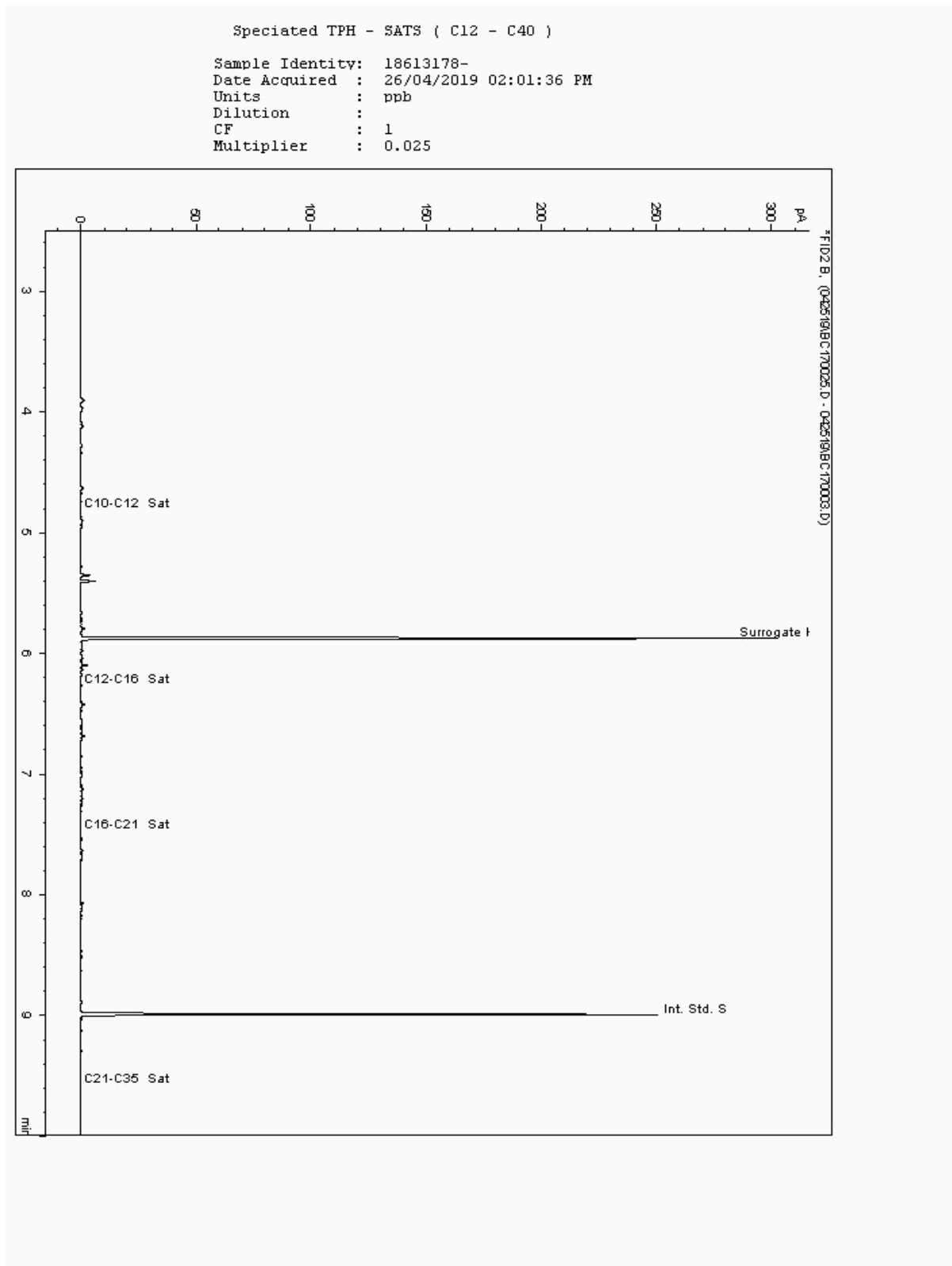
CERTIFICATE OF ANALYSIS

Validated

SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aliphatic) Aqueous GC (W) Sample No : 19818420 Depth : 0.00 - 0.00
Sample ID : WS002





CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

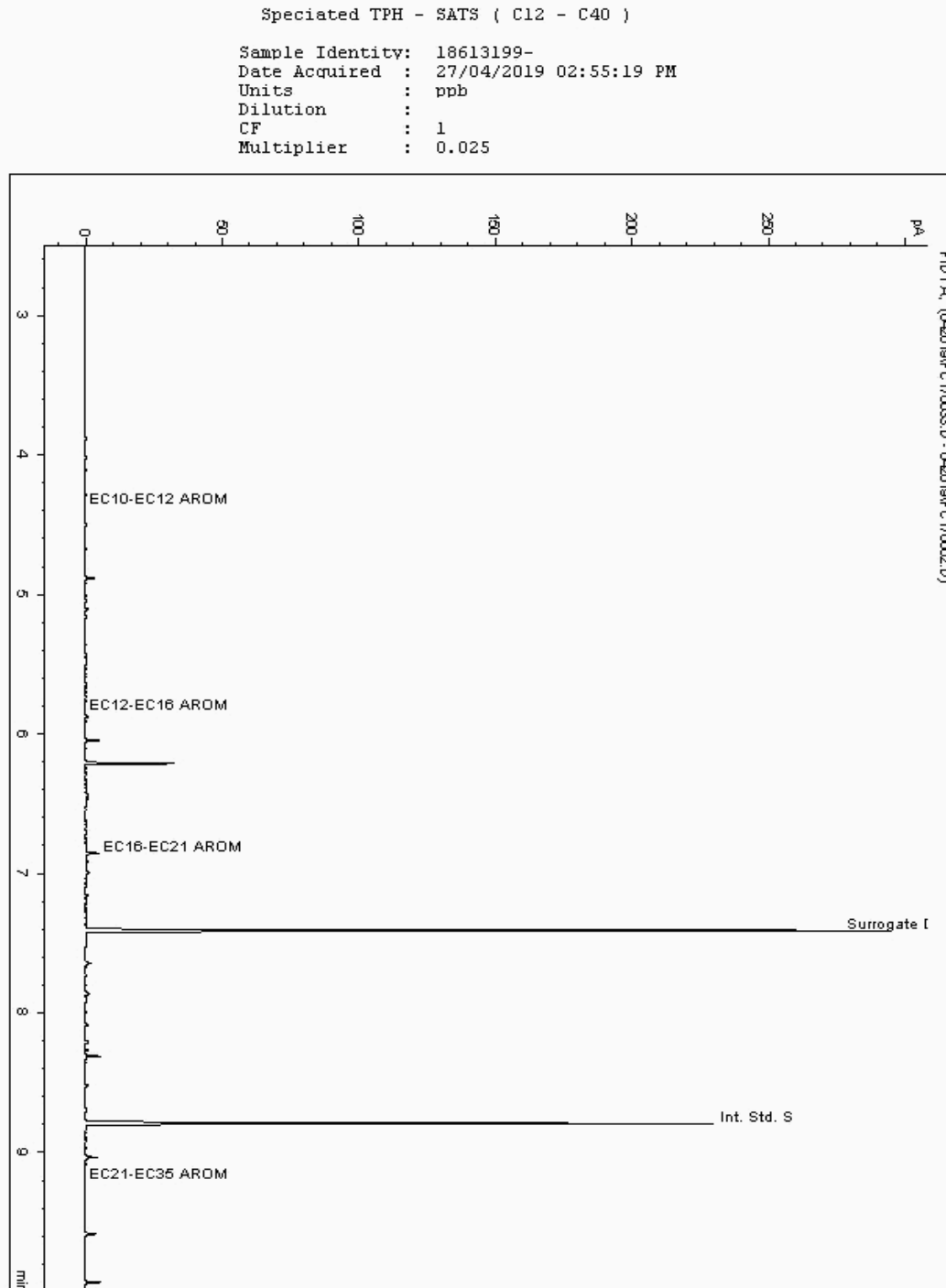
Report Number: 502893
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 19818308
Sample ID : WS003

Depth : 0.00 - 0.00





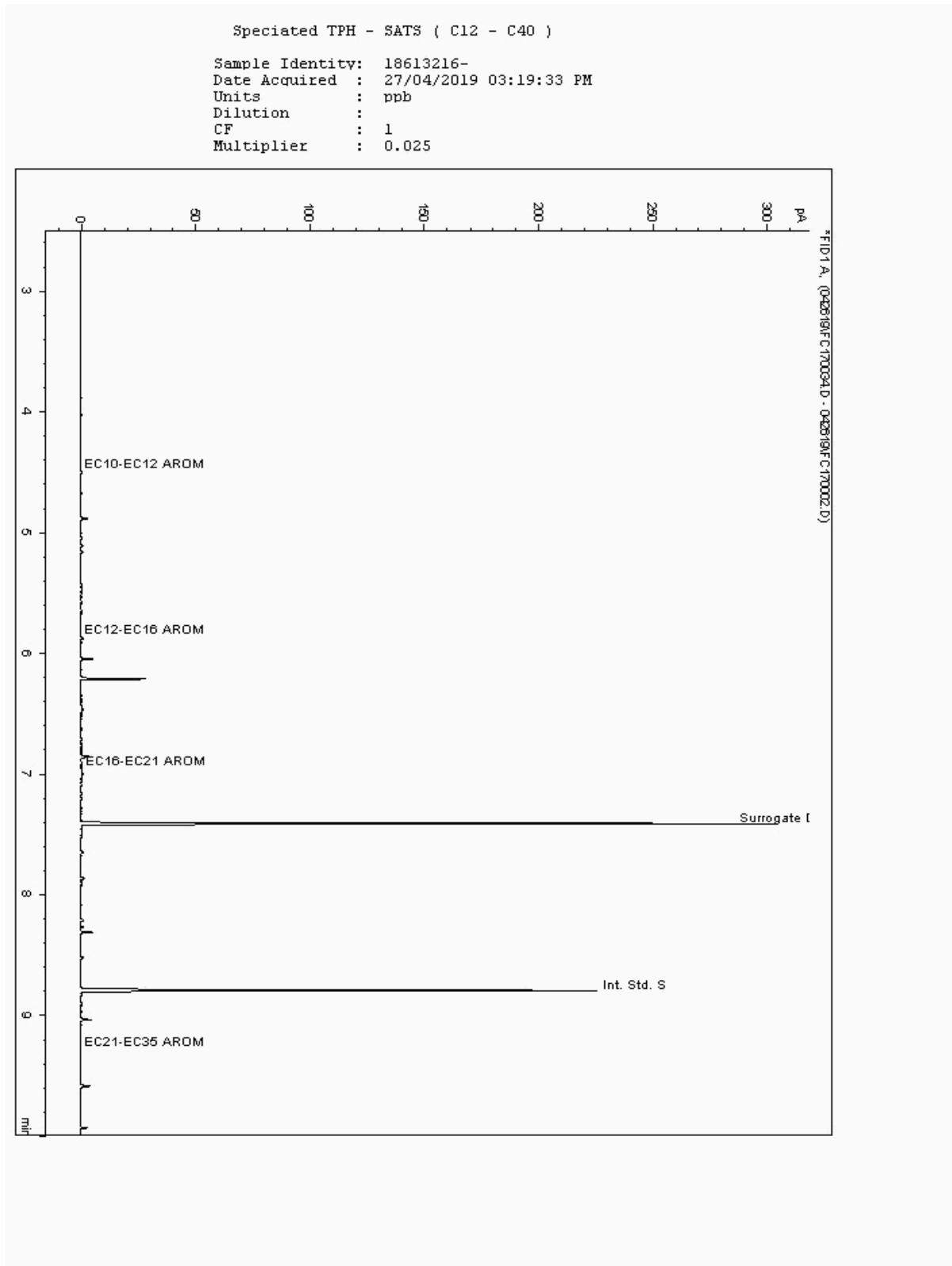
CERTIFICATE OF ANALYSIS

Validated

SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) Sample No : 19818327 Depth : 0.00 - 0.00
Sample ID : BH002





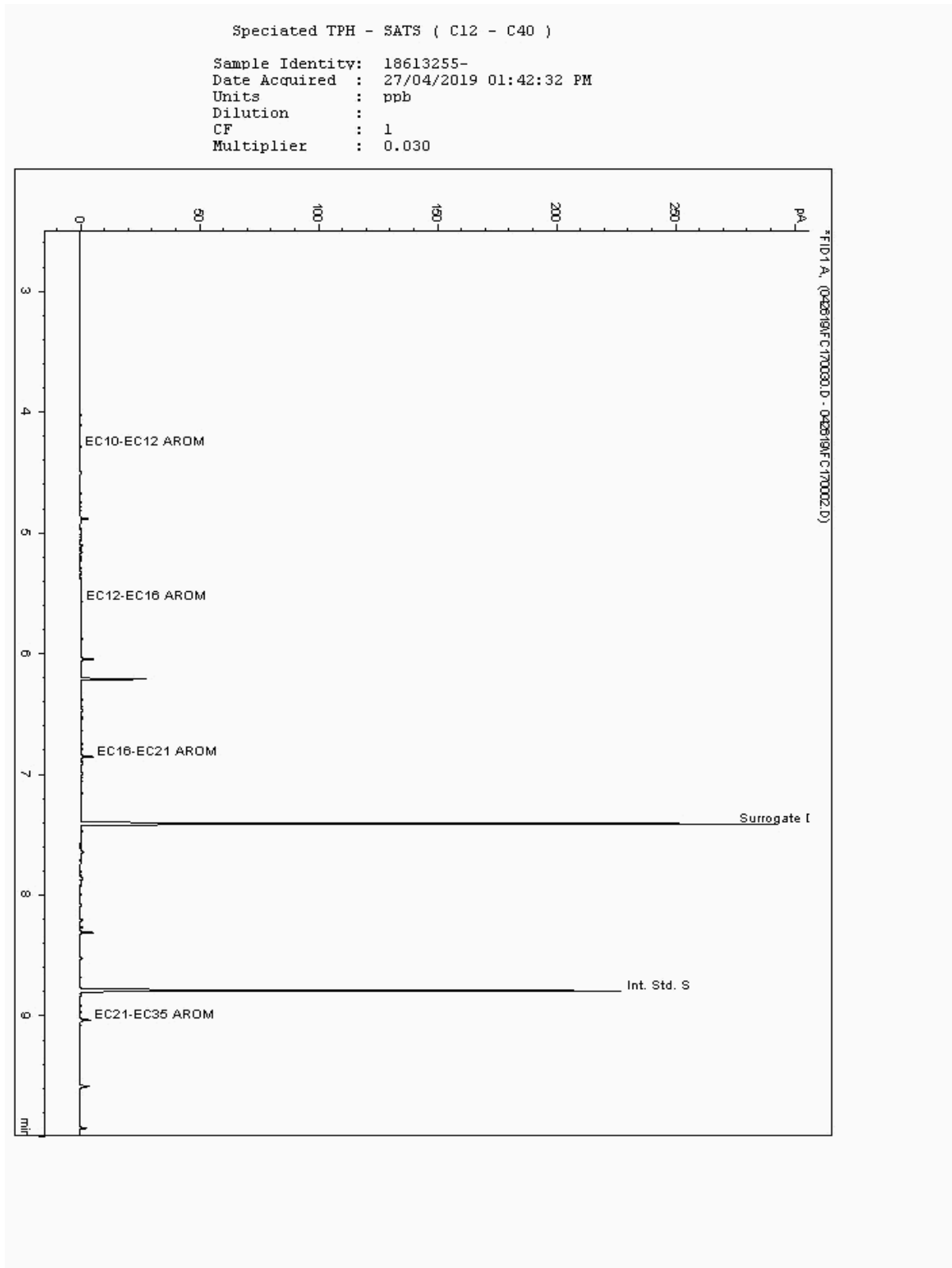
CERTIFICATE OF ANALYSIS

Validated

SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) Sample No : 19818357 Depth : 0.00 - 0.00
Sample ID : WS005





CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 502893
Superseded Report:

Chromatogram

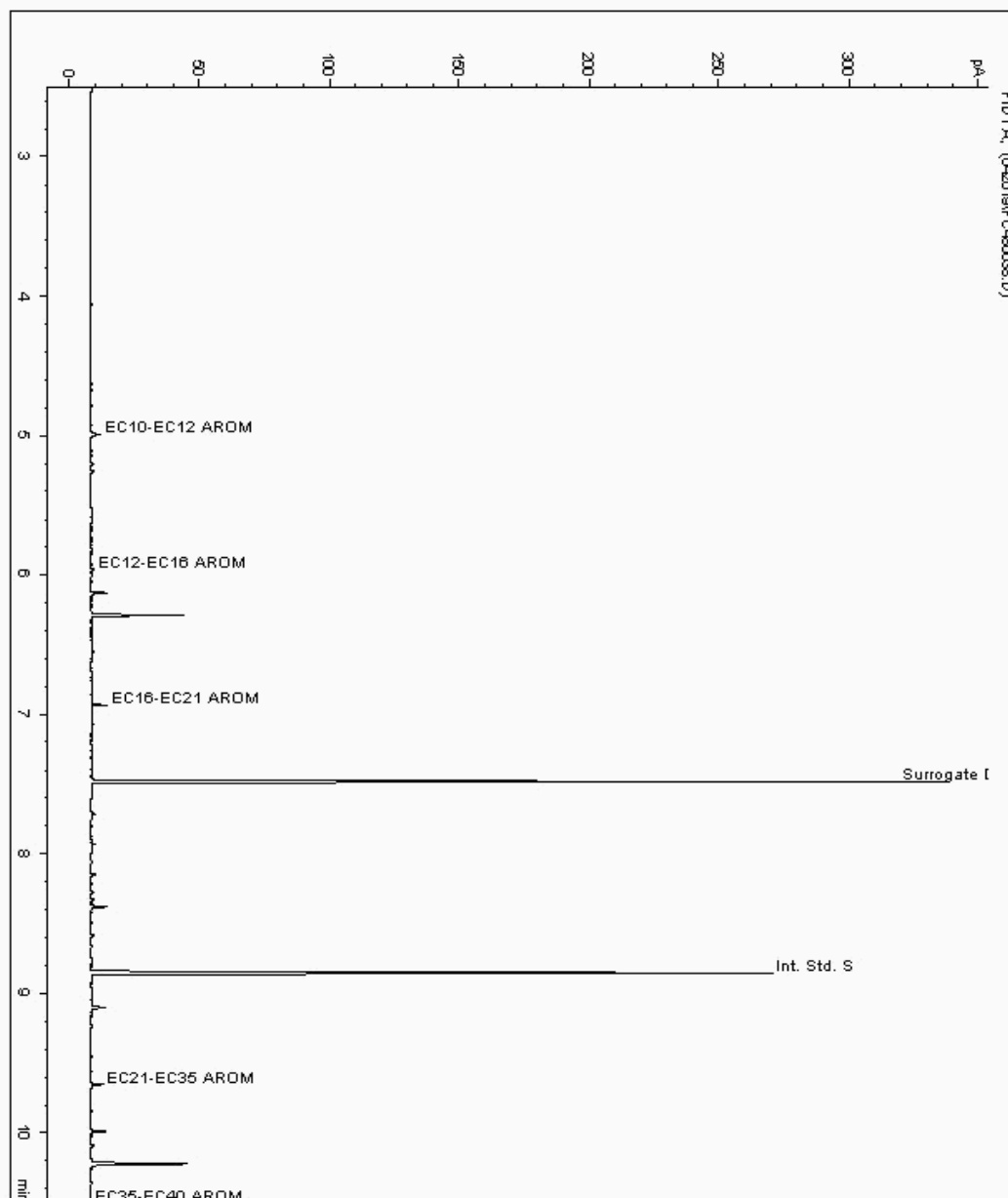
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 19818382
Sample ID : BH001

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 18613236-
Date Acquired : 27/04/2019 03:58:25 PM
Units : ppb
Dilution : SE BH001[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG: 190418-111
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

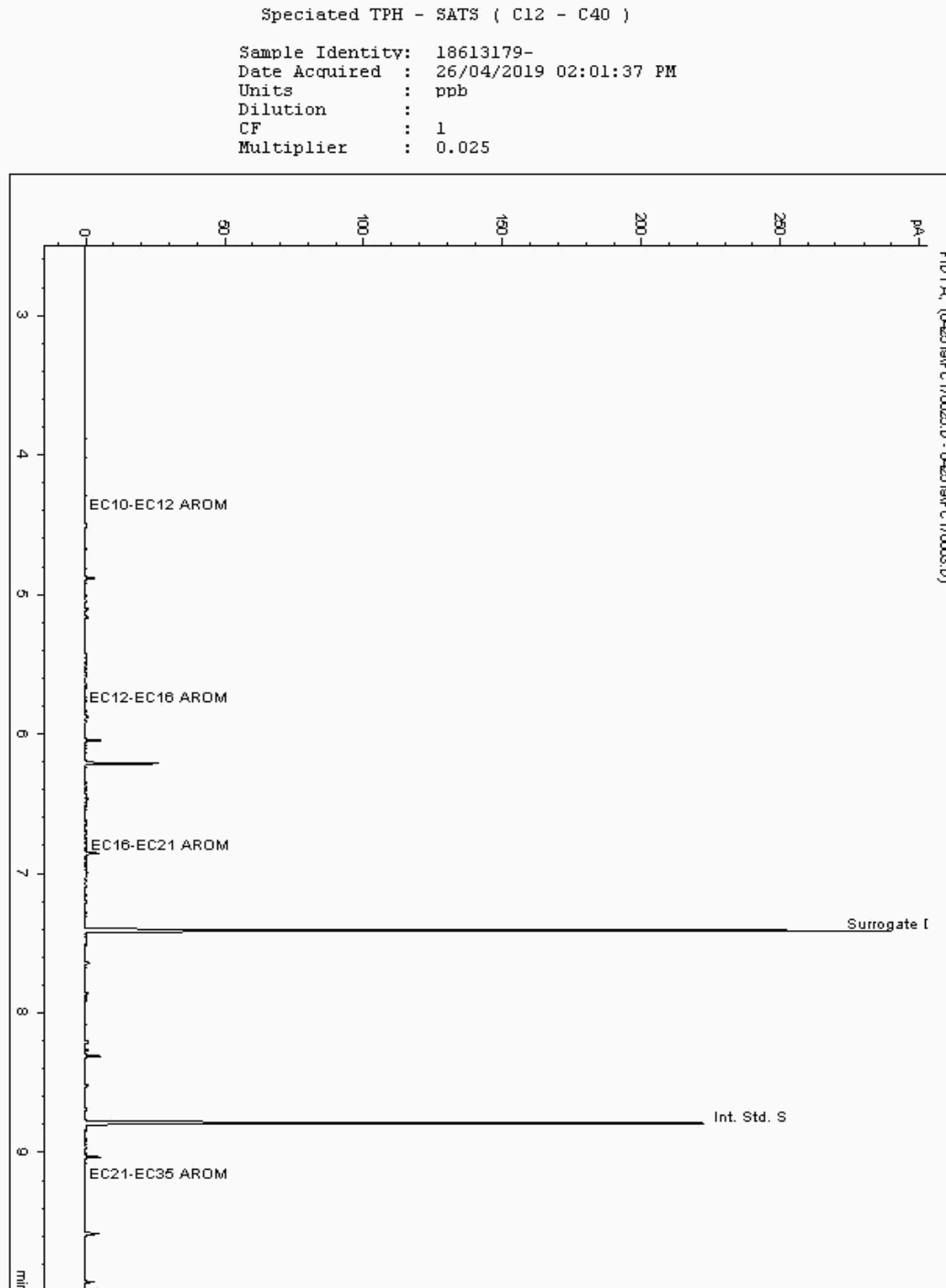
Report Number: 502893
Superseded Report:

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 19818420
Sample ID : WS002

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

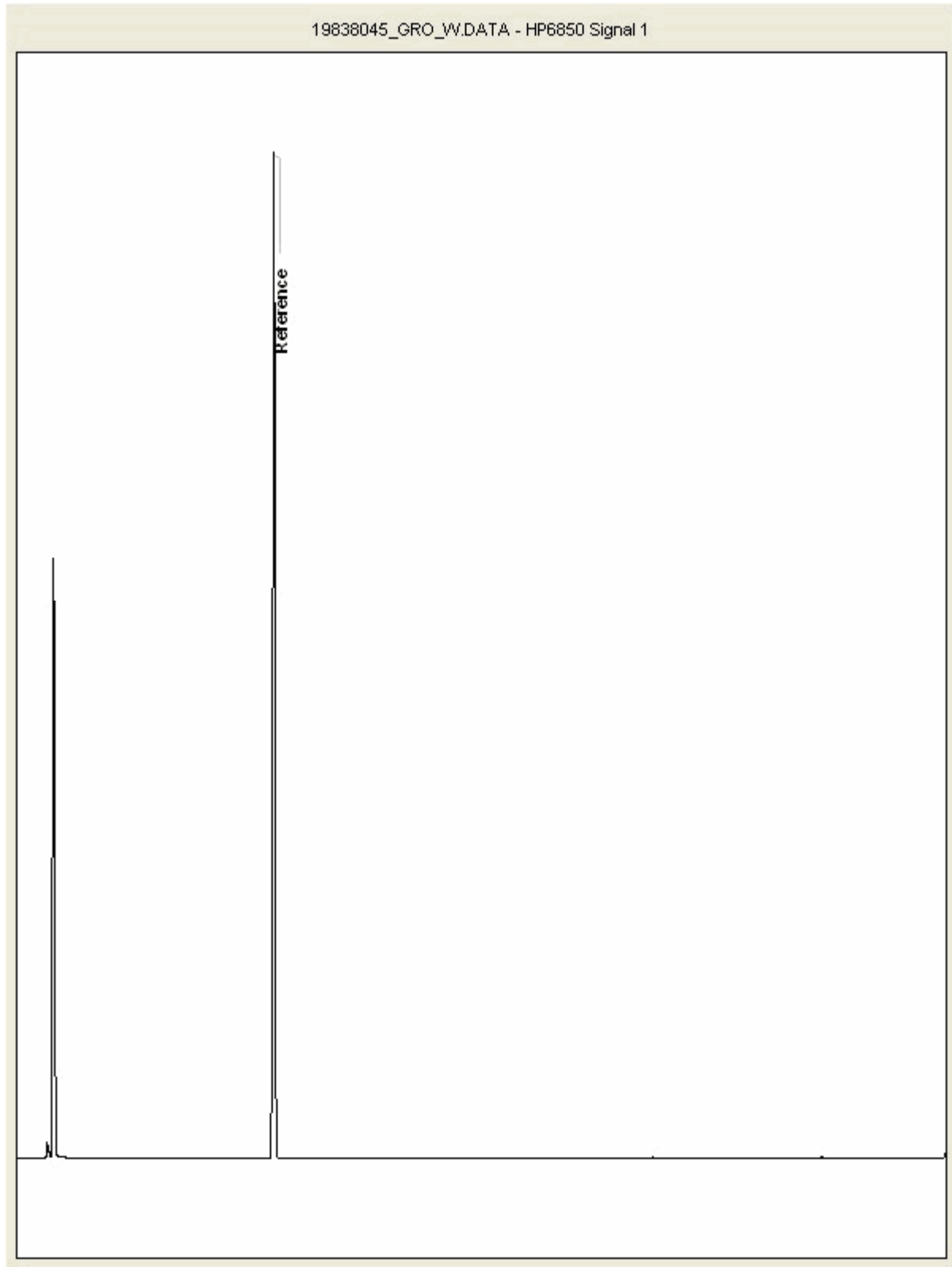
SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 19838045
Sample ID : BH001

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

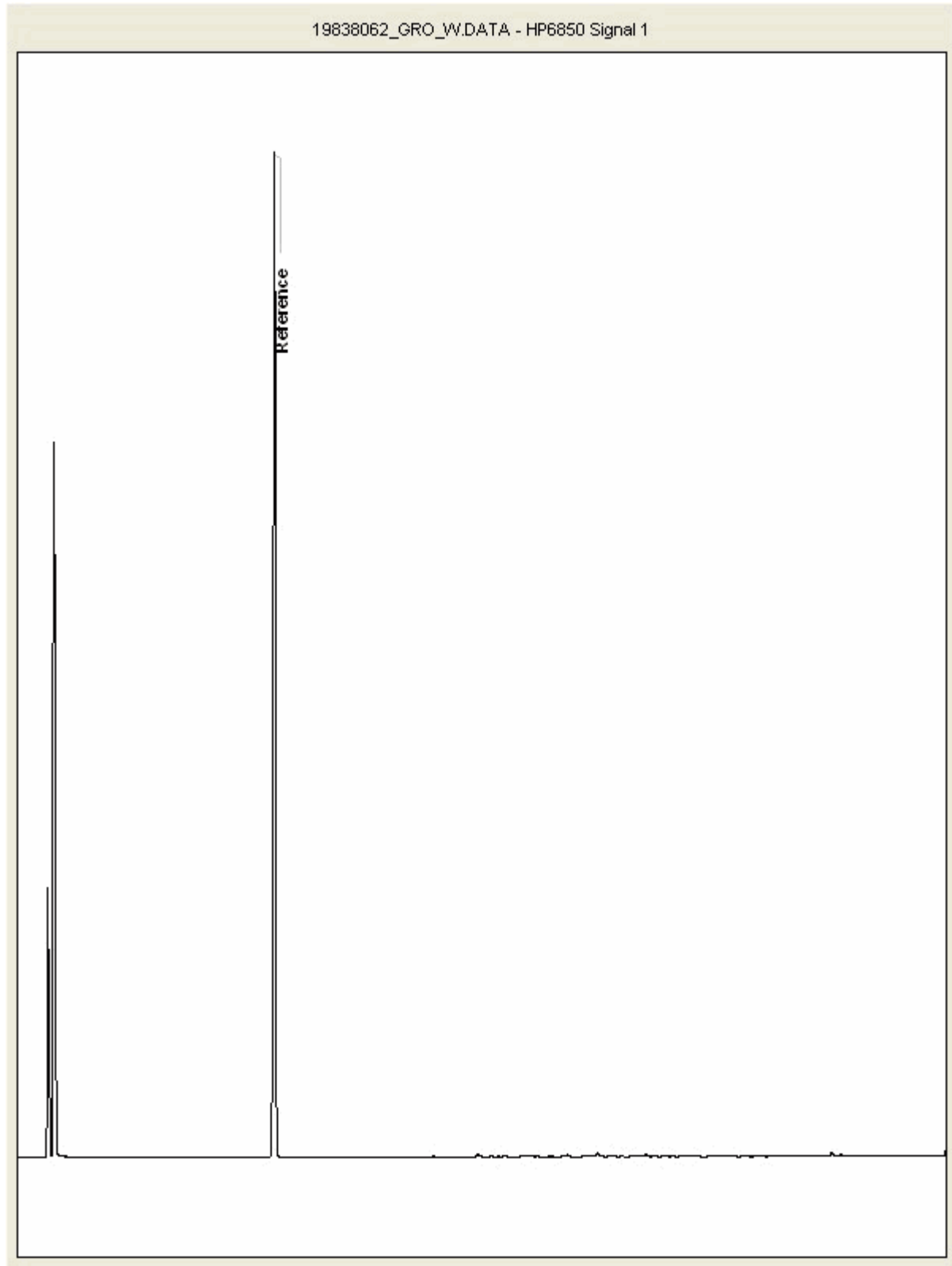
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Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 19838062
Sample ID : WS005

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

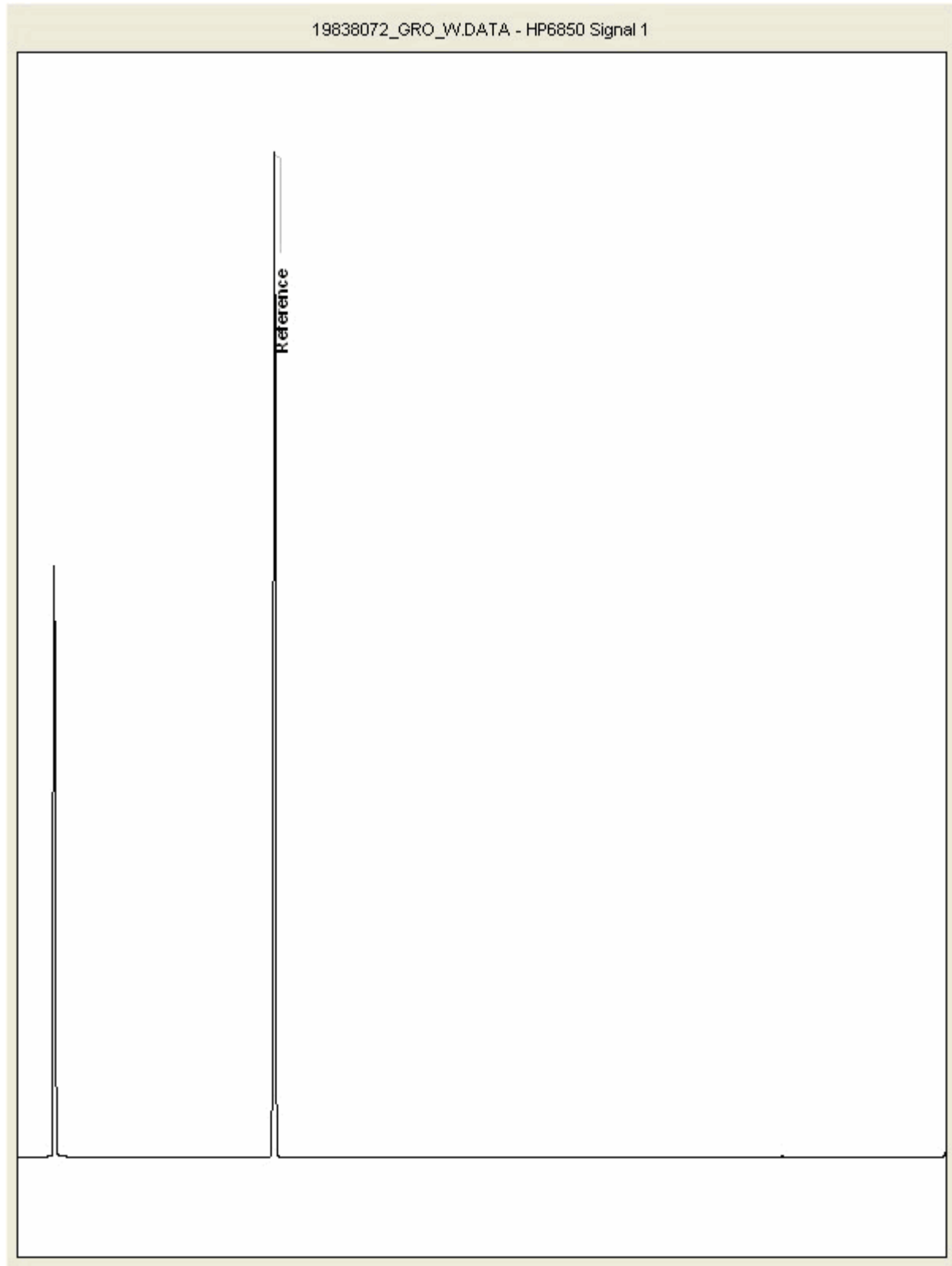
SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 19838072
Sample ID : WS003

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

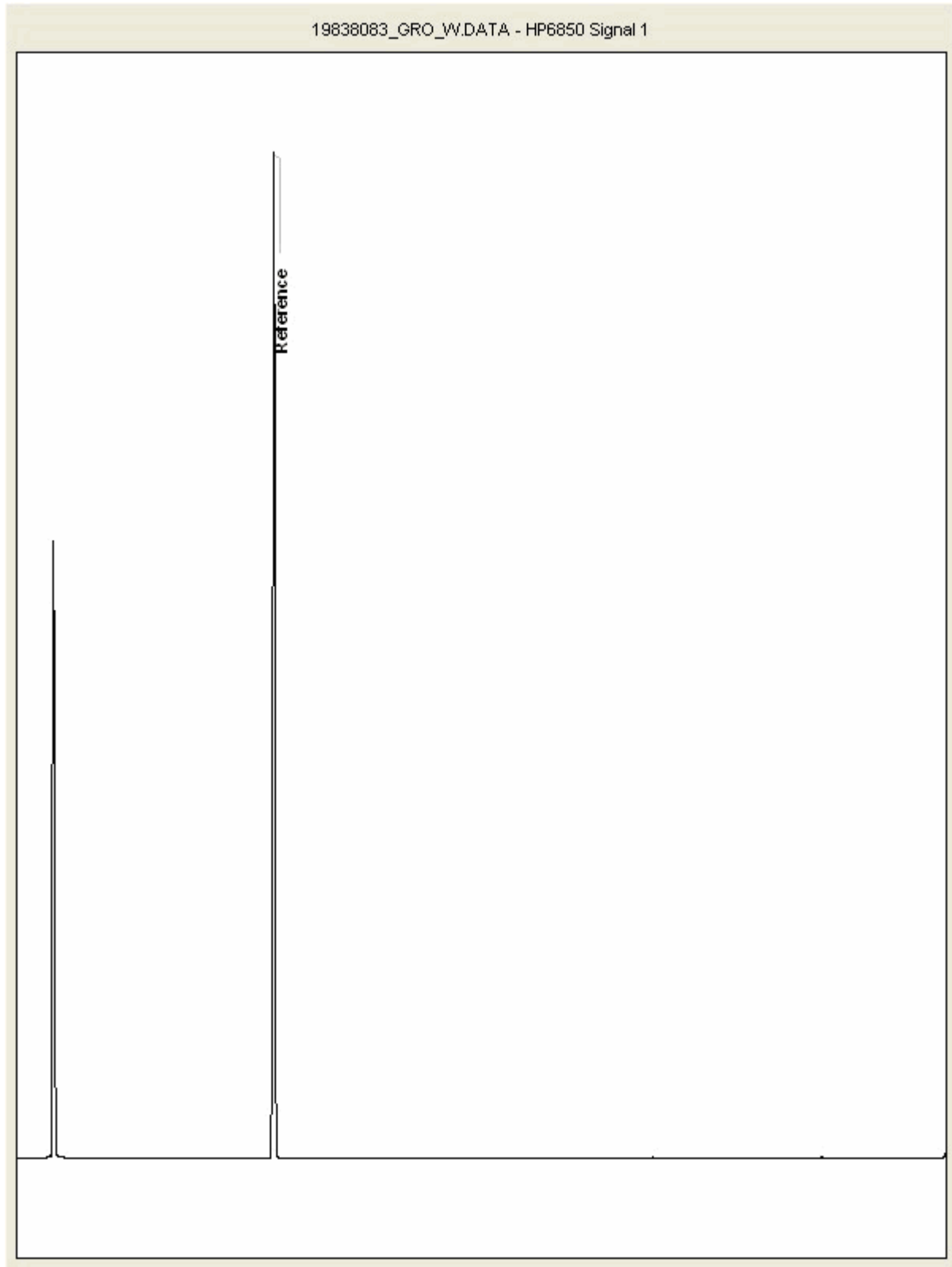
SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 19838083
Sample ID : WS002

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

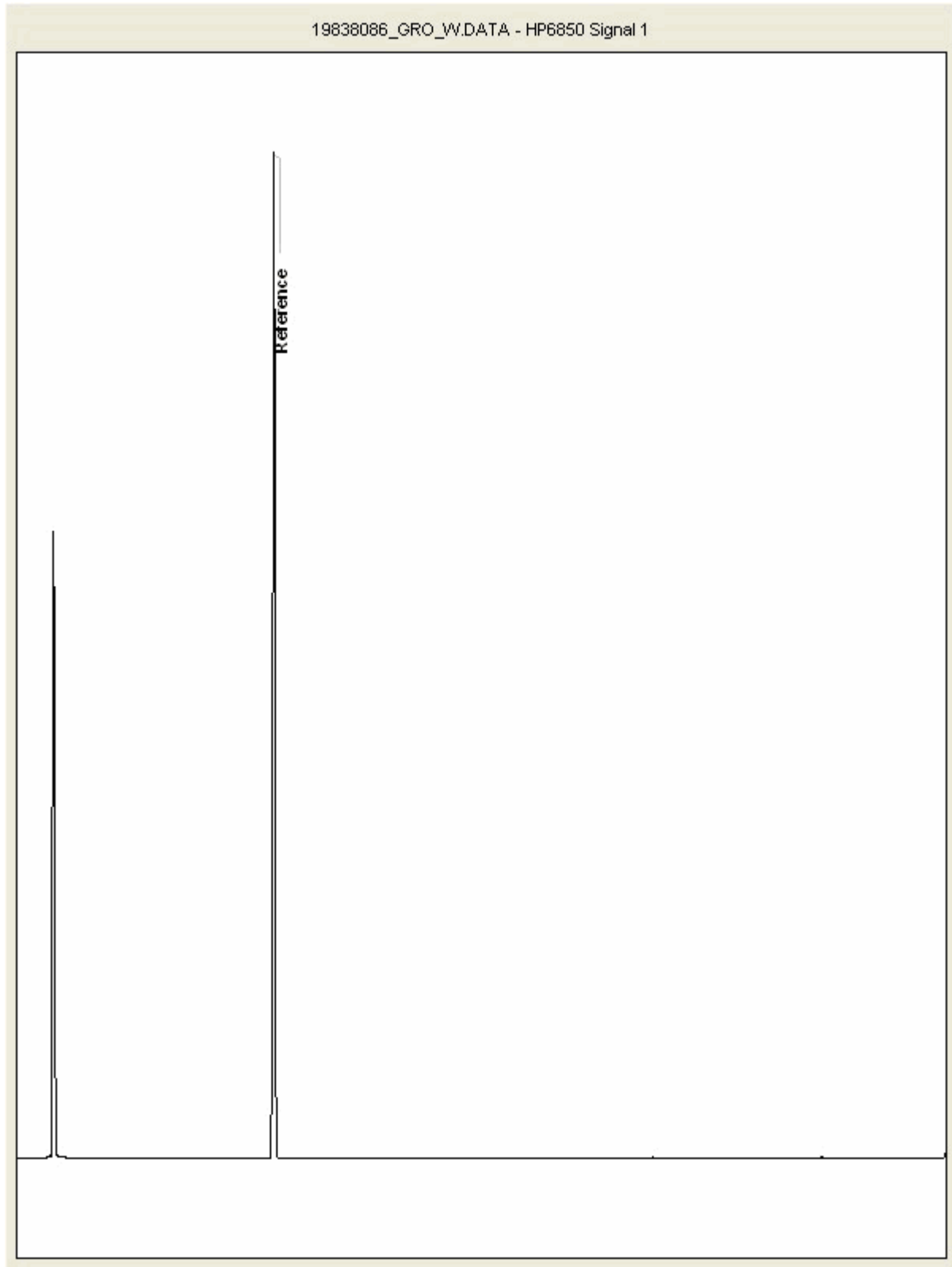
SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 19838086
Sample ID : BH002

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

SDG:	190418-111	Client Reference:	70044279	Report Number:	502893
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

General

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
§	Sampled on date not provided
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



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WSP PB BBC
3rd Floor, Kings Orchard,
1 Queen Street
Bristol
Gloucestershire
BS2 0HQ

Attention: Emma Waite

CERTIFICATE OF ANALYSIS

Date of report Generation:	18 June 2019
Customer:	WSP PB BBC
Sample Delivery Group (SDG):	190608-7
Your Reference:	70044279
Location:	George Street Reading
Report No:	510675

This report has been revised and directly supersedes 510548 in its entirety.

We received 6 samples on Saturday June 08, 2019 and 6 of these samples were scheduled for analysis which was completed on Tuesday June 18, 2019. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
20105266	BH001	EW	0.00 - 0.00	07/06/2019
20105257	BH002	EW	0.00 - 0.00	07/06/2019
20105284	DUPLICATE	EW	0.00 - 0.00	07/06/2019
20105239	WS002	EW	0.00 - 0.00	07/06/2019
20105248	WS003	EW	0.00 - 0.00	07/06/2019
20105275	WS005	EW	0.00 - 0.00	07/06/2019

Maximum Sample/Coolbox Temperature (°C) : 11.6

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7 Client Reference: 70044279 Report Number: 510675
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 510548

Results Legend

X Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container										Sample Type
				500ml Plastic (ALE208)	0.5 glass bottle (ALE227)	Vial (ALE297)	NaOH (ALE245)	HNO3 Filtered (ALE204)	H2SO4 (ALE244)	500ml Plastic (ALE208)	0.5 glass bottle (ALE227)	Vial (ALE297)	NaOH (ALE245)	
20105239	WS002	EW	0.00 - 0.00	GW										GW
20105284	DUPPLICATE	EW	0.00 - 0.00	GW										GW
20105257	BH002	EW	0.00 - 0.00	GW										GW
20105266	BH001	EW	0.00 - 0.00	GW										GW
Ammoniacal Nitrogen	All	NDPs: 0 Tests: 6												
Anions by ion Chromatography	All	NDPs: 0 Tests: 6												
Anions by Kone (w)	All	NDPs: 0 Tests: 6												
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 6												
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 6												
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 6												
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 6												
GRO by GC-FID (W)	All	NDPs: 0 Tests: 6												
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 6												
Low Level Phenols by HPLC (W)	All	NDPs: 0 Tests: 5												
Mercury Dissolved	All	NDPs: 0 Tests: 6												
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 6												
pH Value	All	NDPs: 0 Tests: 6												
SVOC MS (W) - Aqueous	All	NDPs: 0 Tests: 5												
TPH CWG (W)	All	NDPs: 0 Tests: 6												



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7 Client Reference: 70044279 Report Number: 510675
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 510548

Results Legend



Test



No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

VOC MS (W)

Lab Sample No(s)

Customer Sample Reference

AGS Reference

Depth (m)

Container

Sample Type

All

NDPs: 0
Tests: 6

X

X

X

20105275	WS005	EW	0.00 - 0.00	Vial (ALE297)	GW	X	
				NaOH (ALE245)	GW		
				HNO3 Filtered (ALE204)	GW		
				H2SO4 (ALE244)	GW		
				500ml Plastic (ALE208)	GW		
				0.5l glass bottle (ALE227)	GW		
20105248	WS003	EW	0.00 - 0.00	Vial (ALE297)	GW	X	
				NaOH (ALE245)	GW		
				HNO3 Filtered (ALE204)	GW		
				H2SO4 (ALE244)	GW		
				500ml Plastic (ALE208)	GW		
				0.5l glass bottle (ALE227)	GW		
20105239	WS002	EW	0.00 - 0.00	Vial (ALE297)	GW	X	
				NaOH (ALE245)	GW		
				HNO3 Filtered (ALE204)	GW		
				H2SO4 (ALE244)	GW		



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7 Client Reference: 70044279 Report Number: 510675
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 510548

Results Legend			Customer Sample Ref.	BH001	BH002	DUPLICATE	WS002	WS003	WS005
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
Subcontracted - refer to subcontractor report for accreditation status.									
** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F) Trigger breach confirmed									
1-3+5@ Sample deviation (see appendix)									
Component	LOD/Units	Method							
Ammoniacal Nitrogen as N	<200 µg/l	TM099		257	<200	<200	<200	<200	1990
			#	#	#	#	#	#	#
Ammoniacal Nitrogen as NH4 (BRE)	<0.0003 g/l	TM099		0.00033	<0.0003	<0.0003	<0.0003	<0.0003	0.00256
			#	#	#	#	#	#	#
Arsenic (diss.filt)	<0.5 µg/l	TM152		0.634	<0.5	<0.5	<0.5	<0.5	13.4
			#	#	#	#	#	#	#
Barium (diss.filt)	<0.2 µg/l	TM152		118	57.2	52.7	46.5	52.2	149
			#	#	#	#	#	#	#
Beryllium (diss.filt)	<0.1 µg/l	TM152		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			#	#	#	#	#	#	#
Boron (diss.filt)	<10 µg/l	TM152		237	206	181	163	170	472
			#	#	#	#	#	#	#
Cadmium (diss.filt)	<0.08 µg/l	TM152		<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
			#	#	#	#	#	#	#
Chromium (diss.filt)	<1 µg/l	TM152		1.65	5.72	8.76	15.7	7.86	<1
			#	#	#	#	#	#	#
Copper (diss.filt)	<0.3 µg/l	TM152		0.551	0.881	0.8	0.412	<0.3	<0.3
			#	#	#	#	#	#	#
Lead (diss.filt)	<0.2 µg/l	TM152		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
			#	#	#	#	#	#	#
Nickel (diss.filt)	<0.4 µg/l	TM152		8.46	6.78	4.69	3.8	5.08	22.8
			#	#	#	#	#	#	#
Selenium (diss.filt)	<1 µg/l	TM152		<1	<1	1.1	1.29	1.13	1.13
			#	#	#	#	#	#	#
Vanadium (diss.filt)	<1 µg/l	TM152		<1	<1	<1	<1	<1	<1
			#	#	#	#	#	#	#
Zinc (diss.filt)	<1 µg/l	TM152		4.64	3.72	5.6	2.65	3.15	9.81
			#	#	#	#	#	#	#
Hardness, Total as CaCO3	<650 µg/l	TM152		371000	389000	377000	373000	358000	573000
			#	#	#	#	#	#	#
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
			#	#	#	#	#	#	#
Sulphate as %SO4	<0.0002 %	TM184		0.00869	0.0086	0.00744	0.00685	0.0073	0.0152
			#	#	#	#	#	#	#
Nitrate as N	<20 µg/l	TM226		1500	5140	5290	6240	5300	<20
			#	#	#	#	#	#	#
Cyanide, Total	<50 µg/l	TM227		<50	<50	<50	<50	<50	<50
			#	#	#	#	#	#	#
Cyanide, Free	<50 µg/l	TM227		<50	<50	<50	<50	<50	<50
			#	#	#	#	#	#	#
Cyanide, Complex	<50 µg/l	TM227		<50	<50	<50	<50	<50	<50
			#	#	#	#	#	#	#
Chromium, Hexavalent	<30 µg/l	TM241		<30	<30	<30	<30	<30	<30
			#	#	#	#	#	#	#
Resorcinol (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	4.87
			#	#	#	#	#	#	#
Catechol (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	<0.5
			#	#	#	#	#	#	#
Phenol (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	0.81
			#	#	#	#	#	#	#
Cresols (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	<0.5
			#	#	#	#	#	#	#
Xylenols (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	6.2
			#	#	#	#	#	#	#
1-Naphthol (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	1.86
			#	#	#	#	#	#	#
2,3,5-Trimethylphenol (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	1.69
			#	#	#	#	#	#	#
2-Isopropylphenol (low level)	<0.5 µg/l	TM255		<0.5	<0.5		<0.5	<0.5	7.72
			#	#	#	#	#	#	#
pH	<1 pH Units	TM256		7.43	7.74	7.77	7.54	7.43	7
			#	#	#	#	#	#	#



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7
Location: George Street Reading

Client Reference: 70044279
Order Number: 70044279-008

Report Number: 510675
Superseded Report: 510548

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.	BH001	BH002	WS002	WS003	WS005	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	
aq	Aqueous / settled sample.			07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	
dis.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
+	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			08/06/2019	08/06/2019	08/06/2019	08/06/2019	08/06/2019	
(F)	Trigger breach confirmed			190608-7	190608-7	190608-7	190608-7	190608-7	
1-3+5@	Sample deviation (see appendix)			20105266	20105257	20105239	20105248	20105275	
				EW	EW	EW	EW	EW	
Component	LOD/Units	Method							
1,2,4-Trichlorobenzene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
1,2-Dichlorobenzene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
1,3-Dichlorobenzene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
1,4-Dichlorobenzene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2,4,5-Trichlorophenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2,4,6-Trichlorophenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2,4-Dichlorophenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2,4-Dimethylphenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2,4-Dinitrotoluene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2,6-Dinitrotoluene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2-Chloronaphthalene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2-Chlorophenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2-Methylnaphthalene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2-Methylphenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2-Nitroaniline (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
2-Nitrophenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
3-Nitroaniline (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
4-Bromophenylphenylether (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
4-Chloro-3-methylphenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
4-Chloroaniline (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
4-Chlorophenylphenylether (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
4-Methylphenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
4-Nitroaniline (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
4-Nitrophenol (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
Azobenzene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
Acenaphthylene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
Acenaphthene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	1.14 #	
Anthracene (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
bis(2-Chloroethyl)ether (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
bis(2-Chloroethoxy)methane (aq)	<1 µg/l	TM176		<1 #	<1 #	<1 #	<1 #	<1 #	
bis(2-Ethylhexyl) phthalate (aq)	<2 µg/l	TM176	2.66	<2 #	<2 #	<2 #	15.7 #	3.57 #	
Butylbenzyl phthalate (aq)	<1 µg/l	TM176	<1	<1 #	<1 #	<1 #	<1 #	<1 #	



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7
Location: George Street ReadingClient Reference: 70044279
Order Number: 70044279-008Report Number: 510675
Superseded Report: 510548

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.		BH001	BH002	WS002	WS003	WS005	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.				Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	
aq	Aqueous / settled sample.				07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.									
+	Subcontracted - refer to subcontractor report for accreditation status.				08/06/2019	08/06/2019	08/06/2019	08/06/2019	08/06/2019	
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery				190608-7	190608-7	190608-7	190608-7	190608-7	
(F)	Trigger breach confirmed				20105266	20105257	20105239	20105248	20105275	
1-3+5@	Sample deviation (see appendix)				EW	EW	EW	EW	EW	
Component	LOD/Units	Method								
Benzo(a)anthracene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Benzo(b)fluoranthene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Benzo(k)fluoranthene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Benzo(a)pyrene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Benzo(g,h,i)perylene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Carbazole (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Chrysene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Dibenzofuran (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
n-Dibutyl phthalate (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	1.32 #	
Diethyl phthalate (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Dibenzo(a,h)anthracene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Dimethyl phthalate (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
n-Dioctyl phthalate (aq)	<5 µg/l	TM176			<5 ♦ #	<5 #	<5 #	<5 #	<5 #	
Fluoranthene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Fluorene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	1.14 #	
Hexachlorobenzene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Hexachlorobutadiene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Pentachlorophenol (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Phenol (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
n-Nitroso-n-dipropylamine (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Hexachloroethane (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Nitrobenzene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Naphthalene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	1.03 #	
Isophorone (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Hexachlorocyclopentadiene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Phenanthrene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Indeno(1,2,3-cd)pyrene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	
Pyrene (aq)	<1 µg/l	TM176			<1 ♦ #	<1 #	<1 #	<1 #	<1 #	



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7 Client Reference: 70044279 Report Number: 510675
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 510548

VOC MS (W)

Results Legend			Customer Sample Ref.		BH001	BH002	DUPLICATE	WS002	WS003	WS005
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	BH001	0.00 - 0.00 Ground Water (GW) 07/06/2019 08/06/2019 190608-7 20105266 EW	0.00 - 0.00 Ground Water (GW) 07/06/2019 08/06/2019 190608-7 20105257 EW	0.00 - 0.00 Ground Water (GW) 07/06/2019 08/06/2019 190608-7 20105284 EW	0.00 - 0.00 Ground Water (GW) 07/06/2019 08/06/2019 190608-7 20105239 EW	0.00 - 0.00 Ground Water (GW) 07/06/2019 08/06/2019 190608-7 20105248 EW	0.00 - 0.00 Ground Water (GW) 07/06/2019 08/06/2019 190608-7 20105275 EW
M	Aqueous / settled sample.									
aq	Dissolved / filtered sample.									
diss.filt	Total / unfiltered sample.									
tot.unfilt	Subcontracted - refer to subcontractor report for accreditation status.									
+	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
**	Trigger breach confirmed									
(F)	Sample deviation (see appendix)									
1-3+5@										
Component	LOD/Units	Method								
Dibromofluoromethane**	%	TM208			111	113		109	110	116
Toluene-d8**	%	TM208			97.7	98.7		99.8	98.7	97.7
4-Bromofluorobenzene**	%	TM208			96.6	97.2		97.2	98.4	95.8
Dichlorodifluoromethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Chloromethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Vinyl chloride	<1 µg/l	TM208			<1	<1		<1	<1	<1
Bromomethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Chloroethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Trichlorofluoromethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
1,1-Dichloroethene	<1 µg/l	TM208			<1	<1		<1	<1	<1
Carbon disulphide	<1 µg/l	TM208			<1	<1		<1	<1	<1
Dichloromethane	<3 µg/l	TM208			<3	<3		<3	<3	<3
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208			<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	<1 µg/l	TM208			<1	<1		<1	<1	<1
1,1-Dichloroethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
cis-1,2-Dichloroethene	<1 µg/l	TM208			<1	<1		<1	<1	<1
2,2-Dichloropropane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Bromochloromethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Chloroform	<1 µg/l	TM208			<1	<1		<1	<1	<1
1,1,1-Trichloroethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
1,1-Dichloropropene	<1 µg/l	TM208			<1	<1		<1	<1	<1
Carbontetrachloride	<1 µg/l	TM208			<1	<1		<1	<1	<1
1,2-Dichloroethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Benzene	<1 µg/l	TM208			<1	<1	<1	<1	<1	<1
Trichloroethene	<1 µg/l	TM208			<1	<1		<1	<1	<1
1,2-Dichloropropane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Dibromomethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
Bromodichloromethane	<1 µg/l	TM208			<1	<1		<1	<1	<1
cis-1,3-Dichloropropene	<1 µg/l	TM208			<1	<1		<1	<1	<1
Toluene	<1 µg/l	TM208			<1	<1	<1	<1	<1	<1
trans-1,3-Dichloropropene	<1 µg/l	TM208			<1	<1		<1	<1	<1
1,1,2-Trichloroethane	<1 µg/l	TM208			<1	<1		<1	<1	<1



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7 Client Reference: 70044279 Report Number: 510675
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 510548

VOC MS (W)

Results Legend			Customer Sample Ref.		BH001	BH002	DUPLICATE	WS002	WS003	WS005
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
M	mCERTS accredited.				Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.				07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019	07/06/2019
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.									
+	Subcontracted - refer to subcontractor report for accreditation status.				08/06/2019	08/06/2019	08/06/2019	08/06/2019	08/06/2019	08/06/2019
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery				190608-7	190608-7	190608-7	190608-7	190608-7	190608-7
(F)	Trigger breach confirmed				20105266	20105257	20105284	20105239	20105248	20105275
1-3+5@	Sample deviation (see appendix)				EW	EW	EW	EW	EW	EW
Component	LOD/Units	Method								
1,3-Dichloropropane	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Tetrachloroethene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Dibromochloromethane	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,2-Dibromoethane	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Chlorobenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,1,1,2-Tetrachloroethane	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Ethylbenzene	<1 µg/l	TM208	<1	#	<1	#	<1	<1	<1	<1
m,p-Xylene	<1 µg/l	TM208	<1	#	<1	#	<1	<1	<1	<1
o-Xylene	<1 µg/l	TM208	<1	#	<1	#	<1	<1	<1	<1
Styrene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Bromoform	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Isopropylbenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,1,2,2-Tetrachloroethane	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,2,3-Trichloropropane	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Bromobenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Propylbenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
2-Chlorotoluene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,3,5-Trimethylbenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
4-Chlorotoluene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
tert-Butylbenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,2,4-Trimethylbenzene	<1 µg/l	TM208	3.12	#	<1	#		<1	<1	<1
sec-Butylbenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
4-iso-Propyltoluene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,3-Dichlorobenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,4-Dichlorobenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
n-Butylbenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,2-Dichlorobenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,2-Dibromo-3-chloropropane	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
1,2,4-Trichlorobenzene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
Hexachlorobutadiene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208	<1	#	<1	#	<1	<1	<1	<1
Naphthalene	<1 µg/l	TM208	<1	#	<1	#		<1	<1	<1



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7 **Client Reference:** 70044279 **Report Number:** 510675
Location: George Street Reading **Order Number:** 70044279-008 **Superseded Report:** 510548

Table of Results - Appendix

Method No	Reference	Description
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID
TM176	EPA 8270D Semi-Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Determination of SVOCs in Water by GCMS
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM226	In-House Method	Determination of Anions in Waters using Ion Chromatography
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser
TM245	By GC-FID	Determination of GRO by Headspace in waters
TM255		Determination of Low Level Phenols in Waters and Leachates by HPLC
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Environmental Hawarden (Method codes TM) or ALS Environmental Aberdeen (Method codes S).



CERTIFICATE OF ANALYSIS

Validated

SDG: 190608-7 Client Reference: 70044279 Report Number: 510675
Location: George Street Reading Order Number: 70044279-008 Superseded Report: 510548

Test Completion Dates

Lab Sample No(s)	20105266	20105257	20105284	20105239	20105248	20105275
Customer Sample Ref.	BH001	BH002	DUPLICATE	WS002	WS003	WS005
AGS Ref.	EW	EW	EW	EW	EW	EW
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Ammoniacal Nitrogen	11-Jun-2019	11-Jun-2019	11-Jun-2019	11-Jun-2019	11-Jun-2019	11-Jun-2019
Anions by ion Chromatography	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019
Anions by Kone (w)	10-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019
Cyanide Comp/Free/Total/Thiocyanate	11-Jun-2019	11-Jun-2019	11-Jun-2019	11-Jun-2019	11-Jun-2019	11-Jun-2019
Dissolved Metals by ICP-MS	14-Jun-2019	14-Jun-2019	14-Jun-2019	14-Jun-2019	17-Jun-2019	17-Jun-2019
EPH CWG (Aliphatic) Aqueous GC (W)	13-Jun-2019	13-Jun-2019	12-Jun-2019	13-Jun-2019	13-Jun-2019	12-Jun-2019
EPH CWG (Aromatic) Aqueous GC (W)	13-Jun-2019	13-Jun-2019	12-Jun-2019	13-Jun-2019	13-Jun-2019	12-Jun-2019
GRO by GC-FID (W)	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019
Hexavalent Chromium (w)	12-Jun-2019	12-Jun-2019	12-Jun-2019	12-Jun-2019	12-Jun-2019	08-Jun-2019
Low Level Phenols by HPLC (W)	14-Jun-2019	14-Jun-2019		14-Jun-2019	14-Jun-2019	14-Jun-2019
Mercury Dissolved	11-Jun-2019	11-Jun-2019	11-Jun-2019	13-Jun-2019	13-Jun-2019	11-Jun-2019
PAH Spec MS - Aqueous (W)	12-Jun-2019	12-Jun-2019	11-Jun-2019	12-Jun-2019	12-Jun-2019	11-Jun-2019
pH Value	10-Jun-2019	10-Jun-2019	10-Jun-2019	10-Jun-2019	10-Jun-2019	11-Jun-2019
SVOC MS (W) - Aqueous	18-Jun-2019	14-Jun-2019		14-Jun-2019	14-Jun-2019	14-Jun-2019
TPH CWG (W)	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019
VOC MS (W)	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019	13-Jun-2019



CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

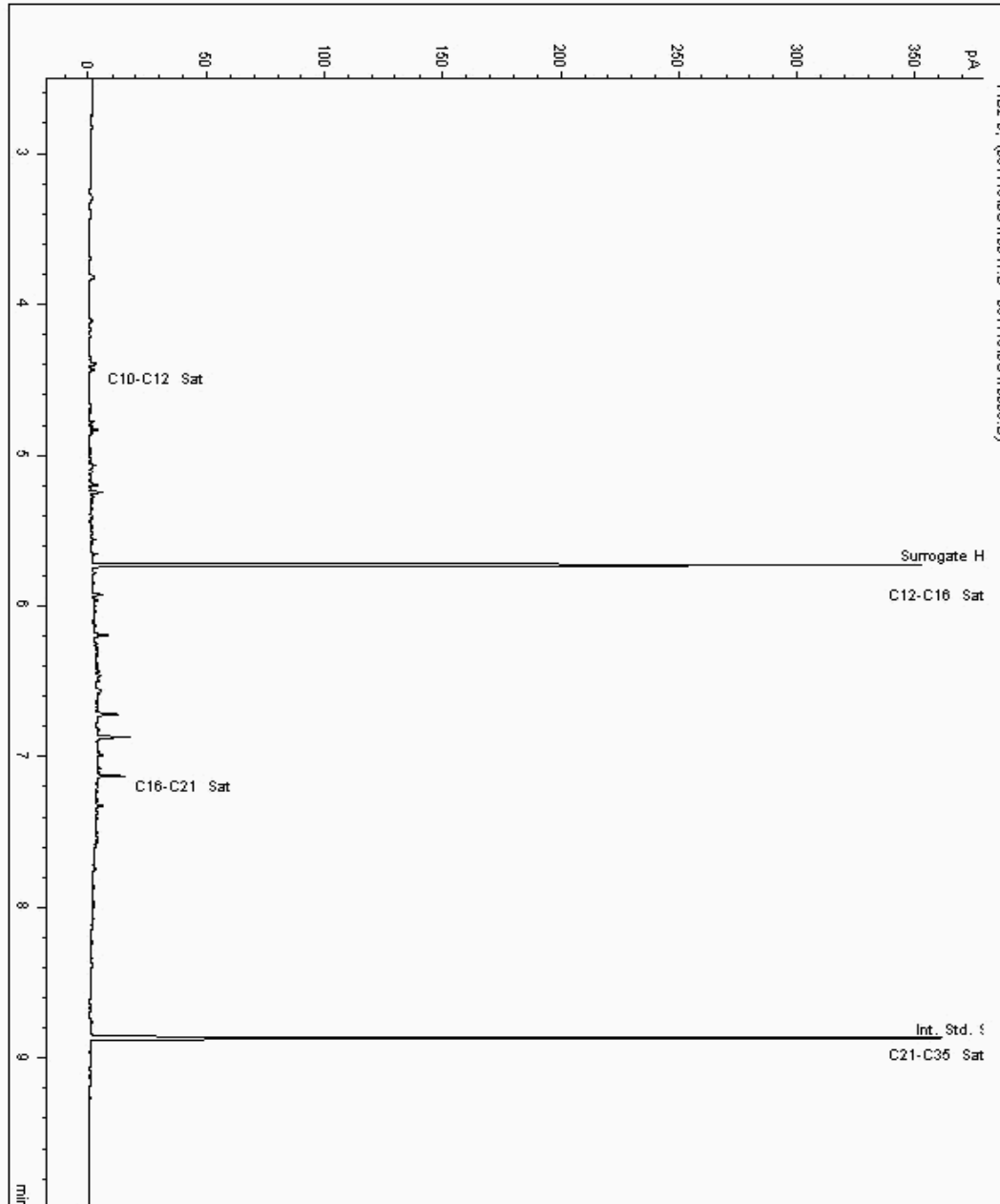
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 20107916
Sample ID : WS005

Depth : 0.00 - 0.00

Speciated TPH - SATS (C12 - C40)

Sample Identity: 18882946-
Date Acquired : 12/06/19 03:38:38 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

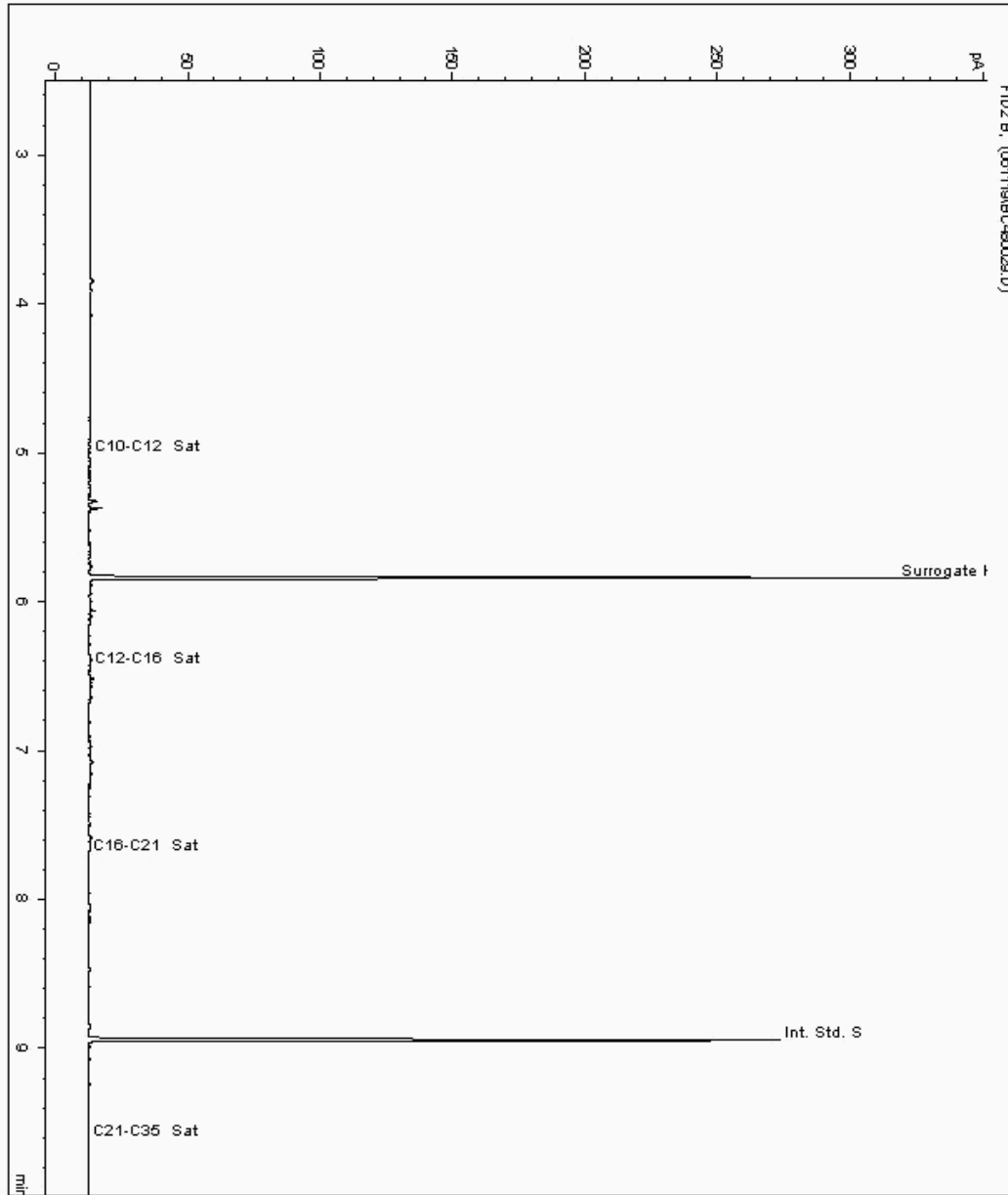
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 20108401
Sample ID : DUPLICATE

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18882962-
Date Acquired : 11/06/2019 21:59:21 PM
Units : ppb
Dilution : SE DUPLICATE[0.00 - 0.00] ->
CF : 1
Multiplier : 0.027





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

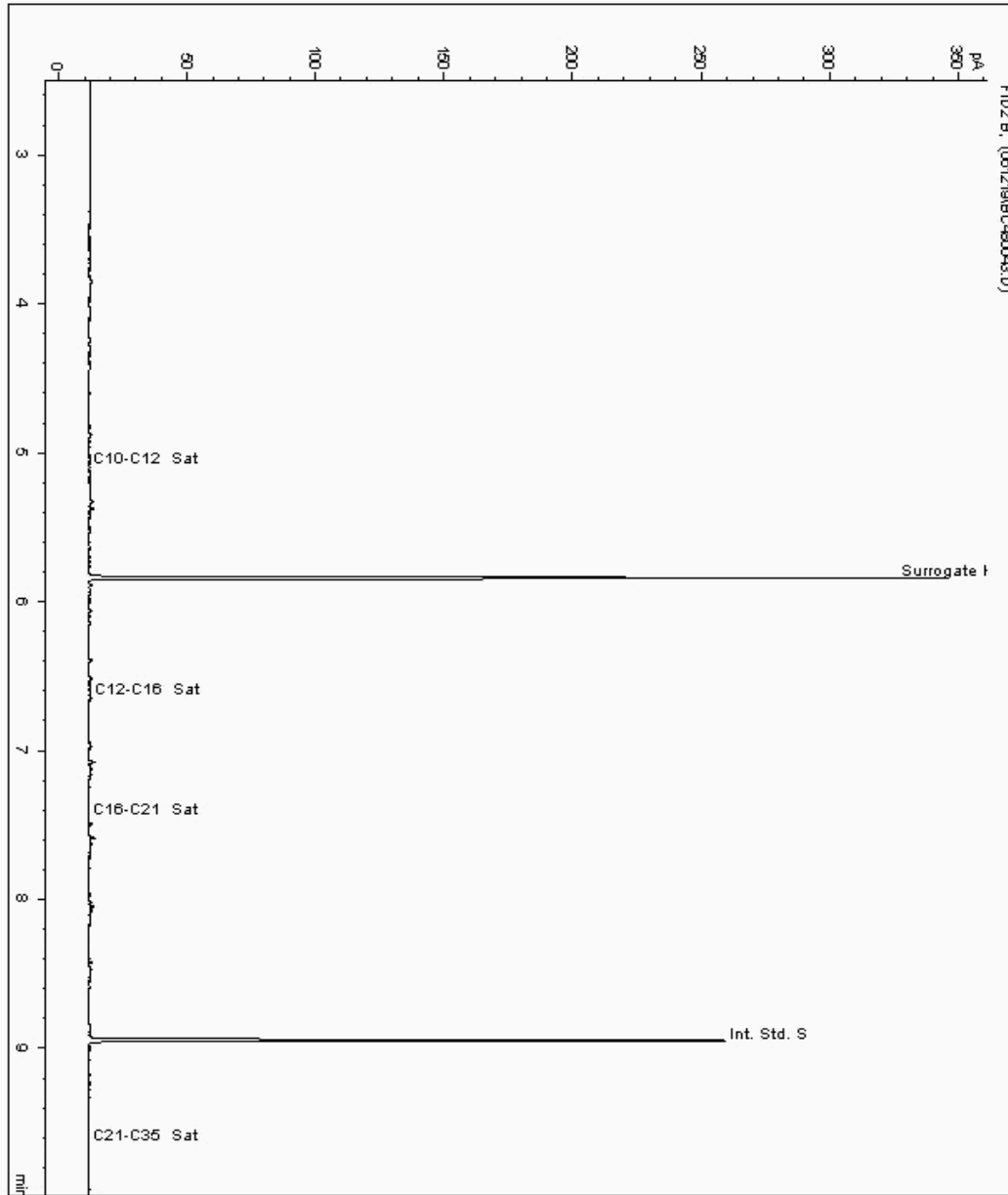
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 20108411
Sample ID : WS002

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18882870-
Date Acquired : 13/06/2019 08:04:59 PM
Units : ppb
Dilution : SE WS002[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

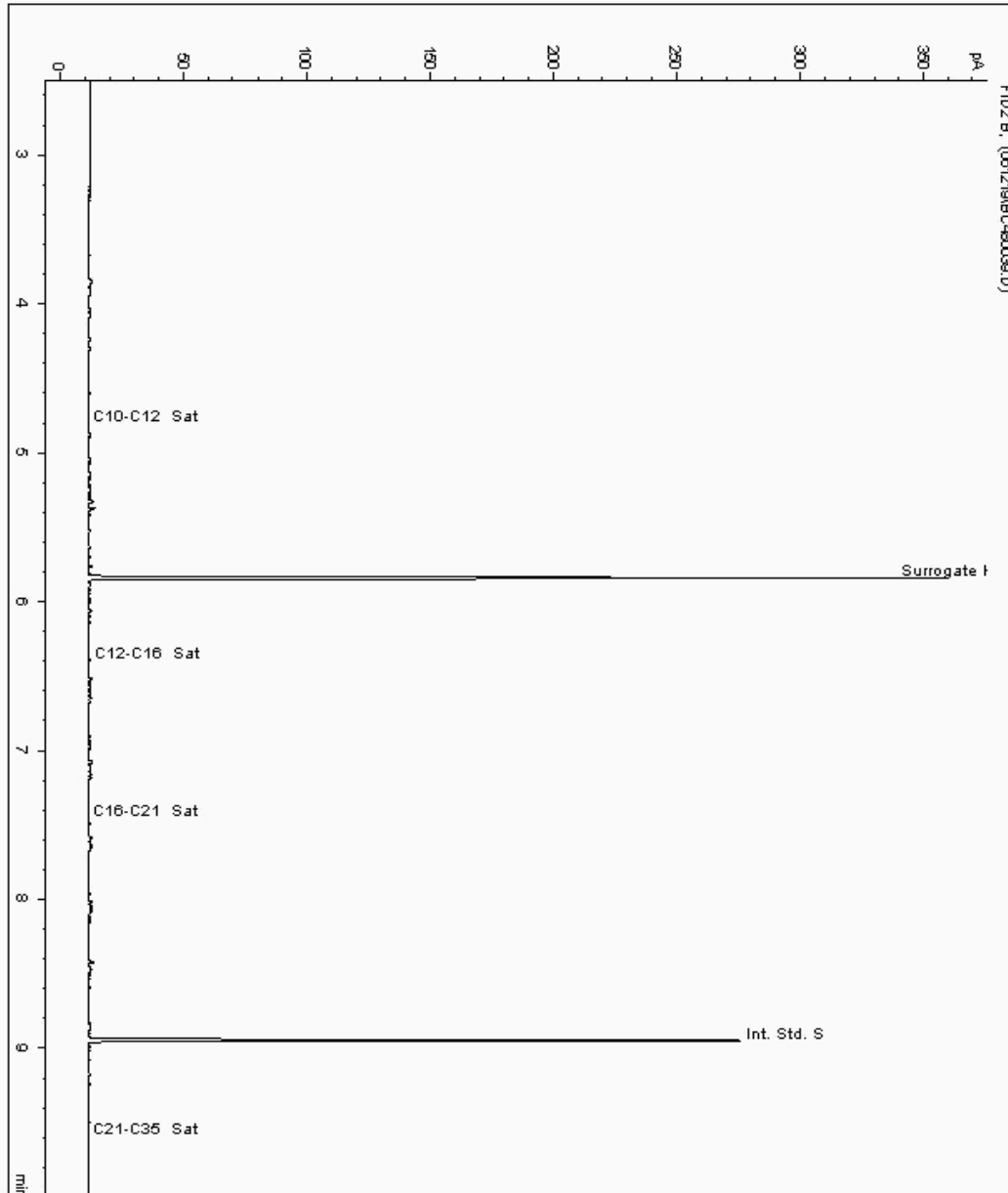
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 20108416
Sample ID : WS003

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18882889-
Date Acquired : 13/06/2019 06:38:22 PM
Units : ppb
Dilution : SE WS003[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

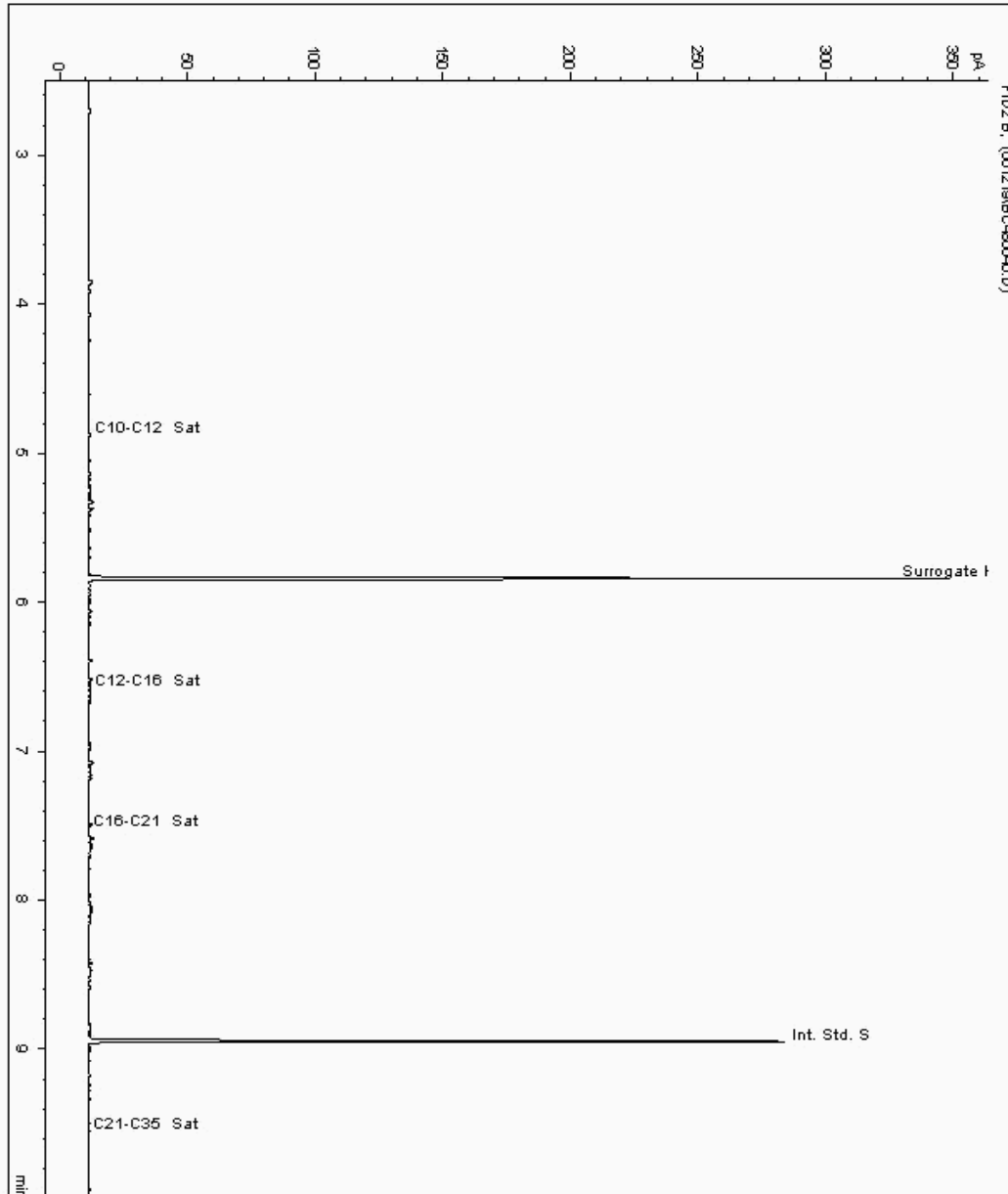
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 20108421
Sample ID : BH002

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18882908-
Date Acquired : 13/06/2019 06:59:58 PM
Units : ppb
Dilution : SE BH002[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

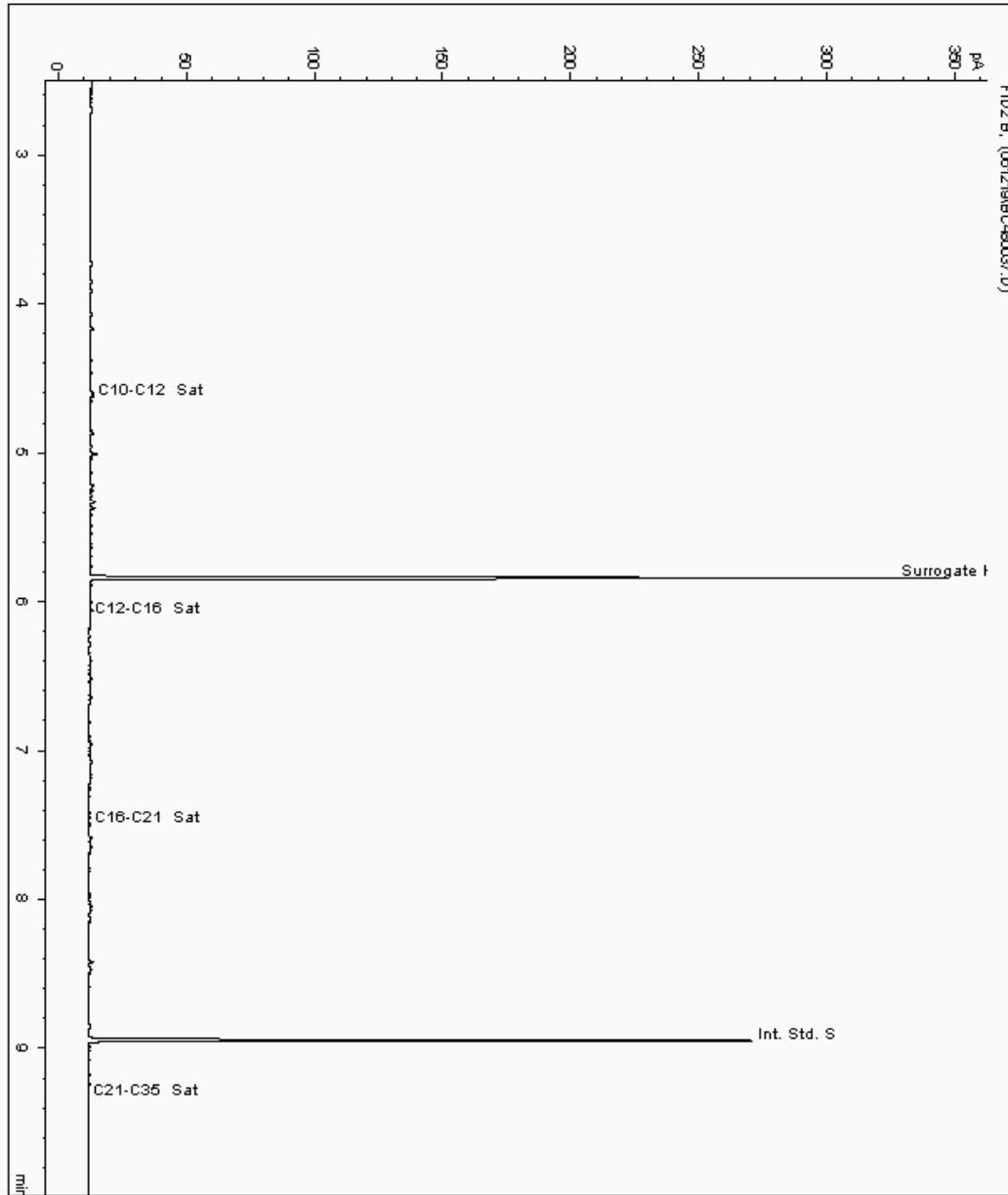
Analysis: EPH CWG (Aliphatic) Aqueous GC (W)

Sample No : 20108436
Sample ID : BH001

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 18882927-
Date Acquired : 13/06/2019 05:51:53 PM
Units : ppb
Dilution : SE BH001[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





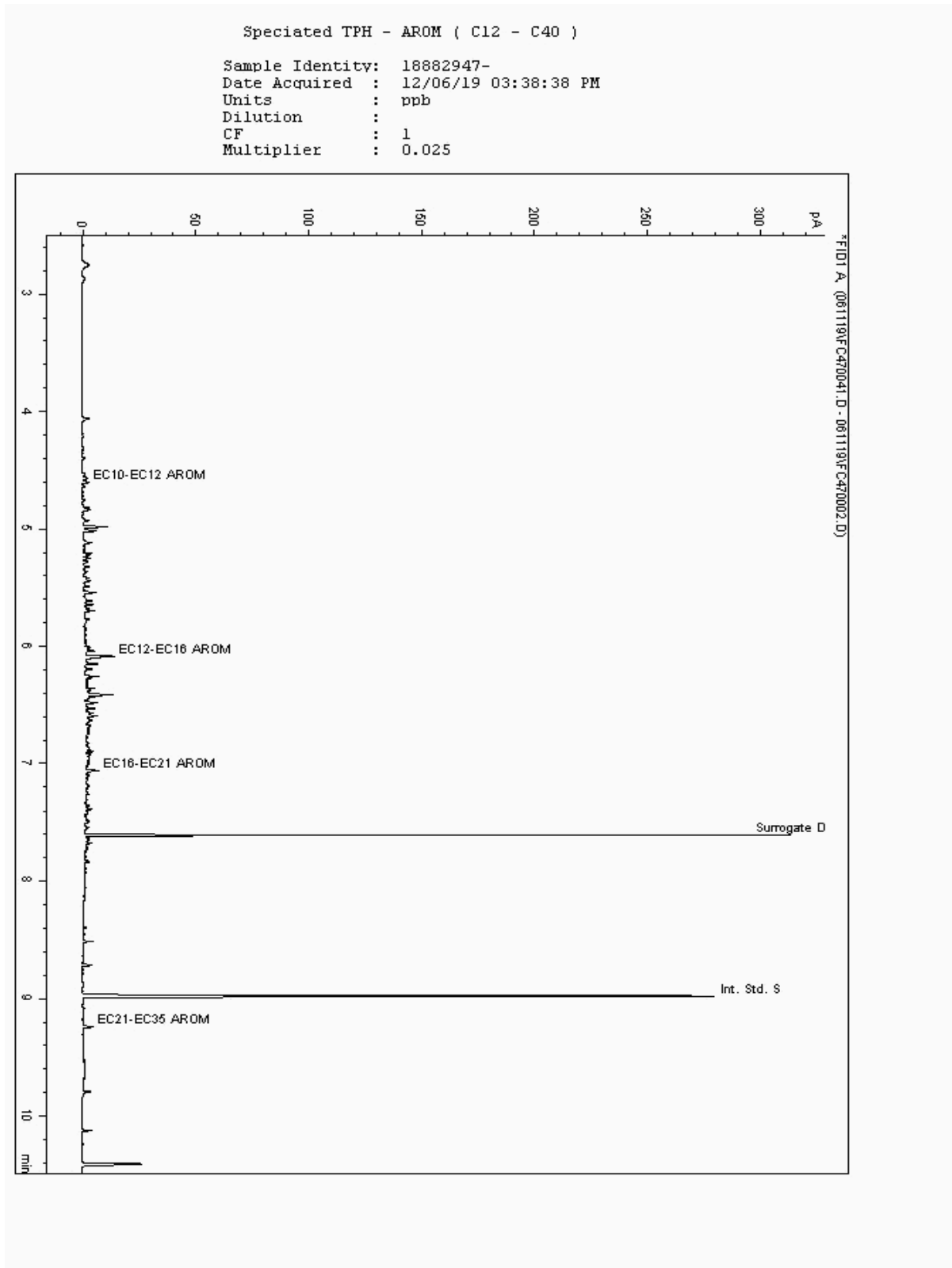
CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) Sample No : 20107916 Depth : 0.00 - 0.00
Sample ID : WS005





CERTIFICATE OF ANALYSIS

Validated

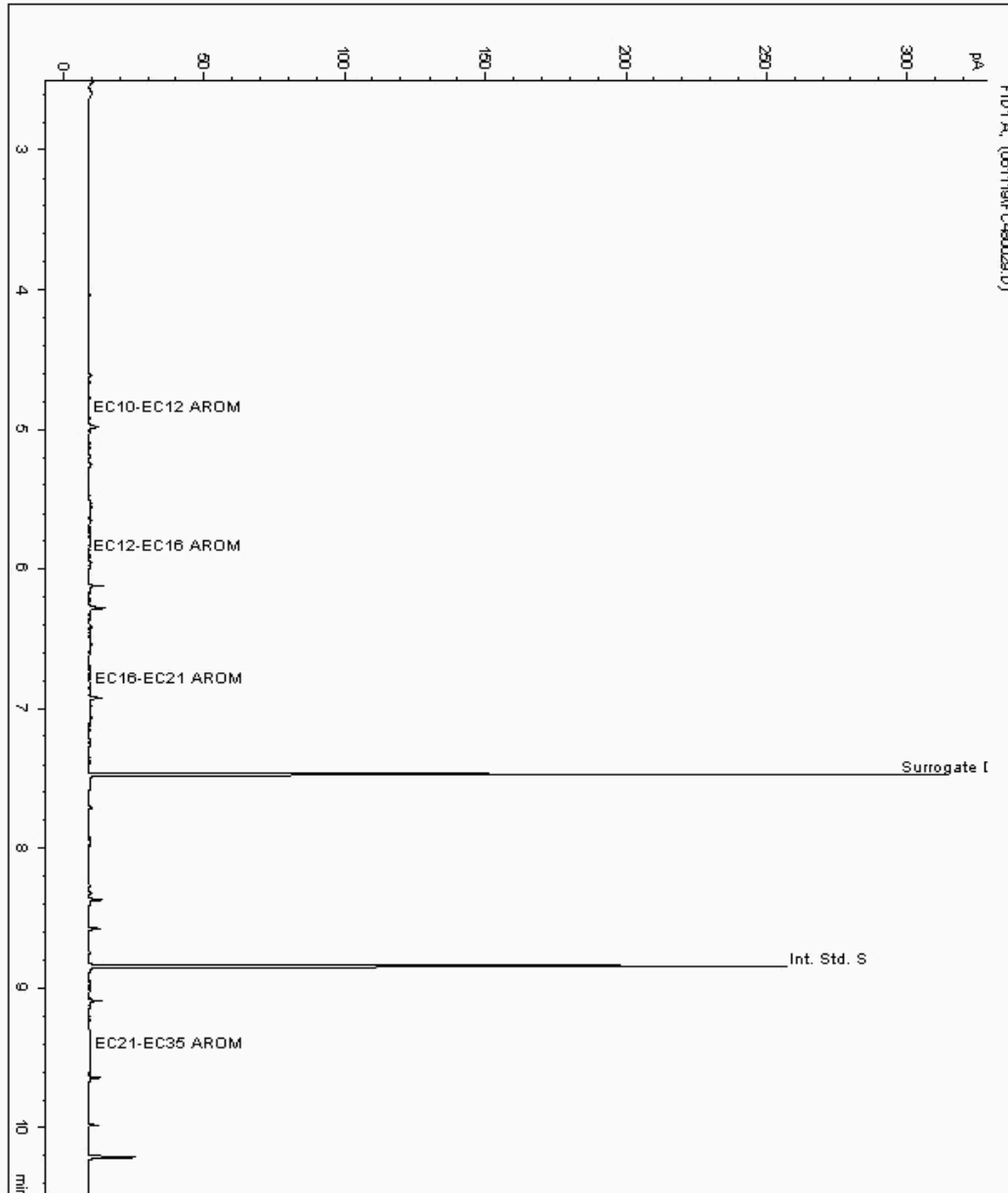
SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: EPH CWG (Aromatic) Aqueous GC (W) Sample No : 20108401 Depth : 0.00 - 0.00
Sample ID : DUPLICATE

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 18882963-
Date Acquired : 11/06/2019 21:59:21 PM
Units : ppb
Dilution : SE DUPLICATE[0.00 - 0.00] ->
CF : 1
Multiplier : 0.027





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

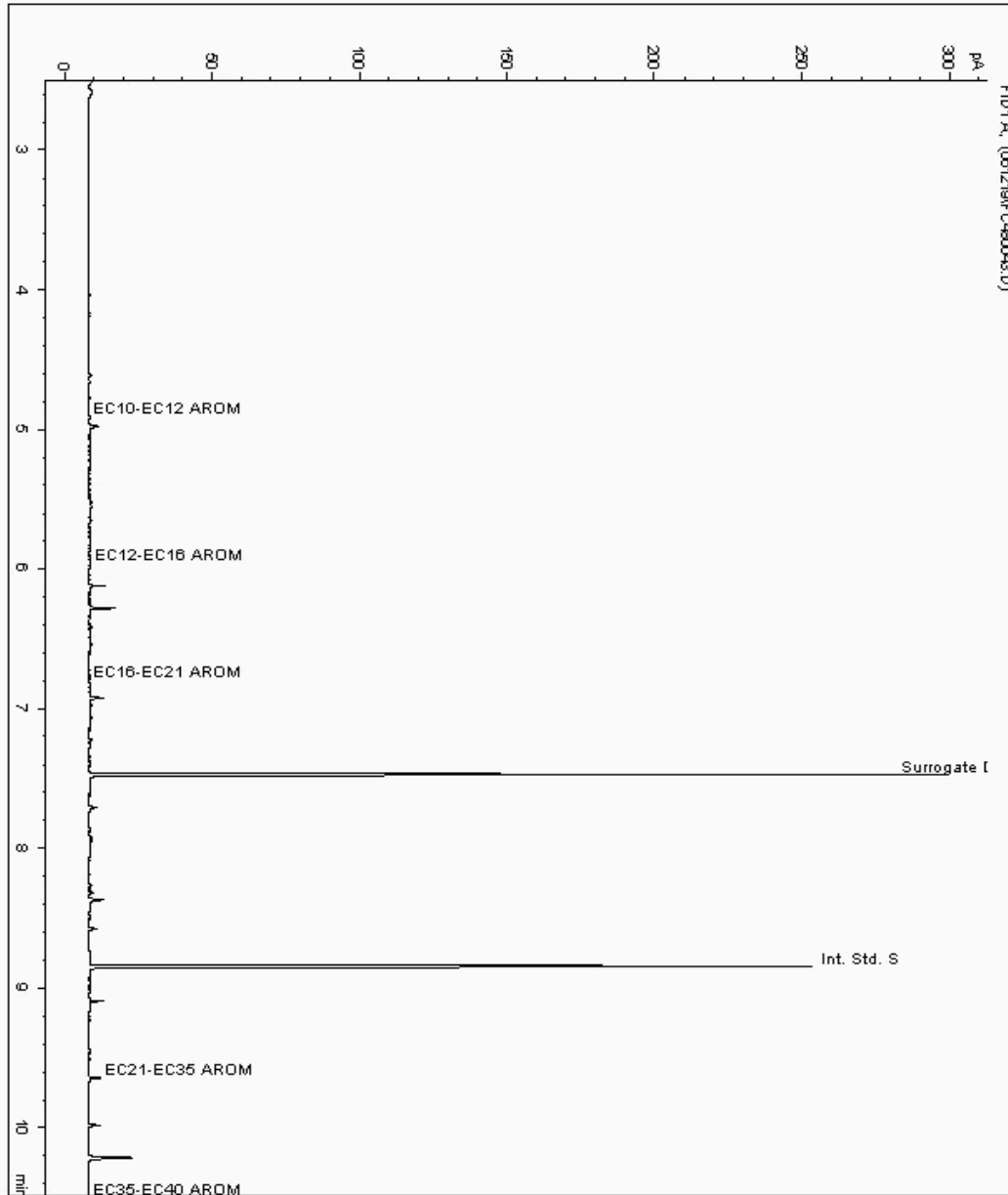
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 20108411
Sample ID : WS002

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 18882871-
Date Acquired : 13/06/2019 08:04:58 PM
Units : ppb
Dilution : SE WS002[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

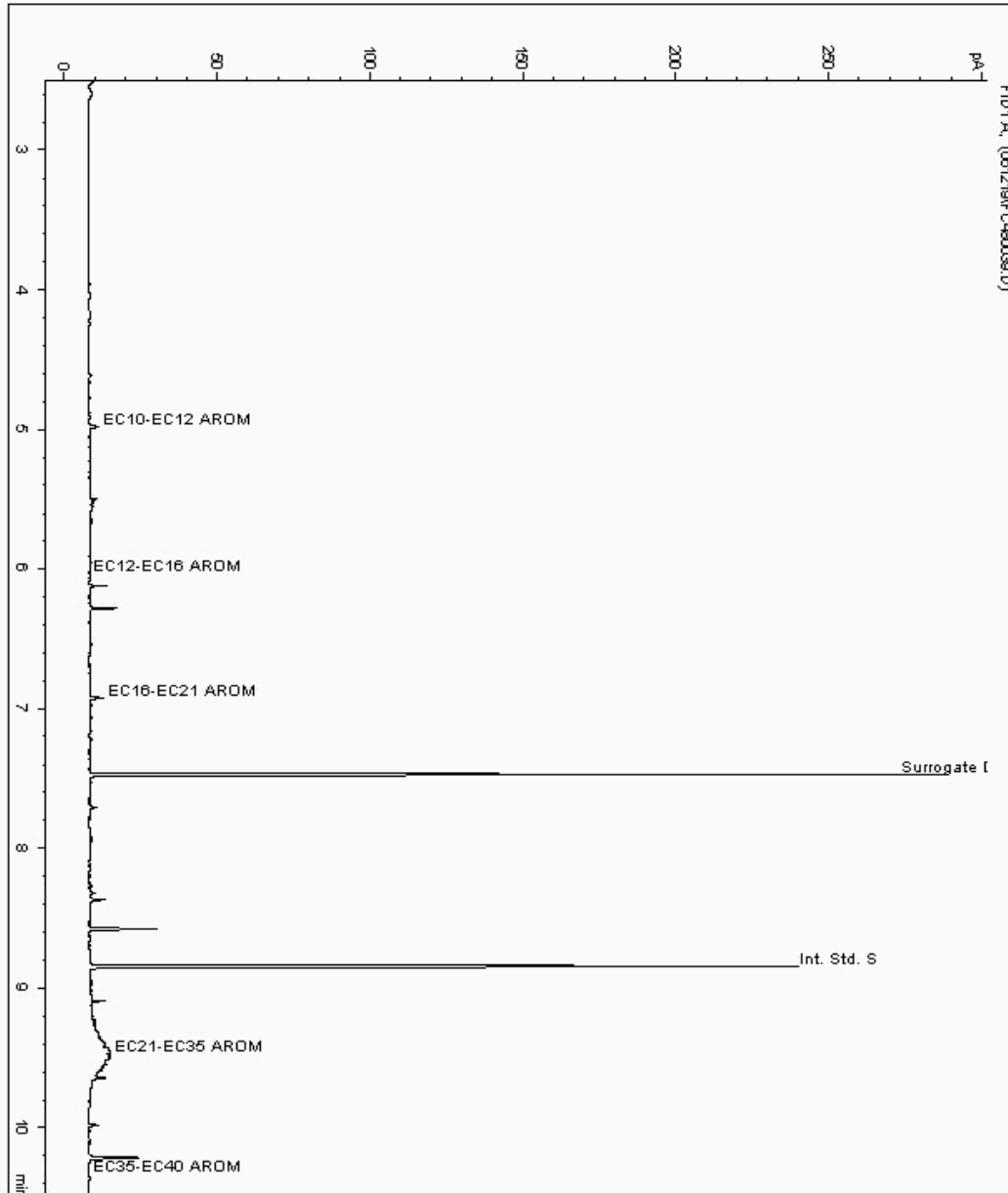
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 20108416
Sample ID : WS003

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 18882890-
Date Acquired : 13/06/2019 06:38:23 PM
Units : ppb
Dilution : SE WS003[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

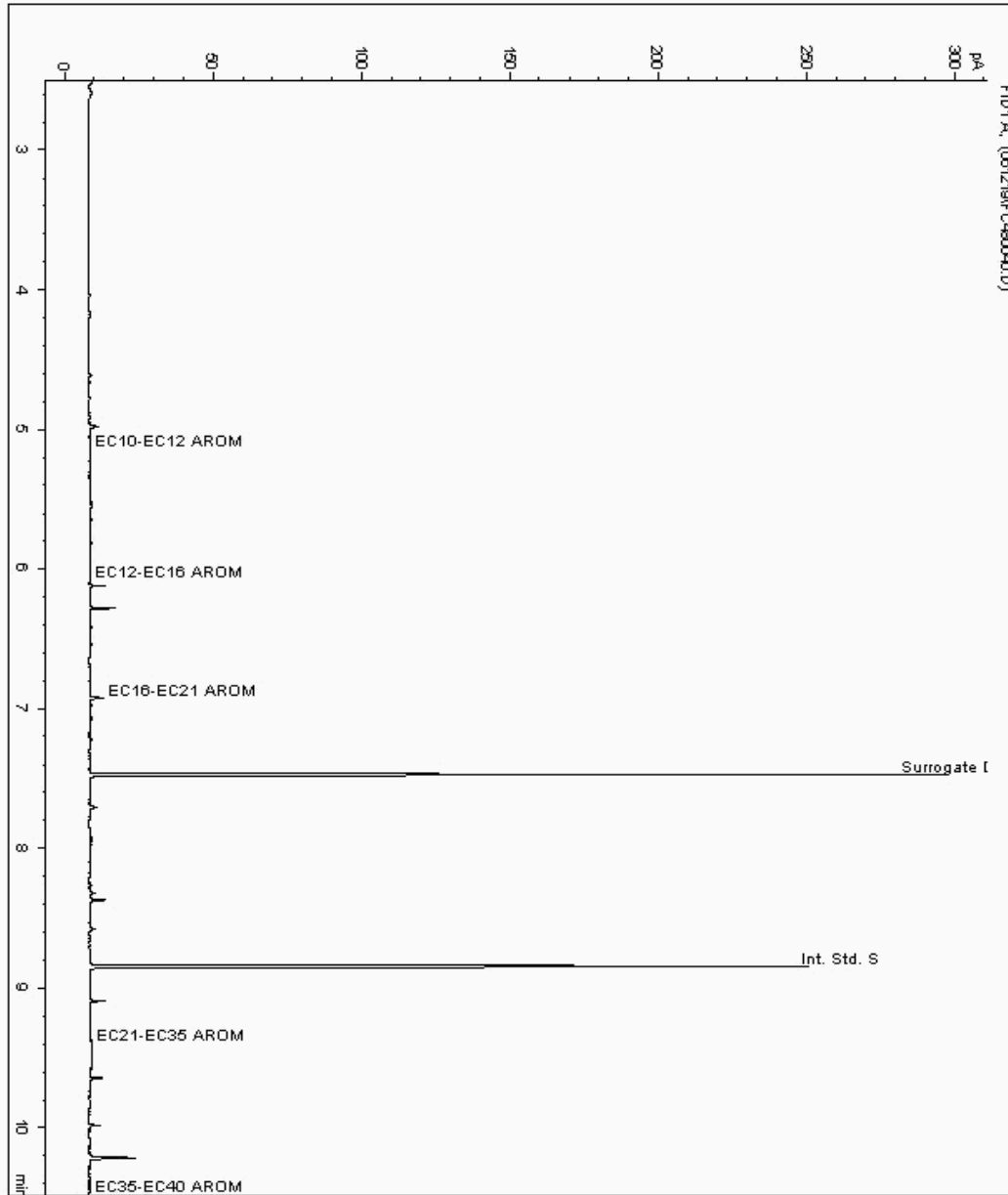
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 20108421
Sample ID : BH002

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 18882909-
Date Acquired : 13/06/2019 06:59:58 PM
Units : ppb
Dilution : SE BH002[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

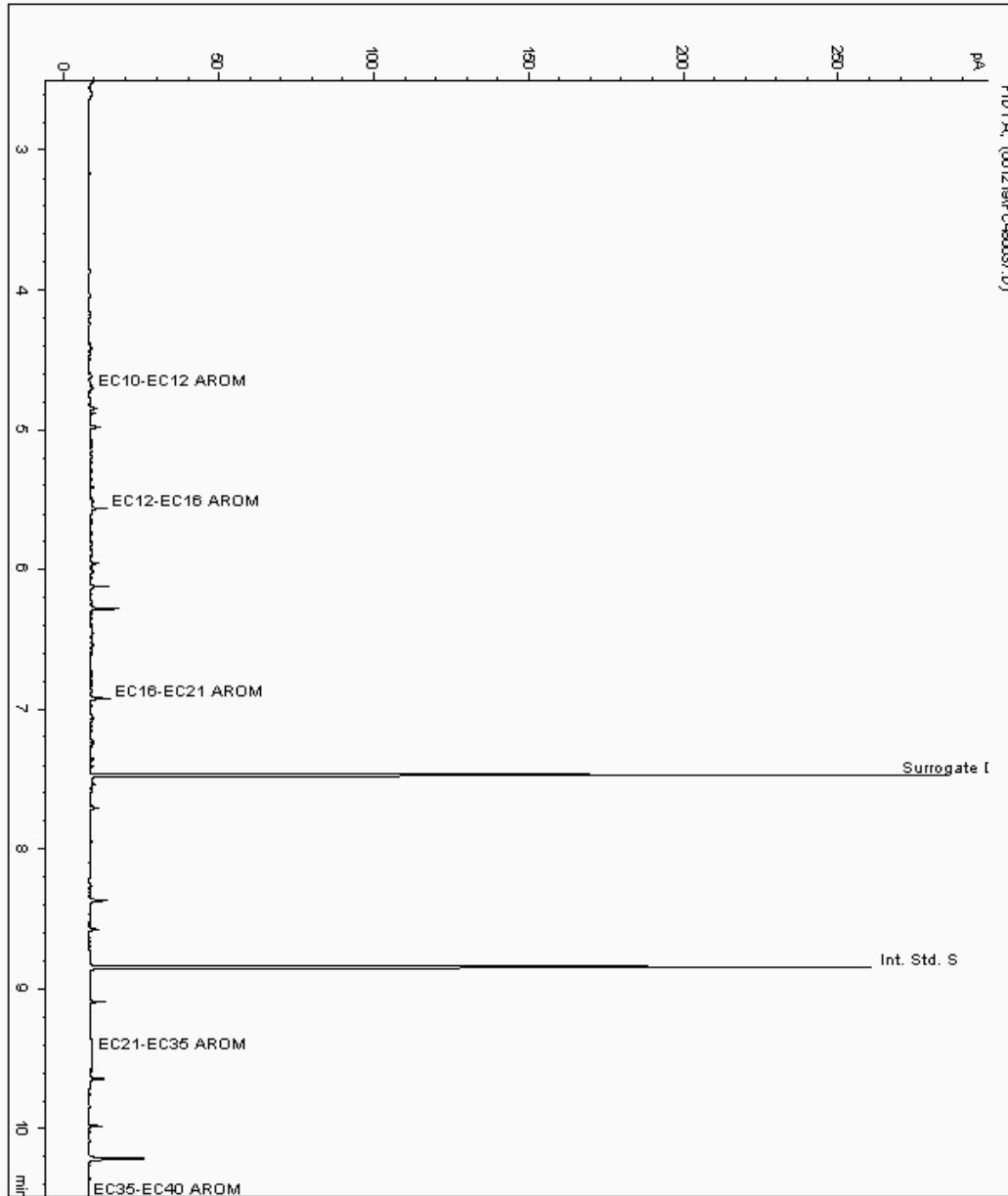
Analysis: EPH CWG (Aromatic) Aqueous GC (W)

Sample No : 20108436
Sample ID : BH001

Depth : 0.00 - 0.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 18882928-
Date Acquired : 13/06/2019 05:51:52 PM
Units : ppb
Dilution : SE BH001[0.00 - 0.00] ->
CF : 1
Multiplier : 0.025





CERTIFICATE OF ANALYSIS

Validated

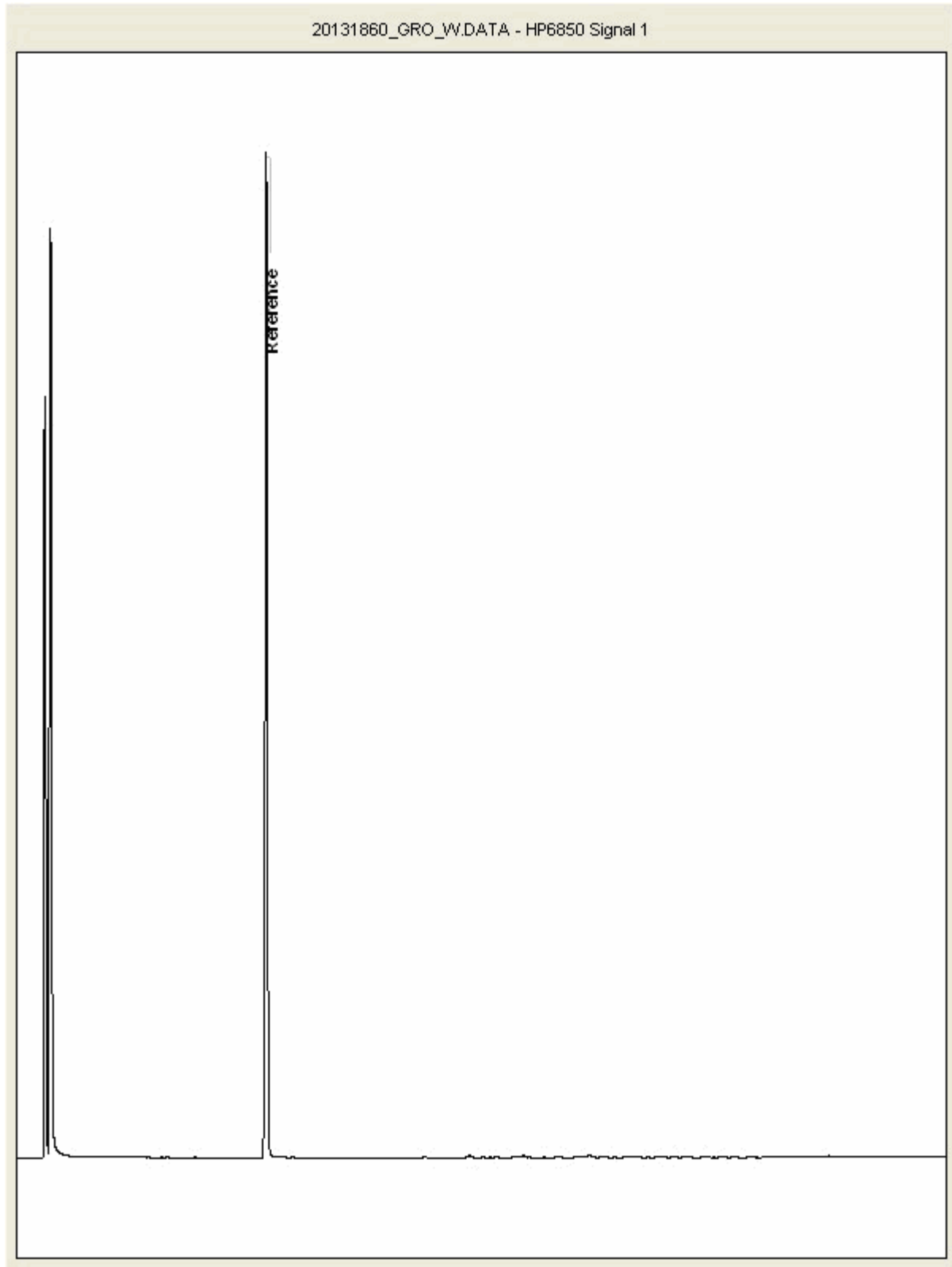
SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 20131860
Sample ID : WS005

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

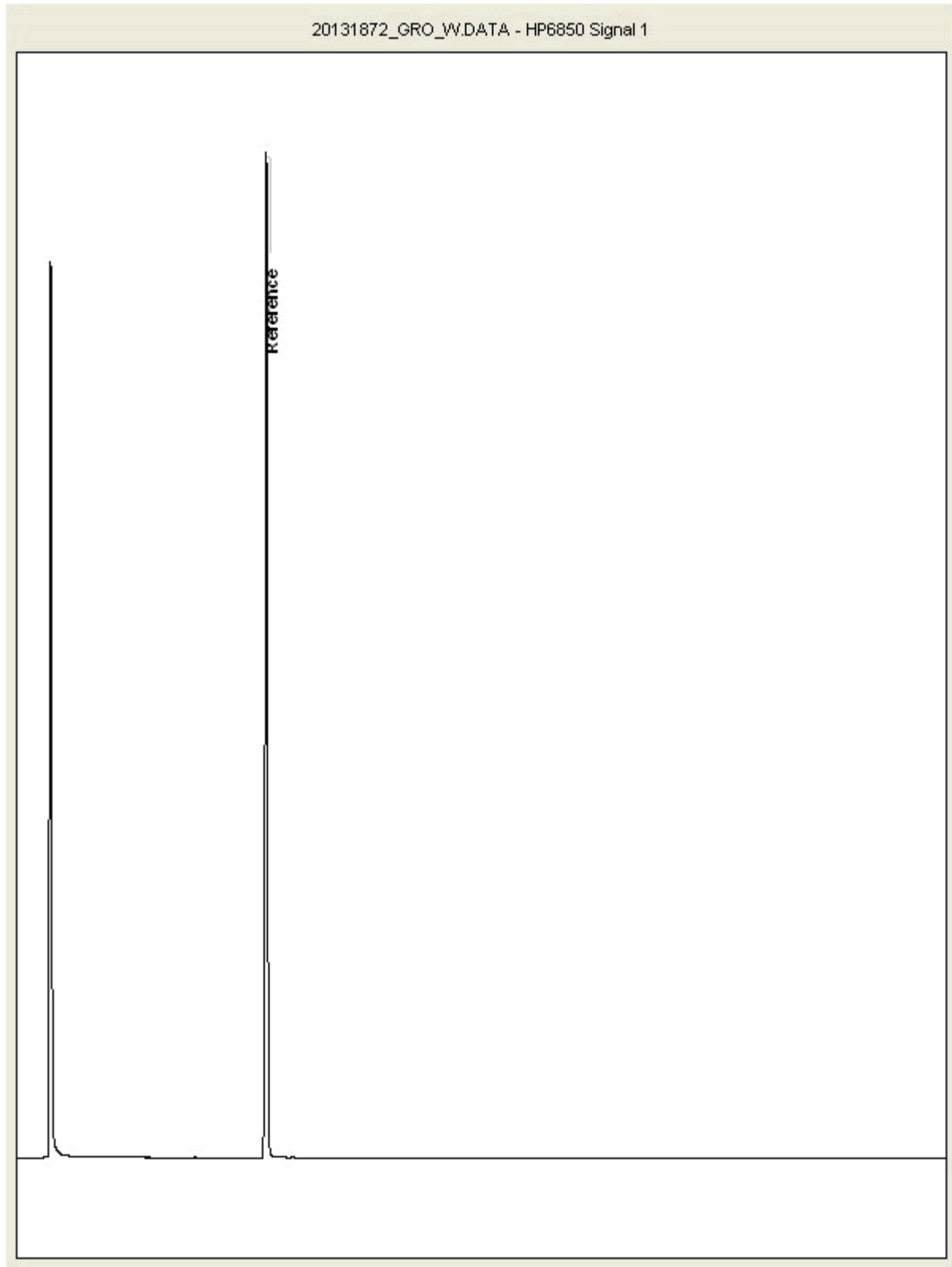
SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 20131872
Sample ID : WS003

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

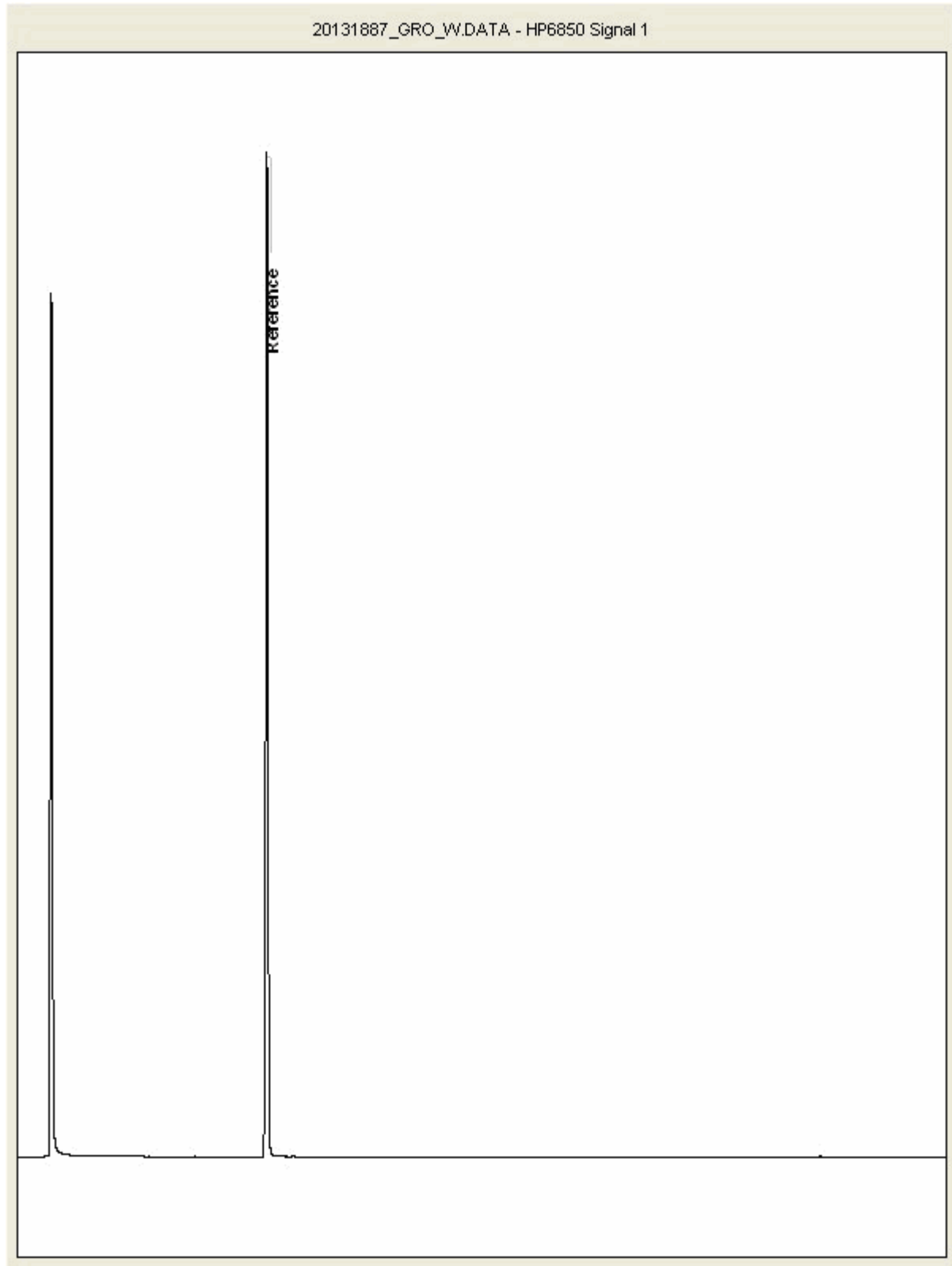
SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 20131887
Sample ID : WS002

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

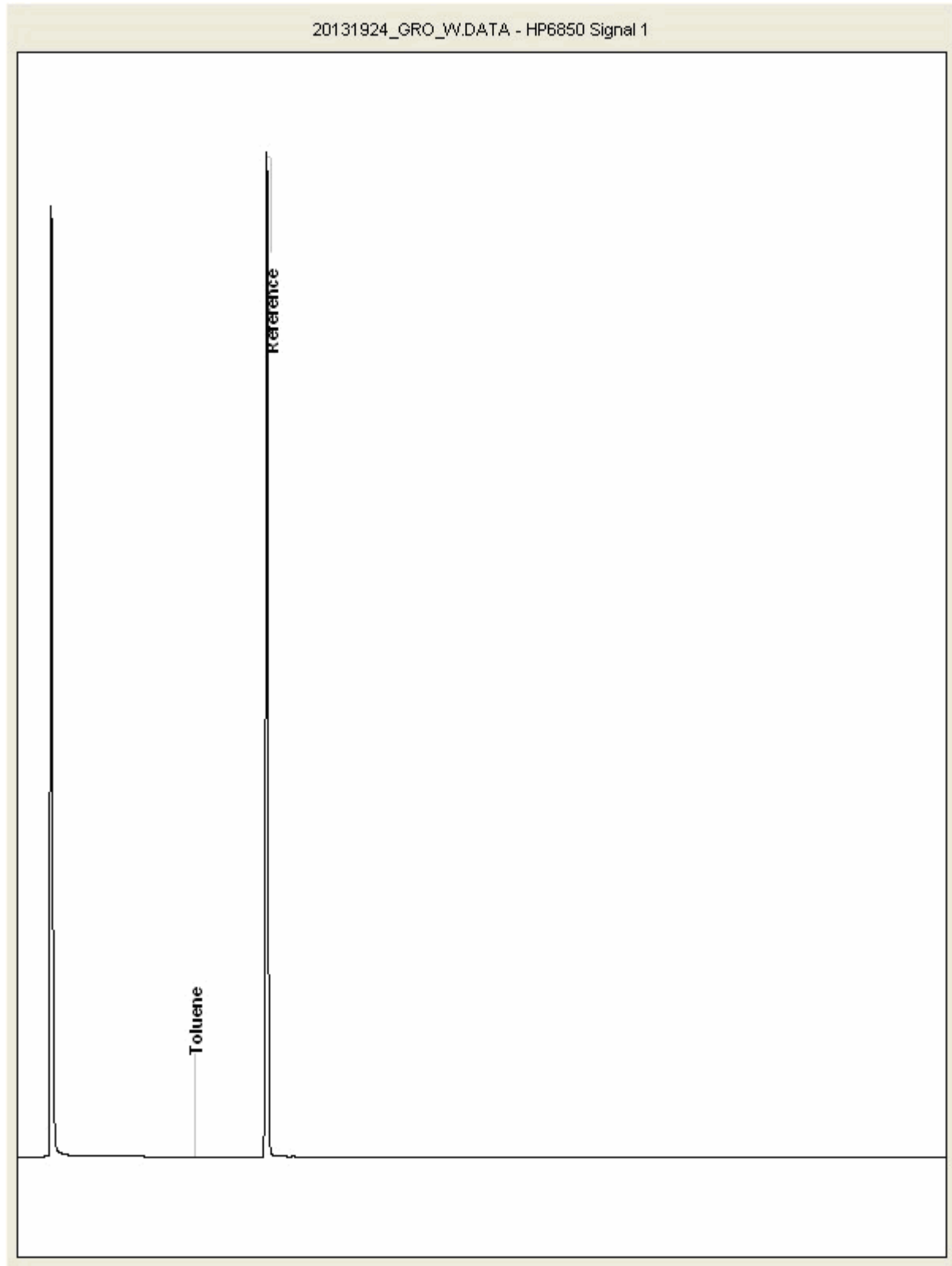
SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 20131924
Sample ID : BH002

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

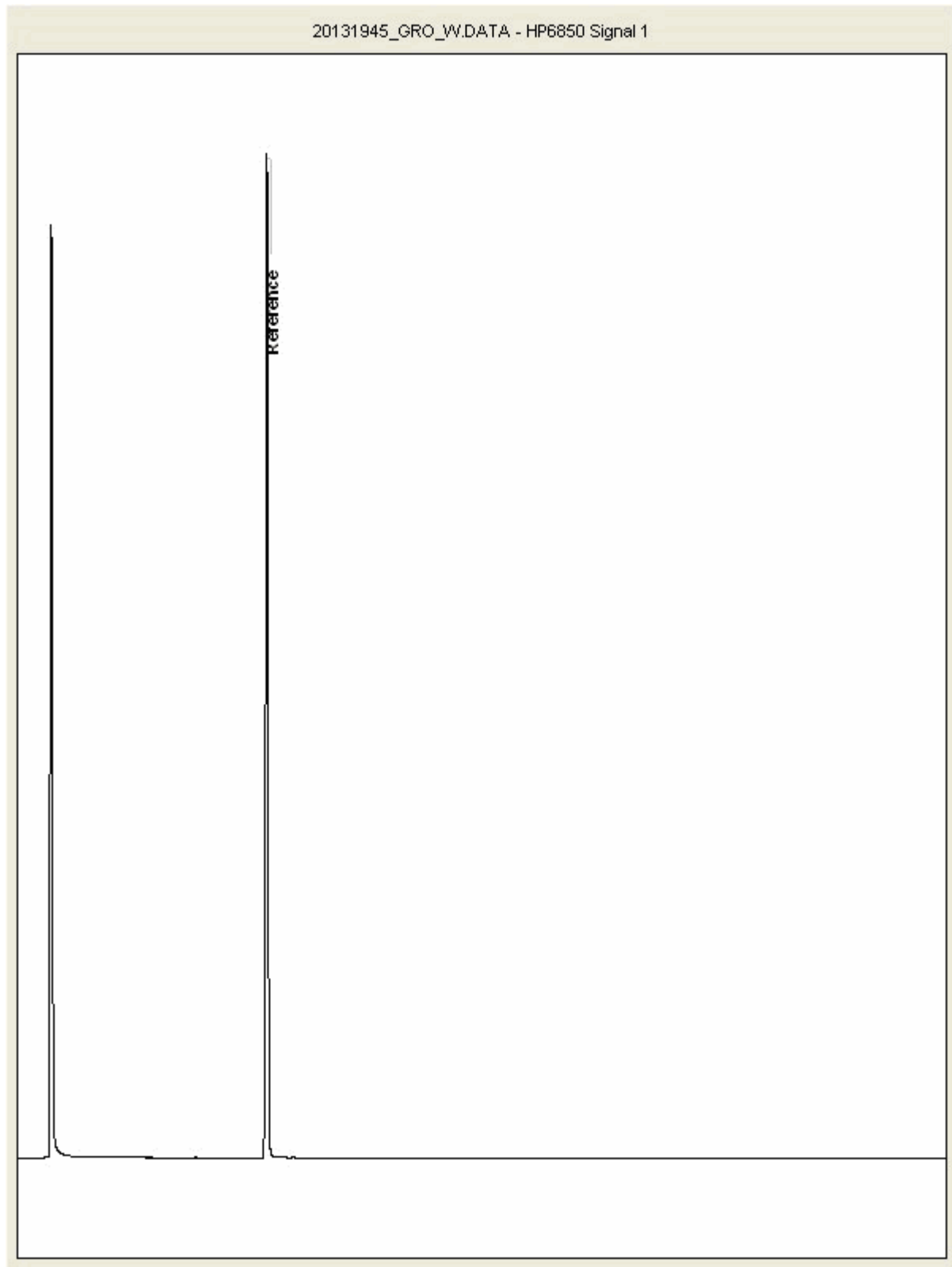
SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 20131945
Sample ID : DUPLICATE

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

Validated

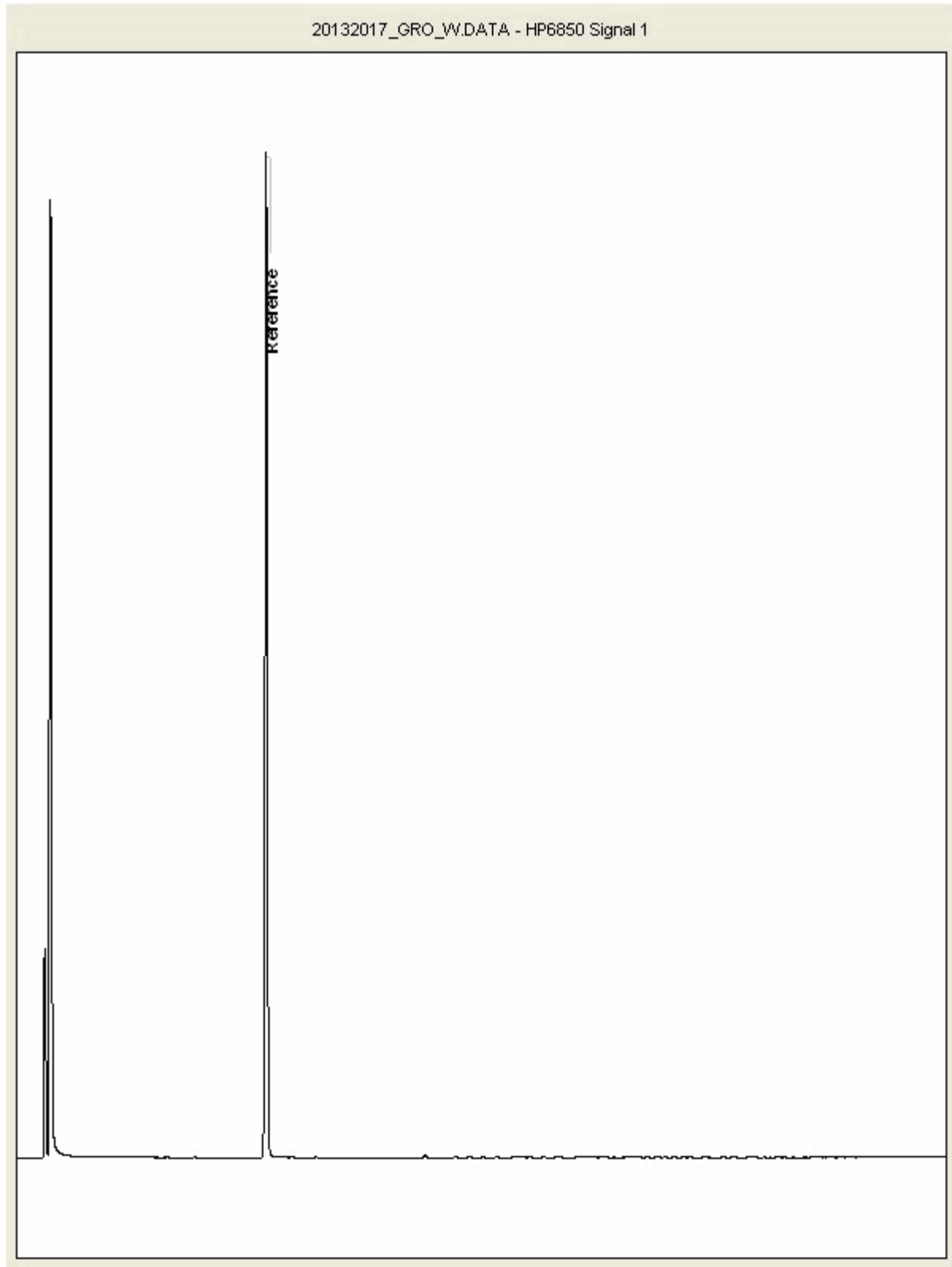
SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Chromatogram

Analysis: GRO by GC-FID (W)

Sample No : 20132017
Sample ID : BH001

Depth : 0.00 - 0.00





CERTIFICATE OF ANALYSIS

SDG:	190608-7	Client Reference:	70044279	Report Number:	510675
Location:	George Street Reading	Order Number:	70044279-008	Superseded Report:	510548

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

General

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
§	Sampled on date not provided
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



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GEOTECHNICAL ENGINEERING LIMITED



For the attention of Ellen Churchill

Version No. 1

Page No. 1 of 14

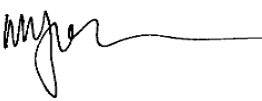
Date of Issue 16/05/2019

TEST REPORT

PROJECT/SITE	George Street	Samples received	23/04/2019
GEL REPORT NUMBER	35126	Schedule received	23/04/2019
Your ref/PO:		Testing commenced	25/04/2019
Test report refers to	Schedule 1	Status	Final

SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	12	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	2	YES
BS1377: Part 2: 1990:3.3, Saturation Moisture Content	3	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	5	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	4	YES
BRE SD1 Suite (Subcontracted)	8	YES/NO

Remarks This report may not be partially reproduced without written permission from this laboratory.	Approved Signatories: W Jones (Laboratory Manager) E Crimp (Senior engineer) J Hanson (Director) N Parry (Director) 
---	--

Doc TR01

Rev No. 20

Revision date 09/10/17

DC:JH

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Registered number: 00700739

VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited

Sort code: 16-22-11 Bank account: 11125135

LIQUID AND PLASTIC LIMITS**BS.1377 : PART 2 : 1990 : 4 and 5**

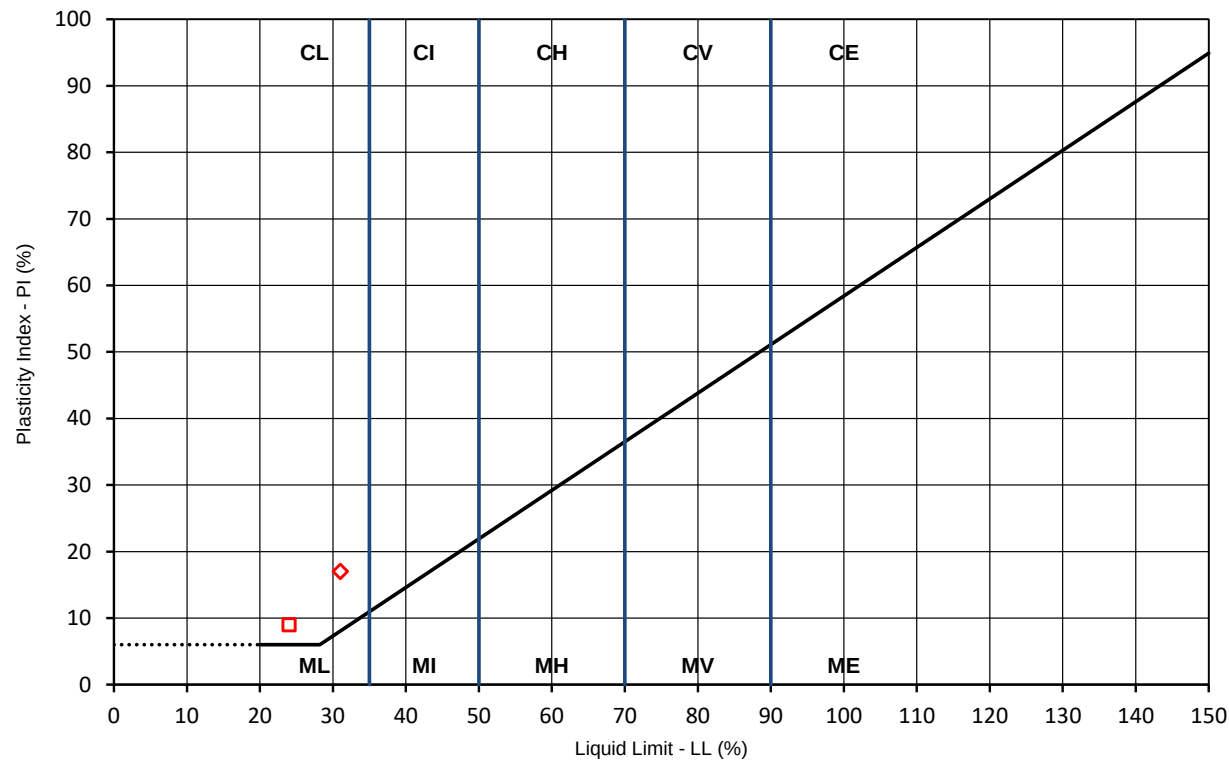
CLIENT WSP

SITE GEORGE STREET

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks	
	no./type	depth (m)									
BH001	D	5.10	5.10	7.4	E					Orangish brown slightly clayey slightly sandy GRAVEL	
BH001	D	9.00	9.00	26.5	E					Off white slightly sandy slightly gravelly SILT (chalk)	
BH001	D	10.30	10.30	25.0	E					Off white slightly sandy slightly gravelly SILT (chalk)	
BH001	D	12.00	12.00	25.8	E					Off white slightly gravelly slightly sandy SILT (chalk)	
BH002	D	1.70	1.70	19.6	BXE	22	24	15	9	Orangish brown slightly gravelly sandy CLAY	
BH002	B	8.50	8.50	26.2	E					Off white slightly sandy slightly gravelly SILT (chalk)	
BH002	B	10.00	10.00	24.5	E					Off white slightly sandy slightly gravelly SILT (chalk)	
BH002	B	12.00	12.00	25.7	E					Off white slightly sandy slightly gravelly SILT (chalk)	
WS001	D	1.50	1.50	28.0	BXE	18	31	14	17	Orangish brown slightly sandy slightly gravelly CLAY	
WS003	D	2.00	2.00	20.2	E					Orangish brown slightly sandy slightly gravelly CLAY	
WS003	D	2.80	2.80	10.2	E					Yellowish brown very clayey very gravelly SAND	
WS003	D	3.80	3.80	7.6	E					Yellowish brown slightly sandy slightly clayey GRAVEL	
general remarks natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified) NP denotes non plastic # denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892											
specimen preparation A - as received B - washed on 0.425mm sieve C - air dried							test method X - cone penetrometer (test 4.3) Y - cone penetrometer (test 4.4) Z - casagrande apparatus (test 4.5)			CONTRACT 35126	CHECKED WJ



CLIENT WSP
SITE GEORGE STREET



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	BH002	1.70	24	15	9	
◇	WS001	1.50	31	14	17	

CONTRACT	CHECKED
35126	WJ

SATURATION MOISTURE CONTENT OF CHALK

BS.1377 : PART 2 : 1990 : 3.3



CLIENT WSP

SITE GEORGE STREET

borehole /trial pit no.	sample		specimen depth (m)	natural moisture content (%)	bulk density (Mg/m ³)	dry density (Mg/m ³)	saturation moisture content (%)	porosity (%)	description and remarks
	no./type	depth (m)							
BH002	B	8.50	8.50	25.4	2.01	1.61	25	41	Off white CHALK
BH002	B	10.00	10.00	25.5	2.01	1.60	26	41	Off white CHALK #
WS001	D	4.50	4.50	25.2	2.00	1.60	26	41	Off white slightly sandy gravelly SILT (chalk)
general remarks natural moisture content determined in accordance with BS1377 : Part 2 : 1990 : 3.2 (unless specified) # denotes sample tested is smaller than that which is recommended in accordance with BS1377									
test method immersion in water (test 3.3)							CONTRACT	CHECKED	
							35126	WJ	



CLIENT	WSP
--------	-----

BH/TP No.

BH001

SITE GEORGE STREET

SAMPLE No./TYPE

D

DESCRIPTION Light brown slightly silty sandy GRAVEL

SAMPLE DEPTH (m)

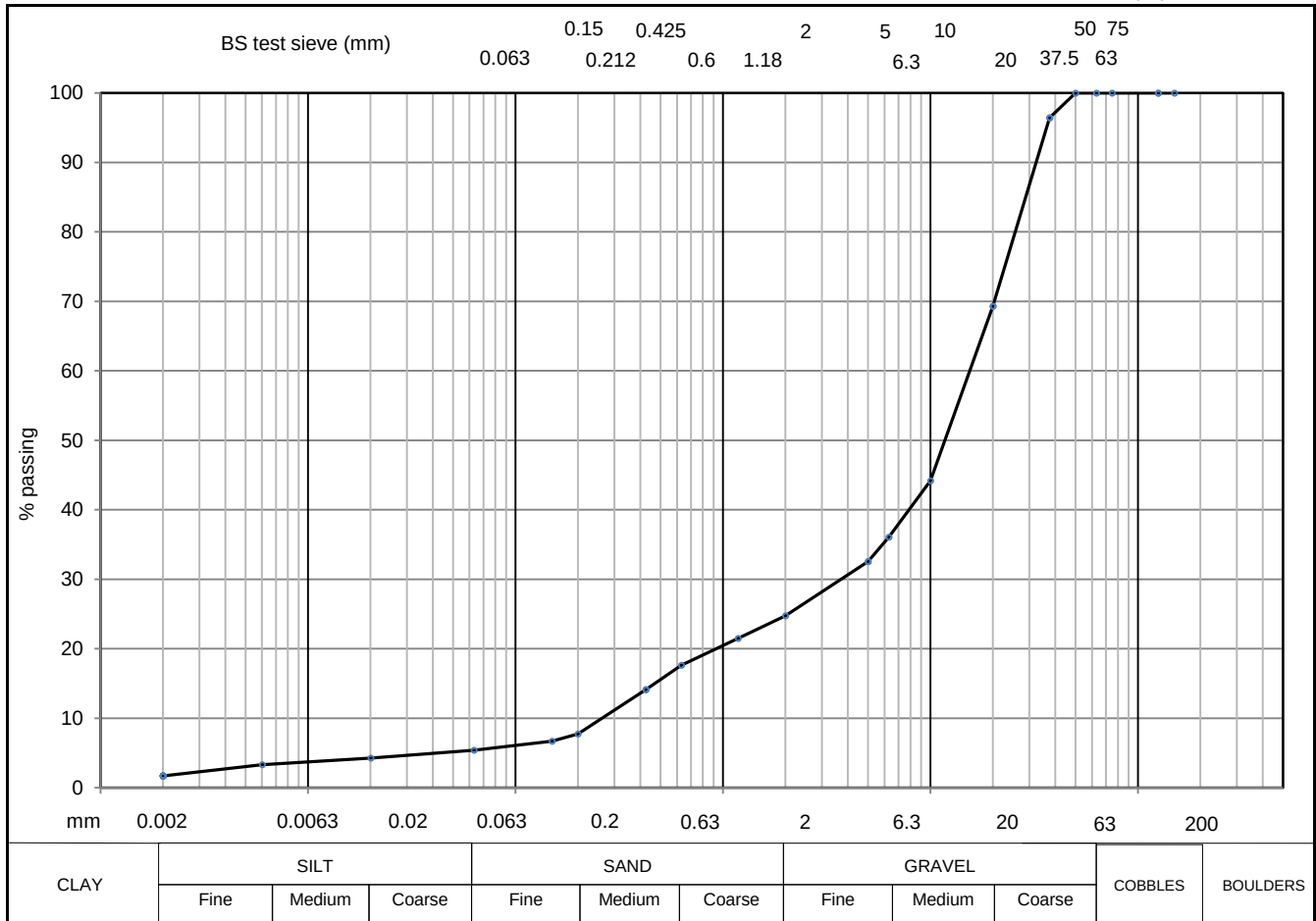
4.30

SPECIMEN TOP (m)

4.30

SPECIMEN BASE (m)

N/A



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	2	150		5	33	20	4
SILT	4						
SILT & CLAY	5						
SAND	19						
GRAVEL	75						
COBBLE & BOULDER	0	63	100	1.18	21	2	2
test method(s)	5.2 & 5.4	50		0.63	18		
test method		37.5		96	0.425		14
5.2 - sieving		20		69	0.2		8
5.3 - sedimentation by hydrometer		10		44	0.15		7
5.4 - sedimentation by pipette		6.3	36	0.063	5		
remarks						CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892						35126	WJ
Particle density assigned an assumed value of 2.70 Mg/m3							



CLIENT	WSP
--------	-----

BH/TP No.

BH002

SITE GEORGE STREET

SAMPLE No./TYPE

B

DESCRIPTION	Multicoloured slightly sandy GRAVEL with medium cobble content
-------------	--

SAMPLE DEPTH (m)

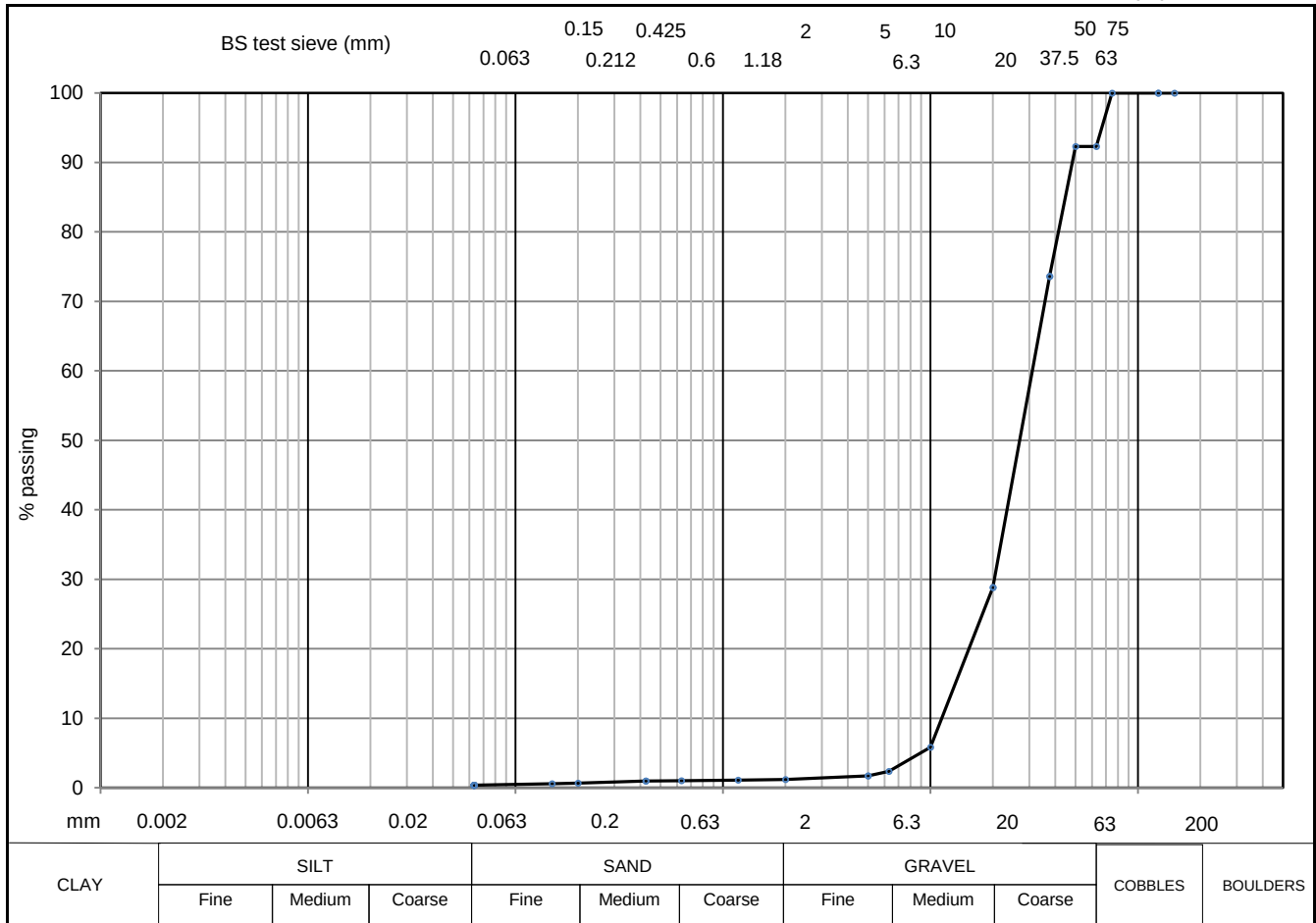
3.00

SPECIMEN TOP (m)

3.00

SPECIMEN BASE (m)

3.70



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150		5	2	20	
SILT & CLAY	0						
SAND	1	75	100	2	1	6	
GRAVEL	91						
COBBLE & BOULDER	8	63	92	1.18	1	2	
test method(s)	5.2						
test method		50	92	0.63	1		
5.2 - sieving		37.5	74	0.425	1		
5.3 - sedimentation by hydrometer		20	29	0.2	1		
5.4 - sedimentation by pipette		10	6	0.15	1		
		6.3	2	0.063	0		
remarks						CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892						35126	WJ
Particle density assigned an assumed value of 2.70 Mg/m ³							

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT WSP

BH/TP No.

BH002

SITE GEORGE STREET

SAMPLE No./TYPE

D

DESCRIPTION Light brown very silty very gravelly SAND

SAMPLE DEPTH (m)

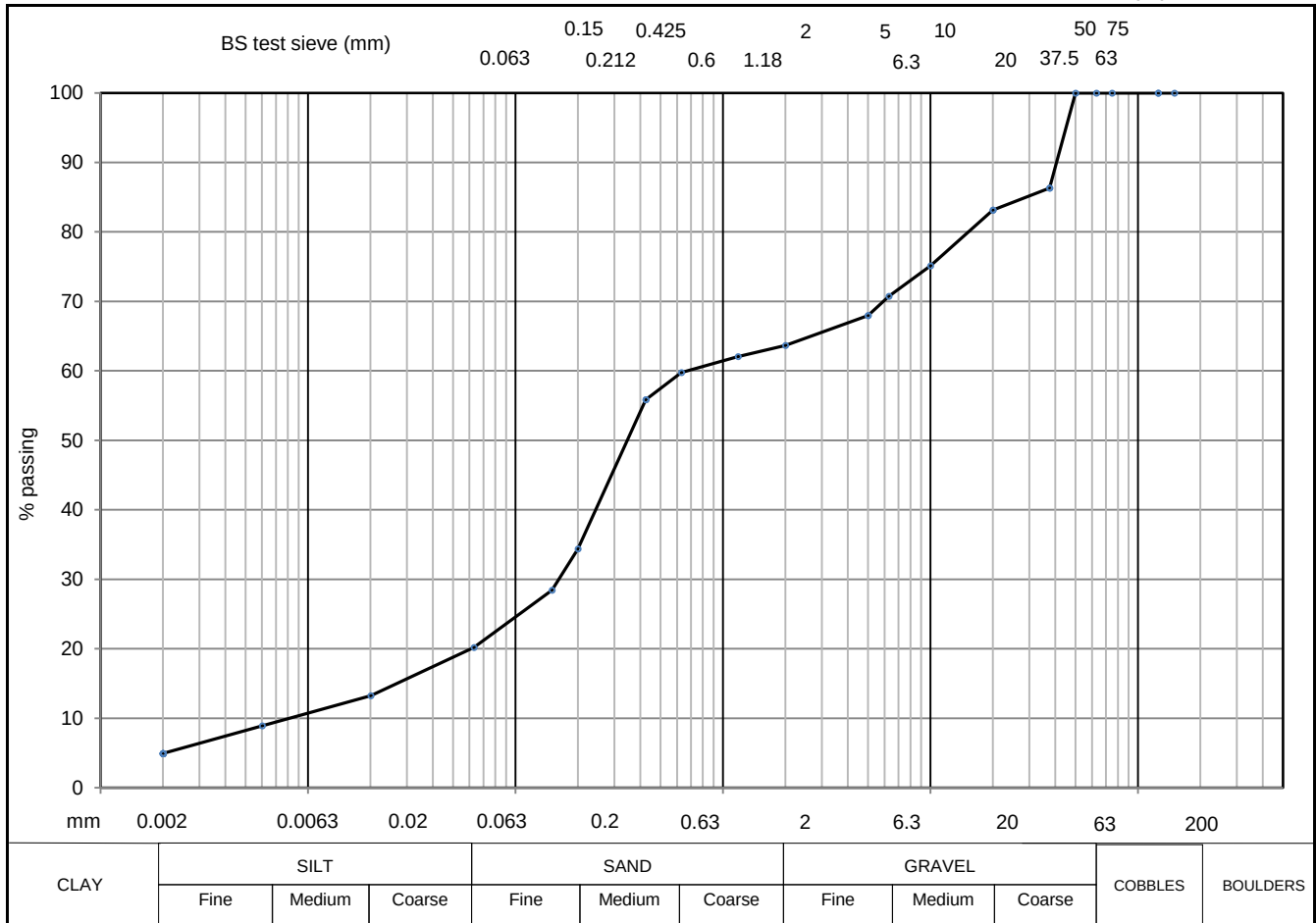
4.00

SPECIMEN TOP (m)

4.00

SPECIMEN BASE (m)

N/A



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	5			5	68	20	13
SILT	15	150					
SILT & CLAY	20			2	64	6	9
SAND	43	75					
GRAVEL	36			1.18	62	2	5
COBBLE & BOULDER	0	63					
test method(s)	5.2# & 5.4	50	100	0.63	60		
test method		37.5	86	0.425	56		
5.2 - sieving		20	83	0.2	34		
5.3 - sedimentation by hydrometer		10	75	0.15	28		
5.4 - sedimentation by pipette		6.3	71	0.063	20		
remarks					CONTRACT		CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892					35126		WJ
Particle density assigned an assumed value of 2.70 Mg/m ³							



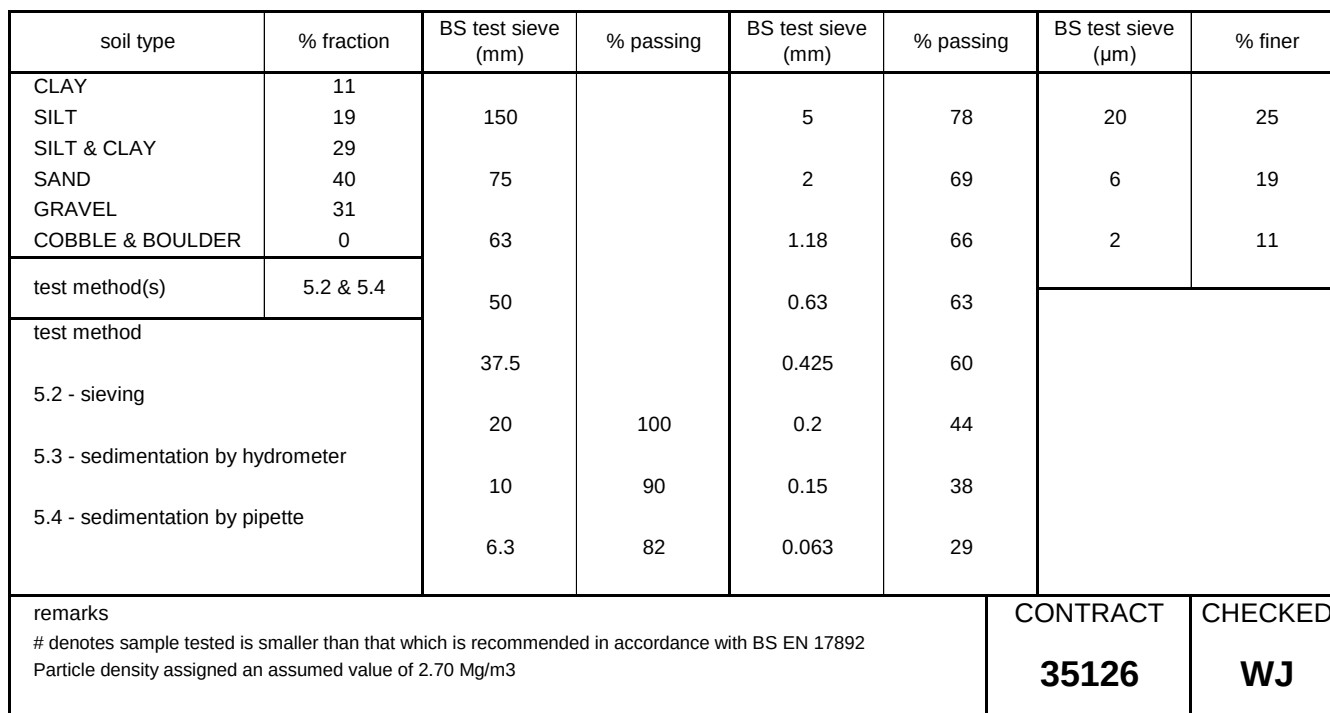
WS003

D

2.80

2.80

N/A





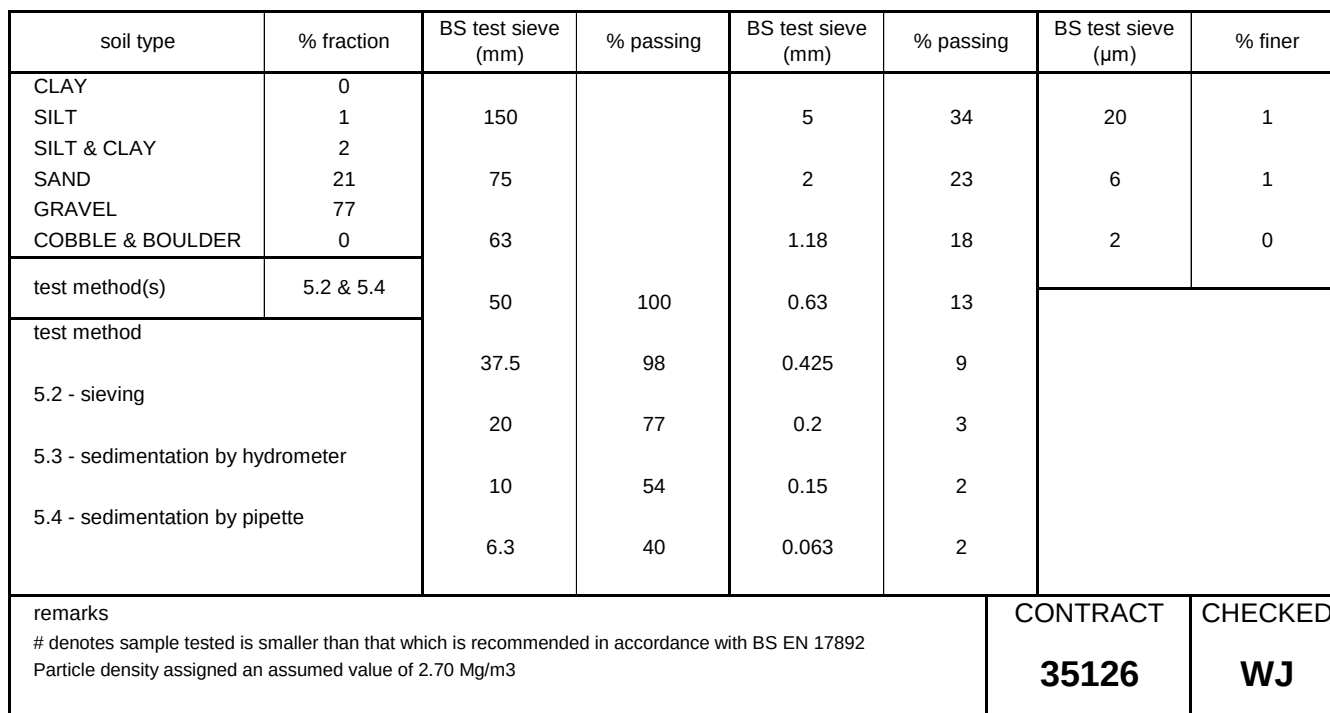
WS005

B

4.50

4.50

N/A





2183

Final Report

Report No.:	19-14202-1		
Initial Date of Issue:	02-May-2019		
Client	Geotechnical Engineering Ltd		
Client Address:	Centurion House Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF		
Contact(s):	GEL Wendy Jones		
Project	35126 - George Street		
Quotation No.:		Date Received:	26-Apr-2019
Order No.:	35126/WJ	Date Instructed:	26-Apr-2019
No. of Samples:	8		
Turnaround (Wkdays):	5	Results Due:	02-May-2019
Date Approved:	02-May-2019		
Approved By:			
Details:	Robert Monk, Technical Manager		

Results - Soil

Client: Geotechnical Engineering Ltd	Chemtest Job No.:				19-14202	19-14202	19-14202	19-14202	19-14202	19-14202	19-14202	19-14202
Quotation No.:	Chemtest Sample ID.:				816586	816587	816588	816589	816590	816591	816592	816593
	Client Sample ID.:				D	D	D	D	D	B	D	B
	Sample Location:				BH001	BH001	BH001	BH002	BH002	BH002	WS003	WS005
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				2.90	5.10	10.30	1.70	5.90	10.00	3.80	4.50
	Bottom Depth (m):									10.50	4.00	5.00
	Date Sampled:				25-Mar-2019	25-Mar-2019	25-Mar-2019	25-Mar-2019	25-Mar-2019	25-Mar-2019	25-Mar-2019	25-Mar-2019
Determinand	Accred.	SOP	Units	LOD								
Moisture	N	2030	%	0.020	6.5	2.7	19	16	20	20	5.7	5.4
pH (2.5:1)	N	2010		N/A	[B] 9.1	[B] 9.2	[B] 9.0	[B] 8.5	[B] 9.0	[B] 8.9	[B] 9.1	[B] 8.9
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.020	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010	[B] 0.041	[B] < 0.010	[B] 0.012	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] 0.029	[B] 0.017
Chloride (Water Soluble)	U	2220	g/l	0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] < 0.010	[B] 0.015	[B] 0.041

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
816586		D	BH001	25-Mar-2019	B	Plastic Bag
816587		D	BH001	25-Mar-2019	B	Plastic Bag
816588		D	BH001	25-Mar-2019	B	Plastic Bag
816589		D	BH002	25-Mar-2019	B	Plastic Bag
816590		D	BH002	25-Mar-2019	B	Plastic Bag
816591		B	BH002	25-Mar-2019	B	Plastic Bag
816592		D	WS003	25-Mar-2019	B	Plastic Bag
816593		B	WS005	25-Mar-2019	B	Plastic Bag

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Appendix E

HUMAN HEALTH RISK ASSESSMENT METHODOLOGY



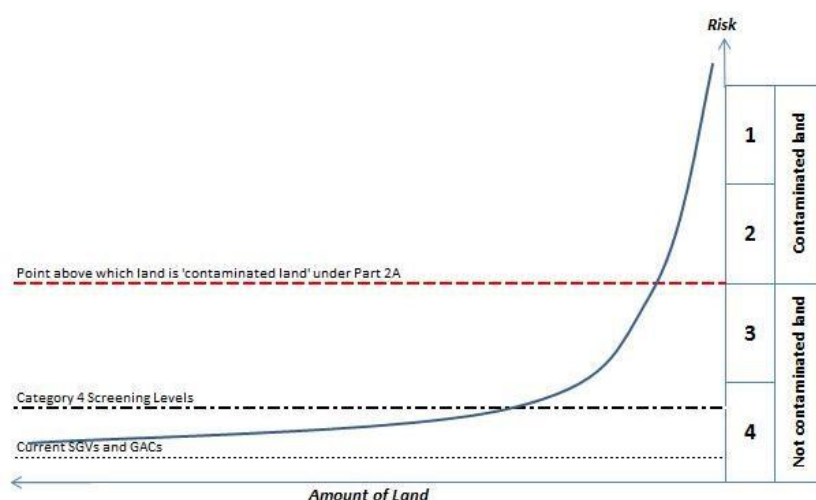
METHODOLOGY FOR THE DERIVATION OF GENERIC QUANTITATIVE ASSESSMENT CRITERIA TO EVALUATE RISKS TO HUMAN HEALTH FROM SOIL & GROUNDWATER CONTAMINATION

UK APPROACH

In the UK, the potential risks to human health from contamination in the ground are usually evaluated through a generic quantitative risk assessment (GQRA) approach. This allows generic and conservative exposure assumptions to be readily applied to risk assessments and can be a useful tool for rapidly screening data and to identify those contaminants or scenarios that could benefit from further investigation and/or site-specific detailed quantitative risk assessment (DQRA). Current industry good practice is to use the approach presented in the Environment Agency (EA) publications SR2¹ and SR3². This approach allows the derivation of Generic Assessment Criteria (GACs), primarily for chronic exposure.

In April 2012, the Department of Environment, Food and Rural Affairs (Defra) published updated statutory guidance³ which introduced a four category approach to determining whether land in England and Wales is contaminated or not on the grounds of significant possibility of significant harm (SPOSH). **Figure 1** presents a graphical representation of the categories.

Figure 1: Four Categories for Determining if Land Represent a SPOSH



Cases classified as Category 1 are considered to be SPOSH based on actual evidence or an unacceptably high probability of harm existing. Category 4 cases are those where there is no risk, or a low risk of SPOSH.

¹ Environment Agency 'Human Health Toxicological Assessment of Contaminants in Soil', Report SC050021/SR2. January 2009.

² Environment Agency 'Updated Technical Background to the CLEA Model,' Report SC050021/SR3. January 2009.

³ Defra 'Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance'. April 2012.

GACs represent a minimal risk level, well within Category 4. A 2014 publication by Contaminated Land: Applications in Real Environments (CL:AIRE), SP1010⁴ and endorsed by Defra⁵ provided an approach to determine Category 4 Screening Levels (C4SLs) which are higher than the GACs whilst being “more pragmatic but still strongly precautionary”. It also provided C4SLs for six contaminants of concern. Although the C4SLs were designed to support Part 2A assessments to determine ‘contaminated land’ they are specifically mentioned, along with reference to the Part 2A statutory guidance, by the Department for Communities and Local Government (DCLG) for use in a planning context⁶.

An updated version the Contaminated Land Exposure Assessment (CLEA) Workbook (v1.071) was released by the EA in September 2015 to take into account the publication of SP1010. The updates comprised: additional toxicity data for the six chemicals for which C4SLs were derived; two new public open space land use scenarios; updated exposure parameters; options to run the model using C4SL exposure assumptions; and increased functionality. There were no changes to algorithms, so it is still possible to replicate the withdrawn SGVs using the input parameters held within v1.071.

It should be noted that the four category approach has not been adopted in Scotland under Part 2A or the planning regime. The Part 2A statutory guidance applicable in Scotland (Paper SE/2006/44 dated May 2006) does not reflect the changes introduced by Defra in April 2012 which allow for the use of C4SLs within Part 2A risk assessments. Additionally, it is considered that the principal of ‘minimal risk’ should still apply under planning in Scotland, based on current guidance.

WSP APPROACH

Following the withdrawal of the SGVs, and in the absence of an industry-wide, accepted set of GACs it is down to individual practitioners to derive their own soil assessment criteria. WSP has used the approach provided within SR2, SR3, SP1010, CLEA Workbook v1.071 and SR4⁷ to produce a set of minimal risk GACs. The chemical-specific data within two key publications were considered during their production: CL:AIRE 2010⁸ and LQM 2015⁹. Both documents provide comprehensive sets of GACs for different contaminants of concern.

The LQM Suitable For Use Levels (S4ULs) have selected exposure parameters somewhere between those of the SR3 land uses and the C4SL exposure scenarios. This approach was rejected by WSP as not representing minimal risk, however, the LQM S4UL document was critically reviewed and the approach and chemical input parameters were utilised where considered to be appropriate.

An industry-led C4SL Working Group is in the process of deriving a larger set of C4SLs in the near future, for approximately 20 contaminants. This will include a critical review of the chemical input data for all selected substances, and may therefore lead to further amendments to the chemical input data used in the WSP in-house screening values. It is considered likely that the contaminant list will

⁴ CL:AIRE ‘Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination’ SP1010, Final Project Report (Revision 2). September 2014.

⁵ Defra ‘SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document’. December 2014.

⁶ DCLG Planning Practice Guidance ‘Land Affected by Contamination’, particularly Paragraphs 001 and 007. Ref IDs: 33-001-20140306 & 33-007-20140612.

⁷ Environment Agency ‘CLEA Software (Version 1.05) Handbook (and Software)’, Report SC050021/SR4. September 2009.

⁸ CL:AIRE ‘The EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment’. ISBN 978-1-05046-20-1. January 2010.

⁹ Nathanail et al ‘The LQM/CIEH S4ULs for Human Health Risk Assessment’, Land Quality Press, ISBN 978-0-9931084-0-2. 2015.

crossover with the current CL:AIRE GACs. As such, this document was not critically reviewed by WSP.

WSP's current approach to the assessment of risks to human health is to continue to evaluate minimal risk through the use of in-house derived GACs, and to use the published C4SLs as a secondary tier of assessment until such time as additional C4SLs are published and/or in-house values are derived.

EXPOSURE MODELS

LAND USES

WSP has largely adopted the exposure assumptions of the generic land use scenarios included within SR3, with two additional public open space scenarios included from within SP1010:

- à Residential with homegrown produce consumption;
- à Residential without homegrown produce consumption;
- à Allotments;
- à Commercial;
- à Public open space near residential housing (POS_{resi}); and
- à Public park (POS_{park}).

Exceptions are described in the following Sections.

SOIL PROPERTIES

SR3 assumes a sandy loam soil with a pH of 7 and a Soil Organic Matter (SOM) content of 6% for its generic land uses, based on the geographical spread of topsoils in the UK. WSP has adopted these default values. In addition, GACs based on an SOM of 1% and 2.5% have been derived, based on common experience of the nature of Made Ground and lack of topsoil on many brownfield sites.

RECEPTOR CHARACTERISTICS AND BEHAVIOURS

SP1010 provides some updated exposure parameters for long-term inhalation rates¹⁰ and the consumption rates for homegrown produce¹¹ compared to those provided in SR3. This data was used to derived WSP's GACs.

The changes in inhalation rates do not apply to the allotment generic land use scenario, as these are based on the breathing rates for short-term exposure of light to moderate intensity activity which were derived from a study that was not updated in USEPA 2011, so the SR3 rates were retained.

¹⁰ USEPA, National Centre for Environmental Assessment 'Exposure Factors Handbook: 2011 Edition' EPA/600/R-09/052F. September 2011.

¹¹ National Diet and Nutrition Survey 2008/2009 to 2010/2011.

CHEMICAL DATA

PHYSICO-CHEMICAL PARAMETERS

Physico-chemical properties for the contaminants for which GACs have been derived have been obtained following critical review of the following hierarchy of data sources:

1. Environment Agency/Defra SGV reports where available.
2. Environment Agency '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', Report SC050021/SR7, November 2008.
3. Published fate and transport reviews within Nathanail et. al 2015 and CL:AIRE 2010.

Where appropriate, and where sufficient data is available, values were adjusted to reflect a UK soil temperature of 10°C (e.g. K_{aw}).

TOXICOLOGICAL DATA

Toxicological data for the derivation of minimal risk Health Criteria Values (HCV) for each contaminant was selected with due regard to the approach presented in SR2. Where appropriate, the following hierarchy of data sources was used:

1. UK toxicity reviews published by authoritative bodies including:
 - < EA;
 - < Public Health England (PHE);
 - < Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT); and
 - < Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC).
2. Authoritative European sources such as European Food Standards Agency (EFSA)
3. International organisations including:
 - < World Health Organisation (WHO); and
 - < Joint FAO/WHO Expert Committee on Food Additives (JECFA).
4. Authoritative country-specific sources including:
 - < United States Environmental Protection Agency (USEPA);
 - < US Agency for Toxic Substances and Disease Registry (ATSDR);
 - < US Integrated Risk Information System (IRIS); and
 - < Netherlands National Institute for Public Health and the Environment (RIVM).

Factors such as the applicability of the data to human health (e.g. epidemiological vs. animal studies), the quality of the data, the level of uncertainty in the results and the age of the data were also taken into account in the final selection. Details for specific substances are available on request.

MEAN DAILY INTAKES

Estimations of background exposure for each threshold substance have been updated. In line with the SR2 approach, the exposure from non-threshold substances in the soil does not take into account exposure from other sources, and as such GACs were derived without consideration of the Mean Daily Intake (MDI) for those substances.

The data published by the EA in its series of TOX reports between 2002 and 2009 was evaluated to determine whether the values were considered to remain valid today. Values from these current UK published sources were not amended unless they were considered to be significantly different so that the GACs remained as comparable as possible with the revoked SGVs.

ORAL MEAN DAILY INTAKES

Oral MDI were generally estimated as the sum of exposure via the ingestion of food and drinking water using the default adult physiological parameters presented in Table 3.3 of SR2.

Data on the exposure of substances from food ingestion was generally obtained from UK Total Diet Studies (TDS) published by the Food Standards Agency (FSA) and its predecessor the Ministry of Agriculture, Fisheries and Food (MAFF) and from studies commissioned by COT. Where no UK-specific data was available, MDI were derived from the European Food Safety Authority (EFSA), Health Canada and US sources. This was a rare occurrence, and in these instances, the data was evaluated to determine its applicability to the UK.

Data on the concentrations of substances in tap water was obtained from a variety of sources. UK data was used where available, with preference given to Drinking Water Inspectorate (DWI) 2014 data from water company tap water testing (LOD, 1st and 99th percentile data is available). Where the substance was not included in tap water testing, other UK sources of information were considered including:

- à DWI data from water company tap water testing from previous years;
- à COT; and
- à FSA.

Where UK data was not available, a number of other data sources were considered, largely WHO International Programme on Chemical Safety (IPCS) Concise International Chemical Assessment Documents (CICADs) and background documents for the development of Guidelines for Drinking Water Quality, using professional judgement on the relevance of the data to the UK. The final decision on the MDI from drinking water was made using professional judgement on the balance of relevance and probability, taking into account the detection limit where not detected, Koc and solubility, reduction in use of the substance, banned substances, tight controls (e.g. on explosives) and with due consideration to the SR2 instruction that “if no data or information in background exposure are available, background exposure should be assumed to be negligible and the MDI set to zero....”.

Data from other countries was generally not used because it was considered that the hydrogeology of these countries along with industrial practices were unlikely to be reflective of the UK.

INHALATION MEAN DAILY INTAKES

Inhalation MDIs were based on estimates of average daily exposure by the inhalation pathway and calculated using the default adult physiological parameters presented in Table 3.3 of SR2.

The inhalation MDIs were generally estimated using background exposure data from the UK, derived from Defra's UK-AIR: Air Information Resource¹², which provides ambient air quality data from a number of sites forming a UK-wide monitoring network. The MDIs for heavy metals were based on rolling annual average metal mass concentration data from Defra's UK Heavy Metals Monitoring Network from the period October 2009 to September 2010¹³.

Information for some substances was obtained from UK sources including Environment Agency TOX reports and data from the UK Expert Panel on Air Quality Standards (EPAQS). Where recent UK data was not available, data was sourced from the International Programme on Chemical Safety (IPCS), the World Health Organisation (WHO), the Agency for Toxic Substances and Diseases Registry (ATSDR), Health Canada, and various other peer-reviewed sources summarised by LQM/CIEH¹⁴.

For other substances, where no data or information on background exposure was available, background exposure was assumed to be negligible and the MDI set at 0.5*TDI in accordance with guidance in SR2.

PLANT UPTAKE

Soil to plant concentration factors are available in CLEA v1.071 for arsenic, cadmium, hexavalent chromium, lead, mercury, nickel and selenium. For all remaining inorganic chemicals, concentration factors were obtained using the PRISM model. Substance-specific correction factors have been selected in accordance with the guidance established within SR3. This is consistent to the approach utilised in the derivation of the LQM S4UL values and the EIC/AGS/CL:AIRE GAC.

Where there is a lack of appropriate data to enable the derivation of specific soil to plant concentrations factors for organic chemicals, plant uptake was modelled within CLEA v1.071 using the generic equations recommended within SR3, as follows:

- à Green Vegetables – Ryan et al. (1988);
- à Root Vegetables – Trapp (2002);
- à Tuber Vegetables – Trapp et al. (2007); and
- à Tree Fruit – Trapp et al. (2003).

There are no suitable models available for modelling uptake for herbaceous fruit or shrub fruit. Exposure is considered negligible.

¹² Crown 2016 copyright Defra via uk-air.defra.gov.uk, licenced under the Open Government Licence (OGL).

¹³ Defra, 2013 Spreadsheet of historic data for multiple years for the Metals network. Available online at: <http://uk-air.defra.gov.uk/data/metals-data>. [Accessed 13/03/2016].

¹⁴ LQM/CIEH, 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment.

SOIL SATURATION LIMITS

GACs are not limited to their theoretical soil saturation within CLEA, although where either the aqueous or the vapour-based saturation is exceeded, this is highlighted within the Workbook (compared with the lower of the two values). This affects pathways which depend on partitioning calculations so in reality this only affects the vapour pathways and is relevant to organic substances and other substances, such as elemental mercury, that have a significant volatile component. However, the Workbook highlights saturation for direct contact pathways to indicate to the user where further qualitative consideration of free phase contamination at surface may be required.

Where the lower of the two saturation limits is exceeded and the vapour pathway is the only exposure route being considered, the chronic risks to human health are likely to be negligible. Further evaluation could be undertaken using an alternative model suitable for evaluating non-aqueous phase liquids (NAPLs), such as the Johnson & Ettinger (J&E) approach described in USEPA 2003. However, WSP considers that if NAPLs are suspected, given the known limitations and over-simplifications of J&E, soil vapour monitoring is a more accurate way of assessing potential risks.

Where the lower saturation limit is exceeded for the vapour pathway and a number of exposure routes are being considered, then the contribution from the NAPL via vapour inhalation to the overall exposure can be evaluated using the procedure provided in SR4. WSP would evaluate this as part of a DQRA process or through soil vapour monitoring on-site to determine site-specific soil vapour concentrations.

CHEMICAL SPECIFIC ASSUMPTIONS

CYANIDES

Cyanide has high acute toxicity, and short term exposure is an important consideration when assessing the risks from soils contaminated with cyanide. The primary risk to human receptors from free cyanide in soils is an acute risk.

There is no current UK guidance available for calculating acute risks from free cyanide. Consequently, GAC for acute exposure were derived using the algorithms presented in MADEP 1992¹⁵ and assuming a one-off ingestion of 10g of soil (this conservative value has been taken as an upper bound estimate for a one-off soil ingestion rate amongst children). Receptor body weights have been selected according to the critical receptor for each exposure scenario. The lowest of the chronic and acute GAC for each land use scenario were adopted by WSP. Brinckerhoff.

LEAD

The SGV for lead was withdrawn by the EA in 2009, and in 2011 the EA withdrew their published TOX report in light of new scientific evidence. The C4SL for lead was derived using the latest scientific evidence from a large human dataset. As such, no chemical-specific margin was applied in the derivation of the C4SL for lead. It may be possible for WSP to derive a GAC for lead using the same dataset and applying a chemical-specific margin, but the value is likely to be lower than UK natural background concentrations. Therefore, WSP has adopted the toxicological data used to derive the C4SLs in deriving the GAC for lead until such time as alternative GACs are published by an authoritative body. The relative bioavailability was set at 100% in line with the approach taken for other GACs, whereas the C4SL assumes 60% for soil and 64% for airborne dust. Thus, the WSP GAC are lower than the C4SLs.

¹⁵ MADEP 'Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration' 1992. http://www.mass.gov/dep/toxics/cn_soil.htm

POLYCYCLIC AROMATIC HYDROCARBONS

WSP's approach to the assessment of polycyclic aromatic hydrocarbons (PAHs) uses the surrogate marker approach. BaP was used as a surrogate marker for all genotoxic PAHs in line with the Health Protection Agency 2010¹⁶ recommendations and SP1010. This assumes that the PAH profile of the data is similar to that of the coal tars used in the Culp *et al* oral carcinogenicity study from which the toxicity data for BaP was produced. In reality, this profile has been shown by HPA to be applicable on the majority of contaminated sites based on assessment of sites across the country.

The alternative is the Toxic Equivalency Factor (TEF) approach which uses a reference compound and assigns TEFs for other compounds based on estimates of potency. Key uncertainties with this approach include the assumption that all compounds have the same toxic mechanism of action within the body and that no compounds with a greater potency than the reference compound are present. It is considered by the HPA that the TEF approach is likely to under predict the true carcinogenicity of PAHs and therefore favours the surrogate marker approach.

For these reasons, WSP considers that the adoption of BaP as a surrogate marker for genotoxic PAHs as opposed to the TEF approach is reasonable, even in cases where the PAH profile may differ from that of the Culp *et al* study. In addition, WSP has derived a GAC for naphthalene, which is commonly a risk driver due to its high volatility, relative to other PAH compounds, as an indicator compound for threshold PAHs.

TRIMETHYLBENZENES

The GAC for trimethylbenzenes can be used for the assessment of any individual isomer (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene or 1,3,5-trimethylbenzene), or a mixture of the three isomers.

CHEMICAL GROUPS

For a number of chemical groups, the available toxicity data is for combinations of chemicals. Given that the physico-chemical parameters may differ between the chemicals, the GACs for the chemicals within the groups have been calculated and then the lowest GAC selected to represent the entire group. This was the approach taken by the EA for m-, o- and p-xylenes, and has also been adopted by WSP for:

- à 2-chlorophenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol and 2,3,4,6-tetrachlorophenol;
- à 2-, 3- and 4-methylphenol (total cresols);
- à aldrin and dieldrin; and
- à α - and β -endosulphan.

¹⁶ HPA Contaminated Land Information Sheet 'Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs) 2010

EXPOSURE TO VAPOURS

INHALATION OF MEASURED VAPOURS

WSP has derived a set of soil vapour GACs (GAC_{sv}) that allow for the assessment of measured site soil vapour concentrations, using J&E, in order to establish potential risks via indoor inhalation of vapours. This methodology enables a more robust assessment of exposure via the inhalation of soil vapours indoors than using CLEA-derived soil GAC, as it is based upon measured soil vapour concentrations beneath the site. It also allows for the assessment of vapours from all source terms (i.e. groundwater, soil or NAPL). Outdoor inhalation was not included. WSP considers that the indoor inhalation pathway is the significantly dominant risk-driver.

The generic land use scenarios within CLEA (residential and commercial) that were used to derive the soil GAC were used to define the receptor and building characteristics for the soil vapour GAC. Only residential and commercial generic land use scenarios include the indoor inhalation of vapours pathway.

The GAC_{sv} were derived for three different soil types; sand, sandy loam and clay, reflecting the importance of this parameter within the J&E model. A depth to contamination of 0.85 m below the base of the building foundation was assumed (i.e. 1 m below ground level). This differs from the depth assumed for the soil GAC (0.5 m bgl), but was selected by WSP as a reasonable worst case scenario.

It is acknowledged that the J&E commonly over-predicts indoor vapour concentrations. In particular, it will significantly over-predict vapour concentrations for suspended floor slabs, which many new builds are constructed with, it does not take into account lateral migration and assumes an infinite source of contamination at steady state conditions. In addition, it is common for soil gas/vapour wells to be installed with at least 1 m of plain riser at the surface and this equates to a total depth of 0.85 m below the building foundation plus a 0.15 m thick foundation, and so is more representative of the depth that samples will be taken from.

The TDSIs and IDs for each substance were converted from $\mu g kg^{-1} bw day^{-1}$ to $\mu g m^{-3}$ using the standard conversions quoted in Table 3.3 of SR2, thereby replacing the need to model C_{air} in the equation:

$$C_{air} = \alpha \cdot C_{vap} \cdot 1,000,000 cm^3 m^{-3}$$

Where:

C_{air} is the concentration of vapours within the building, mg^{-3}

α is the steady state attenuation coefficient between soil and indoor air, dimensionless

C_{vap} is the soil vapour concentration, $mg cm^{-3}$

The target concentrations within indoor air for each substance (C_{air}) are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual exposure model (assuming standard CLEA occupancy periods and receptors).

The attenuation factor was calculated using J&E (Equation 10.4 in SR3) and the resulting C_{vap} is equivalent to the GAC_{sv} for the modelled exposure scenario.

Where the calculated GAC_{sv} for a substance exceeds the vapour saturation limit, no GAC_{sv} has been proposed.

INHALATION OF GROUNDWATER-DERIVED VAPOURS

The CLEA model does not have the capacity to derive GACs to assess vapours derived from dissolved phase contamination. WSP has derived a set of groundwater GACs (GAC_{gw}) to evaluate the potential risks through the indoor inhalation of groundwater-derived vapours by first applying the approach described above for the derivation of the WSP GAC_{sv} to determine the acceptable concentration in soil vapour directly above the water table.

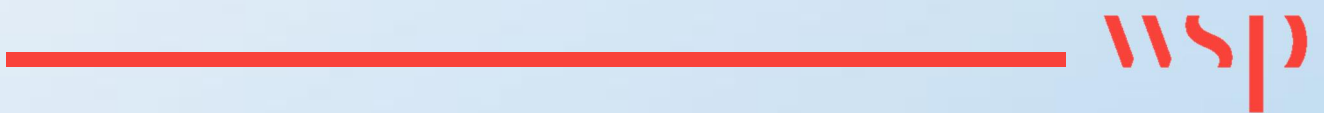
The depth to groundwater was assumed to be 1 m bgl (i.e. 0.85 m below the base of the building foundation). This depth was considered to be more representative of commonly encountered groundwater conditions than the 0.5 m below the base of the building foundation (i.e. 0.65 m bgl) that is used by CLEA for an unsaturated source present in the overlying soil.

The GAC_{gw} was then back-calculated from the GAC_{sv} using the air-water partition coefficient (K_{aw}) for each substance.

Where the calculated GAC_{gw} for a substance exceeds the solubility limit, no GAC_{gw} has been proposed.

Appendix F

HUMAN HEALTH SCREENING TABLE



Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Unrecognised analytes

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Bis(2-chloroisopropyl)ether (TIC) (Unrecognised code)	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	

Aliphatics and Aromatics

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Aliphatic C05-C06	0.010	0.006	0.015	0.010	0.032	0.20	42.0	mg/kg	6	24	4	0	
Aliphatic C06-C08	0.010	0.008	0.026	0.010	0.88	5.46	103	mg/kg	6	24	10	0	
Aliphatic C08-C10	0.010	0.012	0.044	0.010	10.0	61.2	27.0	mg/kg	6	24	11	1	WS005
Aliphatic C10-C12	0.010	0.029	0.25	0.010	49.1	272	132	mg/kg	6	24	11	1	WS005
Aliphatic C12-C16	0.10	1.27	7.81	0.10	552	2,470	1,030	mg/kg	6	24	17	1	WS005
Aliphatic C16-C35	0.10	30.7	146	3.59	883	4,200	88,400	mg/kg	6	24	23	0	
Aliphatic C35-C44	0.10	18.7	257	0.42	24.6	119	88,400	mg/kg	6	24	20	0	
Aliphatics C12-C44	0.10	50.9	403	5.28	1,458	6,780	-	mg/kg	6	24	23	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Aliphatics and Aromatics

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Aromatic C06-C07	0.010	0.005	0.010	0.010	0.025	0.20	-	mg/kg	6	24	0	0	
Aromatic C07-C08	0.010	0.007	0.032	0.010	0.025	0.20	130	mg/kg	6	24	1	0	
Aromatic C08-C10	0.010	0.009	0.029	0.010	6.68	40.8	34.0	mg/kg	6	24	10	1	WS005
Aromatic C10-C12	0.010	0.021	0.17	0.010	32.8	182	74.0	mg/kg	6	24	11	1	WS005
Aromatic C12-C16	0.10	6.01	38.8	0.34	246	1,290	141	mg/kg	6	24	23	1	WS005
Aromatic C12-C44	5.80	640	4,020	1.80	715	3,540	-	mg/kg	6	24	24	0	
Aromatic C16-C21	0.77	87.7	491	0.57	339	1,650	249	mg/kg	6	24	24	2	BH002, WS005
Aromatic C16-C35	5.22	494	3,250	1.46	450	2,170	-	mg/kg	6	24	24	0	
Aromatic C21-C35	4.45	407	2,760	0.26	111	517	873	mg/kg	6	24	24	1	BH002
Aromatic C35-C44	0.58	139	724	0.10	17.5	74.1	873	mg/kg	6	24	23	0	
Aromatic C40-C44	0.10	46.9	192	0.10	7.23	30.7	-	mg/kg	6	24	22	0	
Total Aliphatics and Aromatics (C5-C44)	5.80	691	4,050	7.83	2,275	10,900	-	mg/kg	6	24	24	0	
TPH Hazard Index	0.010	1.02	6.25	0.014	5.18	26.9	1.00	mg/kg	6	24	N/A	6	BH001, BH002, WS001, WS002, WS003, WS005

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Alkali and Alkaline Earth Metals

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING	
	MIN	MEAN*	MAX	MIN	MEAN*	MAX								
Barium	78.2	337	1,340	9.09	30.0	77.0	1,210	mg/kg	6	35	35	1	WS003	
Beryllium	0.36	1.13	3.35	0.010	0.22	0.68	1.70	mg/kg	6	35	33	1	WS001	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Asbestos

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Asbestos Quantification - Gravimetric	0.001	0.0005	0.001	-	-	-	-	%	2	2	0	0	
Asbestos Quantification - PCM Evaluation	0.001	0.0005	0.001	-	-	-	-	%	2	2	0	0	
Asbestos Quantification - Total %	0.001	0.0005	0.001	-	-	-	-	%	2	2	0	0	
Additional Asbestos Components using TM048 (Quantification)	-	-	-	-	-	-	-	No units	2	2	0	0	
Asbestos Ex. actinolite	-	-	-	-	-	-	-	No units	6	12	0	0	
Asbestos Ex. Amosite	-	-	-	-	-	-	-	No units	6	12	0	0	
Asbestos Ex. anthophyllite	-	-	-	-	-	-	-	No units	6	12	0	0	
Asbestos Ex. Chrysotile	-	-	-	-	-	-	-	No units	6	12	0	0	
Asbestos Ex. crocidolite	-	-	-	-	-	-	-	No units	6	12	0	0	
Asbestos Ex. tremolite	-	-	-	-	-	-	-	No units	6	12	0	0	
Asbestos Quantification Comments	-	-	-	-	-	-	-	No units	2	2	0	0	
Non-Asbestos Fibres	-	-	-	-	-	-	-	No units	6	12	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

BTEX and Fuel Additives

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
1,2,4-Trimethylbenzene	0.090	0.045	0.090	0.090	0.30	1.85	5.00	mg/kg	5	9	1	0	
1,3,5-Trimethylbenzene	0.080	0.040	0.080	0.080	0.040	0.080	5.00	mg/kg	5	9	0	0	
Benzene	0.090	0.045	0.090	0.090	0.045	0.090	0.089	mg/kg	6	24	0	0	
Ethylbenzene	0.040	0.020	0.040	0.040	0.020	0.040	47.0	mg/kg	6	24	0	0	
Methyl t-butylether (MTBE)	0.10	0.050	0.10	0.10	0.050	0.10	62.0	mg/kg	6	24	0	0	
Tertiary Amyl Methyl Ether (TAME)	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	6	24	0	0	
Toluene	0.070	0.035	0.070	0.070	0.035	0.070	131	mg/kg	6	24	0	0	
Xylene - Total (Summed)	0.10	0.10	0.10	0.10	0.10	0.10	57.0	mg/kg	6	24	24	0	
Xylene-m & p	0.10	0.050	0.10	0.10	0.050	0.10	57.0	mg/kg	6	24	0	0	
Xylene-o	0.10	0.050	0.10	0.10	0.050	0.10	57.0	mg/kg	6	24	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Chlorinated Aliphatics

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
1,1,1,2-Tetrachloroethane	0.10	0.050	0.10	0.10	0.050	0.10	1.20	mg/kg	5	9	0	0	
1,1,1-Trichloroethane	0.070	0.035	0.070	0.070	0.035	0.070	21.0	mg/kg	5	9	0	0	
1,1,2,2-Tetrachloroethane	0.10	0.050	0.10	0.10	0.050	0.10	1.60	mg/kg	5	9	0	0	
1,1,2-Trichloroethane	0.10	0.050	0.10	0.10	0.050	0.10	0.76	mg/kg	5	9	0	0	
1,1-Dichloroethane	0.080	0.040	0.080	0.080	0.040	0.080	3.40	mg/kg	5	9	0	0	
1,1-Dichloroethene	0.10	0.050	0.10	0.10	0.050	0.10	0.32	mg/kg	5	9	0	0	
1,1-Dichloropropene	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
1,2,3-Trichloropropane	0.16	0.080	0.16	0.16	0.080	0.16	-	mg/kg	5	9	0	0	
1,2-Dichloroethane	0.050	0.025	0.050	0.050	0.025	0.050	0.007	mg/kg	5	9	0	0	
1,2-Dichloropropane	0.10	0.050	0.10	0.10	0.050	0.10	0.034	mg/kg	5	9	0	0	
1,3-Dichloropropane	0.070	0.035	0.070	0.070	0.035	0.070	-	mg/kg	5	9	0	0	
2,2-Dichloropropane	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Carbon tetrachloride	0.10	0.050	0.10	0.10	0.050	0.10	0.36	mg/kg	5	9	0	0	
Chloroethane	0.10	0.050	0.10	0.10	0.050	0.10	12.0	mg/kg	5	9	0	0	
Chloroform	0.080	0.040	0.080	0.080	0.040	0.080	0.92	mg/kg	5	9	0	0	
Chloromethane	0.070	0.035	0.070	0.070	0.035	0.070	0.012	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Chlorinated Aliphatics

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Cis 1,2-Dichloroethene	0.060	0.030	0.060	0.060	0.030	0.060	0.16	mg/kg	5	9	0	0	
Cis 1,3-Dichloropropene	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Dichloromethane	0.10	0.050	0.10	0.10	0.050	0.10	0.62	mg/kg	5	9	0	0	
Hexachlorobutadiene	0.20	0.10	0.20	0.10	0.057	0.20	0.31	mg/kg	5	9	0	0	
Hexachloroethane	0.50	0.63	2.00	0.10	0.11	1.00	0.27	mg/kg	5	9	0	0	
Tetrachloroethene (PCE)	0.050	0.025	0.050	0.050	0.025	0.050	0.18	mg/kg	5	9	0	0	
Trans-1,2-Dichloroethene	0.10	0.050	0.10	0.10	0.050	0.10	0.27	mg/kg	5	9	0	0	
Trans-1,3-Dichloropropene	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Trichloroethene (TCE)	0.090	0.045	0.090	0.090	0.045	0.090	0.016	mg/kg	5	9	0	0	
Vinyl chloride	0.060	0.030	0.060	0.060	0.030	0.060	0.0006	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Chlorinated Aromatics

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
1,2,3-Trichlorobenzene	0.20	0.10	0.20	0.20	0.10	0.20	1.50	mg/kg	5	9	0	0	
1,2,4-Trichlorobenzene	0.20	0.10	0.20	0.10	0.057	0.20	2.50	mg/kg	5	9	0	0	
1,2-Dichlorobenzene	0.10	0.050	0.10	0.10	0.050	0.10	23.0	mg/kg	5	9	0	0	
1,3-Dichlorobenzene	0.080	0.040	0.080	0.080	0.040	0.080	0.41	mg/kg	5	9	0	0	
1,4-Dichlorobenzene	0.050	0.025	0.050	0.050	0.025	0.050	6.60	mg/kg	5	9	0	0	
2-Chlorotoluene	0.090	0.045	0.090	0.090	0.045	0.090	-	mg/kg	5	9	0	0	
4-Chlorotoluene	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Chlorobenzene	0.050	0.025	0.050	0.050	0.025	0.050	0.62	mg/kg	5	9	0	0	
Hexachlorobenzene	0.50	0.63	2.00	0.10	0.11	1.00	1.60	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Chlorinated Phenols

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
2,4,5-Trichlorophenol	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
2,4,6-Trichlorophenol	0.50	0.63	2.00	0.10	0.11	1.00	2.20	mg/kg	5	9	0	0	
2,4-Dichlorophenol	0.50	0.63	2.00	0.10	0.11	1.00	2.20	mg/kg	5	9	0	0	
2-Chlorophenol	0.50	0.63	2.00	0.10	0.11	1.00	2.20	mg/kg	5	9	0	0	
4-Chloro-3-Methylphenol	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Chlorophenols - Total (Summed Isomers)	0.50	1.25	2.00	0.10	0.23	1.00	2.20	mg/kg	5	9	9	0	

Dioxins and Furans

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Dibenzofuran	0.50	0.63	2.00	0.10	0.43	2.60	-	mg/kg	5	9	2	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Dyes

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
3-Nitroaniline	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
4-Nitroaniline	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	

Explosives

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
2,4-Dinitrotoluene	0.50	0.63	2.00	0.10	0.11	1.00	1.50	mg/kg	5	9	0	0	
2,6-Dinitrotoluene	0.50	0.63	2.00	0.10	0.11	1.00	0.81	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

General Chemistry

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
pH	7.88	8.40	10.1	6.79	8.40	8.95	-	pH Units	6	35	35	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Halogonated Hydrocarbons

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
1,2-Dibromo-3-Chloropropane	0.14	0.070	0.14	0.14	0.070	0.14	-	mg/kg	5	9	0	0	
1,2-Dibromoethane	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Bromobenzene	0.10	0.050	0.10	0.10	0.050	0.10	1.20	mg/kg	5	9	0	0	
Bromochloromethane	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Bromodichloromethane	0.070	0.035	0.070	0.070	0.035	0.070	0.022	mg/kg	5	9	0	0	
Bromoform	0.10	0.050	0.10	0.10	0.050	0.10	3.50	mg/kg	5	9	0	0	
Bromomethane	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Dibromochloromethane	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
Dibromomethane	0.090	0.045	0.090	0.090	0.045	0.090	-	mg/kg	5	9	0	0	
Dichlorodifluoromethane	0.060	0.030	0.060	0.060	0.030	0.060	-	mg/kg	5	9	0	0	
Trichlorofluoromethane	0.060	0.030	0.060	0.060	0.030	0.060	-	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Inorganics

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Cyanide (Complex)	1.00	0.73	3.63	1.00	0.50	1.00	-	mg/kg	6	24	2	0	
Cyanide (Free)	1.00	0.50	1.00	1.00	0.50	1.00	15.0	mg/kg	6	24	0	0	
Cyanide (Total)	1.00	0.75	3.75	1.00	0.50	1.00	-	mg/kg	6	24	2	0	
Nitrate	4.34	16.1	37.6	0.50	0.60	1.10	-	mg/kg	6	24	22	0	
Nitrite	0.22	0.49	1.07	0.10	0.52	0.90	-	mg/kg	6	22	20	0	
Sulphate as SO ₄	48.0	484	1,010	148	221	294	-	mg/kg	6	24	23	0	
Sulphide	15.0	7.50	15.0	15.0	18.0	36.9	-	mg/kg	6	24	4	0	
2:1 Water Soluble Ammonium	845	1,979	4,060	1,410	2,753	3,580	-	ug/l	6	24	24	0	

Ketones

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Isophorone	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Metals

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Arsenic	11.7	23.1	43.7	0.60	13.4	26.4	32.0	mg/kg	6	35	32	1	WS001
Boron	1.00	0.65	1.21	1.00	0.55	1.44	300	mg/kg	6	35	5	0	
Cadmium	0.22	0.70	1.41	0.020	0.14	0.45	12.0	mg/kg	6	35	33	0	
Chromium	0.90	11.1	18.3	0.90	6.98	19.0	-	mg/kg	6	35	27	0	
Copper	16.7	58.1	127	1.40	6.64	17.8	2,490	mg/kg	6	35	32	0	
Hexavalent Chromium	0.60	0.42	2.33	0.60	0.30	0.60	4.50	mg/kg	6	35	1	0	
Lead	64.2	778	4,580	0.70	10.6	67.4	148	mg/kg	6	35	32	5	BH001, WS001, WS002, WS003, WS005
Mercury	0.14	0.72	2.09	0.14	0.11	1.40	39.0	mg/kg	6	35	15	0	
Nickel	19.8	29.9	60.8	0.98	15.8	32.5	126	mg/kg	6	35	35	0	
Selenium	1.00	0.50	1.00	1.00	0.75	10.0	258	mg/kg	6	35	0	0	
Vanadium	25.4	39.5	51.9	1.17	26.6	52.3	413	mg/kg	6	35	35	0	
Zinc	63.6	363	971	7.84	32.8	76.3	3,860	mg/kg	6	35	35	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Other

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
2-Chloronaphthalene	0.50	0.63	2.00	0.10	0.11	1.00	5.30	mg/kg	5	9	0	0	
4-Bromophenylphenyl ether	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
4-Chloroaniline	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
4-Chlorophenyl phenyl ether	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Azobenzene	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Bis (2-chloroethoxy) methane	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Bis (2-chloroethyl) ether	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Carbazole	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Carbon Disulphide	0.070	0.035	0.070	0.070	0.035	0.070	0.14	mg/kg	5	9	0	0	
Catechol	0.010	0.005	0.010	0.010	0.005	0.010	-	mg/kg	5	9	0	0	
Naphthols	0.010	0.005	0.010	0.010	0.005	0.010	-	mg/kg	5	9	0	0	
Nitrobenzene	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
n-Nitrosodi-n-Propylamine	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Resorcinol	0.050	0.025	0.050	0.050	0.025	0.050	-	mg/kg	5	9	0	0	
Styrene	0.10	0.050	0.10	0.10	0.050	0.10	8.90	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

PAHs

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
2-Methylnaphthalene	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Acenaphthene	0.008	0.19	0.55	0.008	0.22	3.54	-	mg/kg	6	35	20	0	
Acenaphthylene	0.052	2.05	13.8	0.012	0.078	0.99	-	mg/kg	6	35	20	0	
Anthracene	0.042	1.91	7.05	0.016	0.19	2.53	-	mg/kg	6	35	19	0	
Benzo (a) anthracene	0.35	17.0	134	0.014	0.033	0.25	-	mg/kg	6	35	21	0	
Benzo (a) pyrene	0.49	20.9	167	0.015	0.031	0.17	1.60	mg/kg	6	35	22	6	BH001, BH002, WS001, WS002, WS003, WS005
Benzo (b) fluoranthene	0.49	23.7	198	0.015	0.040	0.25	-	mg/kg	6	35	22	0	
Benzo (ghi) perylene	0.44	13.3	88.7	0.024	0.028	0.12	-	mg/kg	6	35	21	0	
Benzo (k) fluoranthene	0.21	9.77	81.8	0.014	0.017	0.089	-	mg/kg	6	35	21	0	
Chrysene	0.31	12.9	84.2	0.010	0.043	0.43	-	mg/kg	6	35	22	0	
Dibenzo (ah) anthracene	0.069	2.44	16.5	0.023	0.012	0.023	-	mg/kg	6	35	17	0	
Fluoranthene	0.63	25.8	155	0.017	0.094	0.87	-	mg/kg	6	35	23	0	
Fluorene	0.010	0.40	1.46	0.010	0.55	8.04	-	mg/kg	6	35	20	0	
Indeno (1,2,3-cd) pyrene	0.31	16.4	142	0.018	0.024	0.12	-	mg/kg	6	35	21	0	
Naphthalene	0.011	0.57	5.56	0.009	0.069	0.87	2.30	mg/kg	6	35	21	1	BH002
PAH Total (EPA 16)	4.14	154	885	0.12	2.21	28.5	-	mg/kg	6	35	23	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

PAHs

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Phenanthrene	0.13	6.22	25.0	0.015	0.92	13.7	-	mg/kg	6	35	22	0	
Pyrene	0.59	24.8	160	0.015	0.12	1.59	-	mg/kg	6	35	23	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

PCBs

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
PCB105	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB114	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB118	0.004	0.006	0.015	-	-	-	-	mg/kg	3	3	2	0	
PCB123	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB126	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB156	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB157	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB167	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB169	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB189	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB77	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
PCB81	0.003	0.004	0.015	-	-	-	-	mg/kg	3	3	0	0	
Total PCB Congeners WHO12	0.036	0.042	0.18	-	-	-	-	mg/kg	3	3	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Pesticides, Herbicides and Insecticides

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Hexachlorocyclopentadiene	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Pentachlorophenol	0.50	0.63	2.00	0.10	0.11	1.00	3.00	mg/kg	5	9	0	0	

Pharmaceuticals

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
2-Nitroaniline	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Phenols

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
2,4-Dimethylphenol	0.50	0.63	2.00	0.10	0.11	1.00	20.0	mg/kg	5	9	0	0	
2-IsoPropylphenol	0.015	0.008	0.015	0.015	0.008	0.015	-	mg/kg	5	9	0	0	
2-Methylphenol (o-Cresol)	0.50	0.63	2.00	0.10	0.11	1.00	84.0	mg/kg	5	9	0	0	
2-Nitrophenol	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
4-Methylphenol	0.50	0.63	2.00	0.10	0.11	1.00	84.0	mg/kg	5	9	0	0	
4-Nitrophenol	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Cresols	0.010	0.005	0.010	0.010	0.006	0.013	84.0	mg/kg	5	9	1	0	
Methylphenols Total (Summed)	0.50	1.25	2.00	0.10	0.23	1.00	84.0	mg/kg	5	9	9	0	
Phenol	0.010	0.005	0.010	0.010	0.005	0.010	102	mg/kg	5	9	0	0	
Phenols, Total Detected 8 Speciated	0.13	0.065	0.13	0.13	0.065	0.13	-	mg/kg	5	9	0	0	
Trimethylphenols	0.010	0.014	0.022	0.010	0.005	0.010	-	mg/kg	5	9	1	0	
Xylenols	0.015	0.008	0.015	0.015	0.008	0.015	-	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

Phthalates

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
Bis (2-ethylhexyl) phthalate	0.50	0.63	2.00	0.10	0.11	1.00	284	mg/kg	5	9	0	0	
Butyl benzyl phthalate	0.50	0.63	2.00	0.10	0.11	1.00	1,440	mg/kg	5	9	0	0	
Diethyl phthalate	0.50	0.63	2.00	0.10	0.11	1.00	123	mg/kg	5	9	0	0	
Dimethyl phthalate	0.50	0.63	2.00	0.10	0.11	1.00	-	mg/kg	5	9	0	0	
Di-n-butyl phthalate	0.50	0.63	2.00	0.10	0.11	1.00	13.0	mg/kg	5	9	0	0	
Di-n-octyl phthalate	0.50	0.63	2.00	0.10	0.11	1.00	2,240	mg/kg	5	9	0	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

QA Standard

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
4-Bromofluorobenzene	89.0	89.8	90.5	70.3	94.6	102	-	%	5	9	9	0	
Acenaphthene-d10	72.4	83.2	98.8	82.8	91.3	116	-	%	6	35	35	0	
Chrysene-d12	72.0	84.1	98.6	-	84.4	98.7	-	%	6	35	35	0	
Dibromofluoromethane	104	106	108	104	110	119	-	%	5	9	9	0	
Naphthalene-d8	79.2	90.4	102	72.6	94.5	102	-	%	6	35	35	0	
Perylene-d12**	71.3	86.6	101	71.2	88.9	99.2	-	%	6	35	35	0	
Phenanthrene-d10 IS	77.7	86.7	98.5	85.8	93.6	106	-	%	6	35	35	0	
Toluene-d8 Surrogate	98.8	99.4	100	86.6	98.6	105	-	%	5	9	9	0	

Residential HG Veg, SOM=1%

Site Area(s) Selected: N/A, Whole site

Phase(s): All phases, N/A

Notes: * For results below LOD, a value of half LOD is used in the calculation of the mean

TPH/EPH

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
GRO Surrogate	71.3	99.4	148	92.0	105	144	-	%	6	24	24	0	
PRO (C5-C12)	0.10	0.098	0.52	0.10	99.7	562	-	mg/kg	6	24	9	0	

VOCs

ANALYTE	MADEGROUND			NATURAL GROUND			ASSESSMENT CRITERIA (AC)	UNITS	NO. OF LOCATIONS	NO. OF SAMPLES	NO. OF SAMPLES > LOD	NO. OF LOCATIONS > AC	LOCATIONS FAILING SCREENING
	MIN	MEAN*	MAX	MIN	MEAN*	MAX							
4-Isopropyltoluene	0.10	0.050	0.10	0.10	0.050	0.10	-	mg/kg	5	9	0	0	
iso-Propylbenzene	0.050	0.025	0.050	0.050	0.27	1.72	15.0	mg/kg	5	9	1	0	
n-Butylbenzene	0.11	0.055	0.11	0.11	0.77	5.05	-	mg/kg	5	9	1	0	
n-Propylbenzene	0.10	0.050	0.10	0.10	0.48	3.09	46.0	mg/kg	5	9	1	0	
Sec-Butylbenzene	0.10	0.050	0.10	0.10	0.78	5.15	-	mg/kg	5	9	1	0	
Tert-Butylbenzene	0.14	0.070	0.14	0.14	0.070	0.14	-	mg/kg	5	9	0	0	

EXCEEDANCES OF Residential HG Veg, SOM=1%

Aliphatics and Aromatics

Analyte	Point ID	Depth	Result	Threshold	Units	Stratum
Aliphatic C08-C10	WS005	2.5	61.2	27.0	mg/kg	ALLUVIUM
Aliphatic C10-C12	WS005	2.5	272	132	mg/kg	ALLUVIUM
Aliphatic C12-C16	WS005	2.5	2470	1030	mg/kg	ALLUVIUM
Aromatic C08-C10	WS005	2.5	40.8	34.0	mg/kg	ALLUVIUM
Aromatic C10-C12	WS005	2.5	182	74.0	mg/kg	ALLUVIUM
Aromatic C12-C16	WS005	1.8	355	141	mg/kg	ALLUVIUM
	WS005	2.5	1290	141	mg/kg	ALLUVIUM
Aromatic C16-C21	BH002	0.3	491	249	mg/kg	MADE GROUND
	WS005	1.8	546	249	mg/kg	ALLUVIUM
	WS005	2.5	1650	249	mg/kg	ALLUVIUM
Aromatic C21-C35	BH002	0.3	2760	873	mg/kg	MADE GROUND
TPH Hazard Index Calculation	BH002	0.3	6.25	1.00	mg/kg	MADE GROUND
	BH002	1 - 1	2.19	1.00	mg/kg	MADE GROUND
	WS003	0.7 - 0.7	1.01	1.00	mg/kg	MADE GROUND
	WS005	1.8	7.15	1.00	mg/kg	ALLUVIUM
	WS005	2.5	26.9	1.00	mg/kg	ALLUVIUM

Alkali and Alkaline Earth Metals

Analyte	Point ID	Depth	Result	Threshold	Units	Stratum
Barium	WS003	0.15 - 0.15	1340	1210	mg/kg	MADE GROUND
Beryllium	WS001	0.15 - 0.15	3.35	1.70	mg/kg	MADE GROUND

Metals

Analyte	Point ID	Depth	Result	Threshold	Units	Stratum
Arsenic	WS001	0.15 - 0.15	43.7	32.0	mg/kg	MADE GROUND
Lead	BH001	0 - 0.1	1710	148	mg/kg	MADE GROUND
	BH001	0.2	1170	148	mg/kg	MADE GROUND
	BH001	0.3 - 0.5	984	148	mg/kg	MADE GROUND
	BH001	0.5	294	148	mg/kg	MADE GROUND
	WS001	0.15 - 0.15	578	148	mg/kg	MADE GROUND
	WS001	0.5 - 0.5	160	148	mg/kg	MADE GROUND
	WS002	0.1 - 0.1	390	148	mg/kg	MADE GROUND
	WS002	0.5 - 0.5	802	148	mg/kg	MADE GROUND
	WS003	0.15 - 0.15	4580	148	mg/kg	MADE GROUND
	WS003	0.7 - 0.7	1090	148	mg/kg	MADE GROUND
	WS003	1 - 1	152	148	mg/kg	MADE GROUND
	WS005	0.1 - 0.1	397	148	mg/kg	MADE GROUND
	WS005	0.7 - 0.7	408	148	mg/kg	MADE GROUND
	WS005	1.2 - 1.2	175	148	mg/kg	MADE GROUND

PAHs

Analyte	Point ID	Depth	Result	Threshold	Units	Stratum
Benzo (a) pyrene	BH001	0 - 0.1	6.53	1.60	mg/kg	MADE GROUND
	BH001	0.2	7.28	1.60	mg/kg	MADE GROUND
	BH001	0.3 - 0.5	8.07	1.60	mg/kg	MADE GROUND
	BH001	0.5	15.6	1.60	mg/kg	MADE GROUND

EXCEEDANCES OF Residential HG Veg, SOM=1%

PAHs						
Analyte	Point ID	Depth	Result	Threshold	Units	Stratum
Benzo (a) pyrene	BH002	0.3	167	1.60	mg/kg	MADE GROUND
	BH002	1 - 1	40.0	1.60	mg/kg	MADE GROUND
	WS001	0.15 - 0.15	6.71	1.60	mg/kg	MADE GROUND
	WS002	0.1 - 0.1	13.5	1.60	mg/kg	MADE GROUND
	WS002	0.5 - 0.5	9.02	1.60	mg/kg	MADE GROUND
	WS003	0.15 - 0.15	9.02	1.60	mg/kg	MADE GROUND
	WS003	0.7 - 0.7	18.3	1.60	mg/kg	MADE GROUND
	WS003	1 - 1	3.87	1.60	mg/kg	MADE GROUND
	WS005	0.1 - 0.1	27.7	1.60	mg/kg	MADE GROUND
	WS005	0.7 - 0.7	11.2	1.60	mg/kg	MADE GROUND
	WS005	1.2 - 1.2	9.37	1.60	mg/kg	MADE GROUND
	WS005	1.2 - 1.2	9.37	1.60	mg/kg	MADE GROUND
Naphthalene	BH002	0.3	5.56	2.30	mg/kg	MADE GROUND

Appendix G

CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY



1. CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

1.1. GUIDANCE

The Risk Assessment for water environment has been undertaken in line with UK Environment Agency (EA) guidance: Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination, 2006.

Following development of a conceptual model, including identification of pollutant linkages, there are two stages to the water environment risk assessment:

- Generic quantitative risk assessment (GQRA):
 - For soils, Level 1 site specific assessment criteria (SSAC) are derived based on theoretical calculations of soil/water partitioning for comparison with in-situ soil concentrations; and
 - For water, groundwater quality data is compared directly with relevant generic assessment criteria (GAC).
- Detail quantitative risk assessment (DQRA):
 - For soils, Level 2 and 3 assessments are undertaken to derive Level 3 SSAC for comparison with in-situ soil concentrations; and
 - For waters, groundwater quality data is compared with derived Level 3 SSAC.

Each assessment level provides a more detailed model representation. A summary of the assessment levels is provided in Table 1.

Table 1 - 2006 Remedial Targets Method Assessment Levels

Level	Assessment Level Summary
1	(Soil) Theoretical pore water concentration compared directly with applicable Water Quality Standards (WQS).
2	(Soil) Attenuation of pollutants in unsaturated zone and dilution by groundwater flow (Groundwater). Measured groundwater quality compared directly with applicable WQS.
3	(Soil and Groundwater) Attenuation in the saturated zone down gradient of the site.
4	Dilution in the receptor.

At the generic assessment stage, any assessed risk drivers present at concentrations in soil or groundwater that exceed either the Level 1 SSACs or GACs, respectively, are identified as potential contaminants of concern (CoC) and are carried forward for further detailed assessment.

1.2. SELECTED RISK DRIVER COMPOUNDS

A number of contaminants have been selected which represent the key risk drivers for contaminants associated with site use. These compounds and groups of compounds represent the most abundant in fuels and/or are potentially toxic to water environment receptors.

A wide range of specific petroleum compounds are often detected in groundwater samples potentially impacted by hydrocarbon fuel sources. In order to simplify the risk assessment process, a range of key contaminants of varying solubility and mobility were selected to represent a wide range of associated hydrocarbon compounds and groups.

In keeping with EA guidance document “Petroleum Hydrocarbons in Groundwater: Supplementary Guidance for Hydrogeological Risk Assessment, 2017”, only light end aliphatic hydrocarbon groups are included in the water environment risk assessment given their high overall risk ranking with respect to their chemical properties.

Selected compounds have been screened against the appropriate GAC and presented in Tables A and B. Only compounds with detectable concentrations in soil or groundwater have been included.

1.3. SELECTION OF COMPLIANCE ASSESSMENT CRITERIA

EA guidance for the assessment of groundwater advises on the appropriate generic assessment criteria (GAC) to adopt, as follows: ‘a general approach is to use an environmental standard. This standard should be relevant to the current or intended use of the aquifer’.

1.3.1. PRIORITY ORDER OF ASSESSMENT CRITERIA

The standards adopted for GAC are from the following sources, selected as relevant to the identified receptor/s:

- Water Supply (Water Quality Regulations, 2000) – UK DWS;
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 – UK EQS;
- Surface Waters (Dangerous Substances) (Classification) Regulations 1998 – UK EQS;
- International Standards (European Council Directive, WHO, USEPA, Surface Water Abstraction Directive) – appropriate for the receptor and in accordance with UK approach, and, in the absence of a relevant alternative;
- Laboratory analytical limits of detection (LOD).

Where a number of standards are available for a particular compound, statutory standards are prioritised over non-statutory standards.

Relevant GAC are presented for each CoC in Tables A and B.

1.3.2. LEVEL 1 SSAC

The Level 1 soil assessment involves an evaluation of whether theoretical ‘pore water’ concentrations from source zone soils are sufficient to impact on the identified receptor. The ‘pore water’ concentrations are determined based on theoretical calculations of soil/water partitioning.

The derived L1 SSAC are presented for each CoC in Table A. The input parameters adopted for the Level 1 assessment are:

- Water filled soil porosity: 0.03;

- Air filled soil porosity: 0.22;
- Soil bulk density: 0.8 g/cm³
- FOC: 0.001

1.3.3. RISK ASSESSMENT AND IDENTIFICATION OF CONTAMINANTS OF CONCERN

The screening tables presented within the Tables A and B section of this report present the site-specific groundwater and soil results compared with the applicable GAC/L1 SSAC respectively.

The concentrations exceeding the screening criteria for the Level 1 assessment are highlighted.

Appendix H

GROUND GAS MONITORING



Key:

Depth to water		
	Response zone <i>fully</i> flooded during sampling	
	Response zone <i>significantly</i> flooded during sampling	
	Datum or response zone information missing. Response zone flooding cannot be calculated	

Methane
> 1% v/v

Carbon Dioxide
> 5% v/v

Gas Flow
> 70 l/hr

Visit 1, Event: 11/04/19, Date: 11/04/2019

Sheet 1 of 1

Engineer	Edward Jollands	Equipment	SerialNo	Calibrated	Comments and Ground Conditions:
Start/End Time	13:19 - 14:07	Gas Analyser	12450	Yes	
Pressure Start/End (mB)	1022 - 1022				
Temperature (Deg C)	15.00				
Weather Conditions	Fine				

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Differential Pressure	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (ppmV)			Depth to Water	Depth to Base	Thickness of product	Sampled ?
	Top	Base	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO	m	m	mm	Y/N
BH001	9.30	12.30	-3.00	0.00	0	0.00	0.60	0.00	0.50	20.80	19.70	0.00	0.00	77.00	2.01	11.99	N/A	No
BH002	9.50	12.50	0.00	0.00	0	0.00	0.00	0.00	0.40	19.60	20.00	0.00	0.00	0.00	2.22	12.61	N/A	No
WS001	0.50	0.90	0.00	0.00	0	0.00	0.00	0.00	0.50	20.00	18.60	0.00	0.00	0.00		1.14	N/A	No
WS002	1.60	5.00	0.70	0.00	0	0.00	0.00	0.00	1.20	20.00	14.50	0.30	0.00	0.00	1.73	4.81	N/A	No
WS003	1.60	3.00	0.00	0.00	0	0.00	0.00	0.00	0.00	19.90	18.20	0.90	0.00	0.00	2.10	3.17	N/A	No
WS005	1.70	3.00	0.20	0.00	0	0.00	0.00	0.00	2.20	20.00	16.60	1.90	0.00	0.00	1.89	3.16	N/A	No

Key:

Depth to water			Methane	Carbon Dioxide	Gas Flow
	Response zone <i>fully</i> flooded during sampling		> 1% v/v	> 5% v/v	> 70 l/hr
	Response zone <i>significantly</i> flooded during sampling				
	Datum or response zone information missing. Response zone flooding cannot be calculated				

Visit 2, Event: round 2, Date: 16/04/2019

Sheet 1 of 1

Engineer	Edward Jollands	Equipment	SerialNo	Calibrated	Comments and Ground Conditions:
Start/End Time	16:13 - 17:12	Gas Analyser	12450	Yes	
Pressure Start/End (mB)	1011 - 1010				
Temperature (Deg C)	12.00				
Weather Conditions	Overcast				

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Differential Pressure	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (ppmV)			Depth to Water	Depth to Base	Thickness of product	Sampled ?
	Top	Base	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO	m	m	mm	Y/N
BH001	9.30	12.30	1.00	0.00	0	0.00	0.10	0.00	0.60	19.90	20.00	0.00	0.00	17.00	2.03	11.97	N/A	No
BH002	9.50	12.50	0.00	0.00	0	0.00	0.00	0.00	0.60	19.90	19.70	0.20	0.00	0.00	2.24	12.61	N/A	No
WS001	0.50	0.90	0.00	0.00	0	0.00	0.00	0.00	0.60	19.80	19.50	0.00	0.00	0.00		1.14	N/A	No
WS002	1.60	5.00	0.00	0.00	0	0.00	0.00	0.00	2.30	20.20	14.30	0.50	0.00	0.00	1.93	4.94	N/A	No
WS003	1.60	3.00	0.00	0.00	0	0.00	0.00	0.00	0.90	20.40	17.80	0.80	0.00	0.00	1.92	3.00	N/A	No
WS005	1.70	3.00	0.00	0.00	0	0.00	0.10	0.00	2.10	4.40	15.10	1.90	0.00	30.00	1.88	3.08	N/A	No

Key:

Depth to water			Methane	Carbon Dioxide	Gas Flow
	Response zone <i>fully</i> flooded during sampling		> 1% v/v	> 5% v/v	> 70 l/hr
	Response zone <i>significantly</i> flooded during sampling				
	Datum or response zone information missing. Response zone flooding cannot be calculated				

Visit 3, Event: 25/04/2019, Date: 25/04/2019

Sheet 1 of 1

Engineer	Claire Nichols	Equipment	SerialNo	Calibrated	Comments and Ground Conditions:
Start/End Time	08:27 - 10:18	Gas Analyser	G501281	Yes	
Pressure Start/End (mB)	993 - 994	PID	T-109213	Yes	
Temperature (Deg C)	11.00	Dipmeter	-	Yes	
Weather Conditions	Overcast				

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Differential Pressure	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (ppmV)			Depth to Water	Depth to Base	Thickness of product	Sampled ?
	Top	Base	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO	m	m	mm	Y/N
WS001	0.50	0.90	0.00	0.00		0.00	0.00	1.20	1.50	20.10	18.80	0.00	1.00			1.13	N/A	No
WS002	1.60	5.00	0.00	0.00		0.00	0.00	3.60	4.40	9.60	15.20	0.00	0.00		1.95	4.95	N/A	No
WS003	1.60	3.00	0.00	0.00		0.00	0.00	1.50	1.50	20.10	18.20	0.50	0.00		2.12	3.17	N/A	No
WS005	1.70	3.00	0.00	0.00		0.10	0.10	8.40	2.00	16.60	18.10	0.00	1.00		1.87	3.07	N/A	No

Key:

Depth to water					
	Response zone <i>fully</i> flooded during sampling		Methane	Carbon Dioxide	Gas Flow
	Response zone <i>significantly</i> flooded during sampling		> 1% v/v	> 5% v/v	> 70 l/hr
	Datum or reponse zone information missing. Response zone flooding cannot be calculated				

Visit 4, Event: 03/05/2019, Date: 03/05/2019

Sheet 1 of 1

Engineer	Claire Nichols	Equipment	SerialNo	Calibrated	Comments and Ground Conditions:
Start/End Time	09:40 - 10:40	Gas Analyser		Yes	
Pressure Start/End (mB)	1012 - 1013	Dipmeter		Yes	
Temperature (Deg C)	10.00				
Weather Conditions	Overcast				

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Differential Pressure	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (ppmV)			Depth to Water	Depth to Base	Thickness of product	Sampled ?
	Top	Base	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO	m	m	mm	Y/N
WS001	0.50	0.90	0.00	0.00		0.00	0.00	2.00	2.00	20.00	18.30		1.00			1.13	N/A	No
WS002	1.60	5.00	0.00	-0.10		0.00	0.00	4.30	4.40	19.70	15.70		1.00		1.93	4.88	N/A	No
WS003	1.60	3.00	0.00	0.00		0.00	0.00	1.80	1.80	19.80	18.10		1.00		2.11	3.18	N/A	No
WS005	1.70	3.00	0.00	0.00		0.10	0.00	10.60	2.00	18.70	17.90		0.00		1.85	3.07	N/A	No

Key:

Depth to water				
	Response zone <i>fully</i> flooded during sampling		Methane	Carbon Dioxide
	Response zone <i>significantly</i> flooded during sampling		> 1% v/v	> 5% v/v
	Datum or response zone information missing. Response zone flooding cannot be calculated			Gas Flow
				> 70 l/hr

Visit 5, Event: 09/05/2019, Date: 09/05/2019

Sheet 1 of 1

Engineer	Claire Nichols	Equipment	SerialNo	Calibrated	Comments and Ground Conditions:
Start/End Time	10:35 - 12:15	Dipmeter	-	Yes	
Pressure Start/End (mB)	992 - 994	Gas Analyser	G501281	Yes	
Temperature (Deg C)	12.00				
Weather Conditions	Rain showers				

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Differential Pressure	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (ppmV)			Depth to Water	Depth to Base	Thickness of product	Sampled ?
	Top	Base	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO	m	m	mm	Y/N
WS001	0.50	0.90	0.00	0.00		0.00	0.00	2.10	2.20	19.90	17.70		0.00			1.12	N/A	No
WS002	1.60	5.00	0.00	0.00		0.00	0.00	4.40	4.60	19.70	15.50		1.00		1.90	4.88	N/A	No
WS003	1.60	3.00	0.00	0.10		0.00	0.00	2.00	2.00	19.50	17.80		0.00		2.08	3.19	N/A	No
WS005	1.70	3.00	0.00	-0.10		0.10	0.00	12.80	2.10	14.40	17.50		1.00		1.87	3.07	N/A	No

Key:

Depth to water					
	Response zone <i>fully</i> flooded during sampling		Methane	Carbon Dioxide	Gas Flow
	Response zone <i>significantly</i> flooded during sampling		> 1% v/v	> 5% v/v	> 70 l/hr
	Datum or response zone information missing. Response zone flooding cannot be calculated				

Visit 6, Event: 16/05/2019, Date: 16/05/2019

Sheet 1 of 1

Engineer	Claire Nichols	Equipment	SerialNo	Calibrated	Comments and Ground Conditions:
Start/End Time	07:30 - 08:50	Gas Analyser	G501281	Yes	
Pressure Start/End (mB)	1017 - 1018	Dipmeter	-	Yes	
Temperature (Deg C)	11.00				
Weather Conditions	Fine				

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Differential Pressure	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gases (ppmV)			Depth to Water	Depth to Base	Thickness of product	Sampled ?
	Top	Base	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO	m	m	mm	Y/N
WS001	0.50	0.90	0.00	-0.10		0.00	0.00	2.30	2.30	19.00	17.80		1.00			1.13	N/A	No
WS002	1.60	5.00	0.00	-0.10		0.00	0.00	4.50	5.10	19.10	14.20		1.00		1.95	4.88	N/A	No
WS003	1.60	3.00	0.00	0.00		0.00	0.00	2.00	2.10	20.50	17.70		0.00		2.14	3.18	N/A	No
WS005	1.70	3.00	0.00	0.00		0.10	0.00	13.30	3.00	16.10	17.30		1.00		1.90	3.08	N/A	No

Appendix I

GROUNDWATER VAPOUR ASSESSMENT



Target concentrations within indoor air are based upon the health criteria values for each substance (or where available, the lowest level of toxicological concern). They are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual exposure model (assuming standard CLEA 'residential' occupancy periods, and a child female receptor).

These target concentrations represent a risk level equivalent to the health criteria values for each substance (or the LLTC). The residential GAC assume a small terraced house and a source depth (groundwater depth) of 0.85m below the base of the building foundation (1m bgl).

Target soil vapour concentrations above the water table have been calculated by dividing the target concentration by the steady-state attenuation factor coefficient between soil and indoor air. The attenuation factor has been calculated in accordance with the Johnson & Ettinger model, as presented within Environment Agency Science Report SC050021/SR3, 2009. The air-water partition coefficient (K_{aw}) has been used to predict the partitioning behaviour of each chemical between soil pore water and air.

The WSP Groundwater Vapour GAC are protective against a dissolved phase contaminant source only. Where the presence of NAPL is suspected, the risks from this source will need to be assessed. Where reported groundwater concentrations exceed the relevant solubility limit, free product may occur, and the user should discuss their project with an experienced risk assessor.

Where the calculated GAC exceeds the solubility limit for the chemical, the GAC has been highlighted using bold text.

Derivation of Target Concentrations within Indoor Air – Residential Exposure Scenario

Target concentrations are based upon the health criteria values for each substance. They are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual model (assuming standard CLEA 'residential' occupancy periods, and a female child receptor). Target concentrations represent a minimal risk level, equivalent to the health criteria values for each substance (a target concentration based on the LLTC is available for benzene).

Chemical	HCV (µg/kg bw/d)	ID or TDI	Inhalation MDI (child) (µg/d)	Convert HCV to µg/d	HCV minus MDI (for threshold contaminants)	Target Concentration in Air (µg/m ³)	Revised Target Concentration in Air (µg/m ³)
Benzene (based on LLTC)	3.3	ID	n/a	43.89	43.89	5.0	5.5
Benzene (based on HCV)	1.4	ID	n/a	18.62	18.62	2.1	2.4
Toluene	1,400	TDI	40.32	18,620	18,579.68	2,120	2,348
Ethylbenzene	74.3	TDI	8.15	988.19	980.04	112	124
Xylenes (total)	60	TDI	45.58	798	752.42	86	95
Naphthalene	0.86	TDI	1.23	11.438	10.208	1.2	1.3
Trimethylbenzenes	17.1	TDI	37.69	227.43	189.74	22	24
MTBE	722	TDI	87.66	9,602.6	9,514.94	1,085	1,202
n-hexane	200	TDI	assume neg.	2,660	2660	303	336
TPH aromatic EC5-7	1,400	TDI	87.66	18,620	18,532.34	2,114	2,342
TPH aromatic EC7-8	1,400	TDI	219.15	18,620	18,400.85	2,099	2,325
TPH aromatic EC8-10	60	TDI	50% rule used	798	399	46	50
TPH aromatic EC10-12	60	TDI	50% rule used	798	399	46	50
TPH aromatic EC12-16	60	TDI	50% rule used	798	399	46	50
TPH aliphatic EC5-6	5,260	TDI	50% rule used	69,958	34,979	3,990	4,420
TPH aliphatic EC6-8	5,260	TDI	50% rule used	69,958	34,979	3,990	4,420
TPH aliphatic EC8-10	290	TDI	50% rule used	3,857	1,928.5	220	244
TPH aliphatic EC10-12	290	TDI	50% rule used	3,857	1,928.5	220	244
TPH aliphatic EC12-16	290	TDI	50% rule used	3,857	1,928.5	220	244
Carbon Disulphide	28.6	TDI	50% rule used	380.38	190.19	22	24
Isopropylbenzene	114.3	TDI	128.86	1,520.19	1,391.33	159	176
Propylbenzene	220	TDI	7.19	2,926	2,918.81	333	369
Styrene	240	TDI	2.45	3,192	3,189.55	364	403
1,1,1,2-tetrachloroethane	5.8	TDI	0.88	77.14	76.26	8.7	9.6
1,1,1-trichloroethane	1,429	TDI	144.64	19,005.7	18,861.06	2,152	2,383
1,1,2,2-tetrachloroethane	5.8	TDI	0.88	77.14	76.26	8.7	9.6

Chemical	HCV (µg/kg bw/d)	ID or TDI	Inhalation MDI (child) (µg/d)	Convert HCV to µg/d	HCV minus MDI (for threshold contaminants)	Target Concentration in Air (µg/m ³)	Revised Target Concentration in Air (µg/m ³)
1,1,2-trichloroethane	4.85	TDI	0.44	64.505	64.07	7.3	8.1
1,1-dichloroethene	57	TDI	0.18	758.1	757.92	86	96
1,2,3,4-tetrachlorobenzene	3.4	TDI	16.87	45.22	28.35	3.2	3.6
1,2,3,5-tetrachlorobenzene (50% rule)	0.41	TDI	16.87	5.453	2.7265	0.31	0.34
1,2,3-trichlorobenzene (50% rule)	1	TDI	16.87	13.3	6.65	0.76	0.84
1,2,4,5-tetrachlorobenzene (50% rule)	0.1	TDI	16.87	1.33	0.665	0.08	0.08
1,2,4-trichlorobenzene (50% rule)	2.3	TDI	16.87	30.59	15.295	1.7	1.9
1,2-dichlorobenzene	43	TDI	72.76	571.9	499.14	57	63
1,2-dichloropropane	1.14	TDI	2.28	15.162	12.88	1.5	1.6
1,3,5-trichlorobenzene (50% rule)	1	TDI	16.87	13.3	6.65	0.76	0.84
1,3-dichlorobenzene (50% rule)	2	TDI	32.43	26.6	13.3	1.5	1.7
1,4-dichlorobenzene	17	TDI	32.00	226.1	194.10	22	25
Bromobenzene	3.43	TDI	assume neg.	45.619	45.619	5.2	5.8
Chlorobenzene	8.1	TDI	16.87	107.73	90.86	10	11
Chloroethane	2,857	TDI	5.92	37,998.1	37,992.18	4,334	4,801
Chloromethane (50% rule)	5.14	TDI	92.92	68.362	34.181	3.9	4.3
Dichloromethane	134.3	TDI	153.41	1,786.19	1,632.79	186	206
Pentachlorobenzene	0.5	TDI	0.12	6.65	6.53	0.74	0.82
Trans-1,2-dichloroethene	17	TDI	2.63	226.1	223.47	25	28
Trichloromethane (chloroform)	40	TDI	43.83	532	488.17	56	62
2-chloronaphthalene	0.286	TDI	0.01	3.8038	3.80	0.43	0.48
Mercury, elemental	0.06	TDI	0.02	0.798	0.78	0.09	0.10
Hexachloro-1,3-butadiene	0.2	TDI	0.53	2.66	2.13	0.24	0.27
1,2-dichloroethane	0.12	ID	n/a	1.596	1.596	0.18	0.20
Tetrachloroethene (PCE) (50% rule)	11	TDI	87.66	146.3	73.15	8.3	9.2
Carbon Tetrachloride	28.57	TDI	21.92	379.981	358.061	41	45
Trichloroethene (TCE)	0.57	ID	n/a	7.581	7.581	0.86	0.96
Vinyl Chloride	0.3	ID	n/a	3.99	3.99	0.46	0.50

Terminology

The health criteria value (HCV) for a chemical is a benchmark level of exposure to that chemical, derived from available toxicity data, for the purposes of safeguarding human health. For substances exhibiting threshold behaviour (such as naphthalene), the HCV is expressed as a tolerable daily intake (TDI). For substances exhibiting non-threshold behaviour (such as benzene), the HCV is expressed as an index dose (ID).

A TDI is the amount of a chemical that can be ingested / inhaled daily, over a lifetime, without appreciable health risk. An ID is the amount of a chemical that can be experienced over a lifetime with minimal cancer risk.

The MDI (mean daily intake) is the average daily intake of a soil contaminant from other, non-soil sources. It arises principally from exposure to the contaminant in food, water and air.

Methodology

The HCV for each potential contaminant of concern is converted to a target concentration within (indoor) air, as a function of receptor bodyweight, inhalation rate, exposure duration and background exposure (MDI).

Example 1 – Benzene (Scotland - HCV is an index dose)

The minimum risk (Scotland) HCV for benzene is 1.4 $\mu\text{g/kg bw/d}$ (the England & Wales value is derived using the low level of toxicological concern, LLTC, taken from the C4SL report). Background exposure is not taken into consideration for chemicals with an index dose.

The HCV is converted to a concentration in air by multiplying by the receptor bodyweight (13 kg) and then dividing by the daily inhalation rate ($8.766 \text{ m}^3/\text{d}$). The selected bodyweight and inhalation rate are based on UK best practice. This gives a concentration in air of $2.1 \mu\text{g}/\text{m}^3$.

The exposure duration for a residential exposure scenario is 23 hours per day (age classes 1 to 4) and 19 hours per day (age classes 5 and 6). The concentration in air is therefore converted to a target concentration in air, accounting for exposure duration, by multiplying by 1.1077, giving a value of **$2.4 \mu\text{g}/\text{m}^3$** .

Example 2 – Naphthalene (HCV is a tolerable daily intake)

The HCV for naphthalene is 0.86 $\mu\text{g/kg bw/d}$. Background exposure needs to be accounted for, as the HCV is a TDI.

The HCV is multiplied by the receptor bodyweight (13.3 kg) to give a figure of 11.438 $\mu\text{g/d}$. The MDI (1.23 $\mu\text{g/d}$) is then subtracted from this figure, to account for background exposure. The resultant figure (10.208 $\mu\text{g/d}$) is divided by the daily inhalation rate (8.766 m^3/d), to give a concentration in air of 1.2 $\mu\text{g/m}^3$.

The exposure duration for a residential exposure scenario is 23 hours per day (age classes 1 to 4) and 19 hours per day (age classes 5 and 6). The concentration in air is therefore converted to a target concentration in air, accounting for exposure duration, by multiplying by 1.1077, giving a value of **1.3 $\mu\text{g/m}^3$** .

Example 3 – the 50% rule (PCE)

It could be possible for a high MDI (background exposure) to result in total exposure exceeding the TDI, even when exposure from soil or soil vapour is minimal. UK best practice therefore is that a minimum of 50% of the TDI is reserved for exposure from the land.

For example, the inhalation MDI for PCE (87.66 $\mu\text{g/d}$) is greater than 50% of the inhalation TDI (146.3 $\mu\text{g/d}$). So, when the inhalation TDI is amended to account for background exposure, it is set at 50% of the full value. This ensures that a minimum of 50% of the TDI is reserved for exposure from the land.

Calculation of Attenuation Factors

Attenuation factors have been calculated using the Johnson & Ettinger Model, as contained within Appendix A of the Environment Agency report 'SC050021/SR3 Updated technical background to the CLEA model, 2009'.

The equation that governs soil gas volumetric flow rate into a building is as follows:

$$Q_{soil} = \frac{2\pi \Delta P k_v X_{crack} \times 10 \text{ g cm}^{-1} \text{ s}^{-2} \text{ Pa}^{-1}}{\mu_a \ln \left(\frac{2Z_{crack}}{r_{crack}} \right)}$$

Where Q_{soil} is the volumetric flow rate of soil gas entering the building, $\text{cm}^3 \text{ s}^{-1}$
 π [= 3.14159]
 ΔP is the pressure difference between soil air and the enclosed living space, Pa
 k_v is the effective air permeability, cm^2
 X_{crack} is the floor-wall seam perimeter, cm
 μ_a is the air viscosity at ambient temperature, $\text{g cm}^{-1} \text{ s}^{-1}$
 Z_{crack} is the depth below ground to bottom of floor, cm
 r_{crack} is the effective crack radius, cm

The output of the Johnson & Ettinger model is an attenuation factor (α), which represents a (dimensionless) steady-state attenuation coefficient between soil and indoor air. It is estimated using the following equation:

$$\alpha = \frac{\left[\frac{D_{eff} A_B}{Q_b L_T} \exp \left(\frac{Q_s L_{crack}}{D_{crack} A_{crack}} \right) \right]}{\left[\exp \left(\frac{Q_s L_{crack}}{D_{crack} A_{crack}} \right) + \frac{D_{eff} A_B}{Q_b L_T} + \frac{D_{eff} A_B}{Q_s L_T} \right] \left[\exp \left(\frac{Q_s L_{crack}}{D_{crack} A_{crack}} \right) - 1 \right]}$$

Where: α is the steady-state attenuation coefficient between soil and indoor air, dimensionless
 D_{eff} is the effective diffusion coefficient for unsaturated soils, $\text{cm}^2 \text{ s}^{-1}$
 A_B is the area of enclosed floor and walls below ground, cm^2
 Q_b is the building ventilation rate, $\text{cm}^3 \text{ s}^{-1}$
 L_T is the source-building separation, cm
 Q_s is the volumetric flow rate of soil gas into the enclosed space, $\text{cm}^3 \text{ s}^{-1}$ [25 to 150]
 L_{crack} is the foundation slab thickness, cm
 A_{crack} is the floor crack area, cm^2
 D_{crack} is the effective diffusion coefficient through the cracks, $\text{cm}^2 \text{ s}^{-1}$ [= D_{eff}]

Air-water partition coefficient (K_{aw})

This is the constant of proportionality between the concentrations of a chemical in air and in water, at low partial pressures, a specified temperature and pressure, and below the saturation limits in either air or water. It is calculated from Henry's Law constant, which is the constant of proportionality between water solubility and the partial pressure of the gas phase. The air-water partition coefficient is used by the CLEA model to predict the partitioning behaviour of an organic chemical between environmental compartments such as soil pore water and air. Consequently, K_{aw} has been used to back-calculate the target concentrations in groundwater (the groundwater vapour GAC).

Aliphatics and Aromatics

Result > Assessment Criteria Limit of detection > Assessment Criteria				PointID	BH001	BH002	WS002	WS003	WS005
Response Zone				Depth (m bgl)	9.3 - 12.3	9.5 - 12.5	1.6 - 5	1.6 - 3	1.7 - 3
Sample Date					17/04/19	17/04/19	17/04/19	17/04/19	17/04/19
Analyte	Units	LOD	GAC						
Aliphatic C05-C06	ug/l	10.0	3,030		<10	<10	<10	<10	<10
Aliphatic C06-C08	ug/l	10.0	2,330		<10	<10	<10	<10	<10
Aliphatic C08-C10	ug/l	10.0	84.0		<10	<10	<10	<10	14
Aliphatic C10-C12	ug/l	10.0	GAC > Sol		<10	<10	<10	<10	100
Aliphatic C12-C16	ug/l	10.0	GAC > Sol		<10	<10	<10	<10	<10
Aromatic C07-C08	ug/l	10.0	343,200		<10	<10	<10	<10	<10
Aromatic C08-C10	ug/l	10.0	2,870		<10	<10	<10	<10	<10
Aromatic C10-C12	ug/l	10.0	10,000		<10	<10	<10	<10	67
Aromatic C12-C16	ug/l	10.0	GAC > Sol		<10	<10	<10	<10	35

BTEX and Fuel Additives

Result > Assessment Criteria Limit of detection > Assessment Criteria				PointID	BH001	BH002	WS002	WS003	WS005
				Response Zone Depth (m bgl)	9.3 - 12.3	9.5 - 12.5	1.6 - 5	1.6 - 3	1.7 - 3
				Sample Date	17/04/19	17/04/19	17/04/19	17/04/19	17/04/19
Analyte	Units	LOD	GAC						
1,2,4-Trimethylbenzene	ug/l	1.00	540		<1		<1		<1
1,3,5-Trimethylbenzene	ug/l	1.00	540		<1		<1		<1
Benzene	ug/l	1.00	318		<1	<1	<1	<1	<1
Ethylbenzene	ug/l	1.00	16,200		<1	<1	<1	<1	<1
Methyl t-butylether (MTBE)	ug/l	1.00	126,900		<1	<1	<1	<1	<1
Toluene	ug/l	1.00	346,500		<1	<1	<1	<1	<1
Xylene - Total (Summed)	ug/l	-999	15,500		1	1	1	1	1

Chlorinated Aliphatics

Result > Assessment Criteria Limit of detection > Assessment Criteria				PointID	BH001	WS002	WS005
Response Zone				Depth (m bgl)			
Sample Date							
Analyte	Units	LOD	GAC				
1,1,1,2-Tetrachloroethane	ug/l	1.00	371		<1	<1	<1
1,1,1-Trichloroethane	ug/l	1.00	11,269		<1	<1	<1
1,1,2,2-Tetrachloroethane	ug/l	1.00	2,520		<1	<1	<1
1,1,2-Trichloroethane	ug/l	1.00	798		<1	<1	<1
1,1-Dichloroethene	ug/l	1.00	245		<1	<1	<1
1,2-Dichloroethane	ug/l	1.00	13.0		<1	<1	<1
1,2-Dichloropropane	ug/l	1.00	39.0		<1	<1	<1
Carbon tetrachloride	ug/l	1.00	133		<1	<1	<1
Chloroethane	ug/l	1.00	15,085		<1	<1	<1
Chloromethane	ug/l	1.00	20.0		<1	<1	<1
Dichloromethane	ug/l	3.00	5,268		<3	<3	<3
Hexachlorobutadiene	ug/l	1.00	4.00		<1	<1	<1
Tetrachloroethene (PCE)	ug/l	1.00	53.0		<1	<1	<1
Trans-1,2-Dichloroethene	ug/l	1.00	244		<1	<1	<1
Trichloroethene (TCE)	ug/l	1.00	9.00		<1	<1	<1
Vinyl chloride	ug/l	1.00	1.00		<1	<1	<1

Chlorinated Aromatics

Result > Assessment Criteria Limit of detection > Assessment Criteria				PointID	BH001	WS002	WS005
Response Zone				Depth (m bgl)	9.3 - 12.3	1.6 - 5	1.7 - 3
Sample Date					17/04/19	17/04/19	17/04/19
Analyte	Units	LOD	GAC				
1,2,3-Trichlorobenzene	ug/l	1.00	55.0		<1	<1	<1
1,2,4-Trichlorobenzene	ug/l	1.00	106		<1	<1	<1
1,2-Dichlorobenzene	ug/l	1.00	3,499		<1	<1	<1
1,3,5-Trichlorobenzene	ug/l	1.00	12.0		<1	<1	<1
1,3-Dichlorobenzene	ug/l	1.00	48.0		<1	<1	<1
1,4-Dichlorobenzene	ug/l	1.00	977		<1	<1	<1
Chlorobenzene	ug/l	1.00	239		<1	<1	<1

Halogenated Hydrocarbons

Result > Assessment Criteria Limit of detection > Assessment Criteria				PointID	BH001	WS002	WS005
Response Zone				Depth (m bgl)	9.3 - 12.3	1.6 - 5	1.7 - 3
Sample Date					17/04/19	17/04/19	17/04/19
Analyte	Units	LOD	GAC				
Bromobenzene	ug/l	1.00	333		<1	<1	<1

Other

				PointID	BH001	WS002	WS005
				Response Zone			
				Depth (m bgl)	9.3 - 12.3	1.6 - 5	1.7 - 3
				Sample Date	17/04/19	17/04/19	17/04/19
Analyte	Units	LOD	GAC				
2-Chloronaphthalene	ug/l	1.00	259		<1	<1	<1
Carbon Disulphide	ug/l	1.00	83.0		<1	<1	<1
Styrene	ug/l	1.00	13,558		<1	<1	<1

PAHs

				PointID					
					BH001	BH002	WS002	WS003	WS005
				Response Zone Depth (m bgl)	9.3 - 12.3	9.5 - 12.5	1.6 - 5	1.6 - 3	1.7 - 3
				Sample Date	17/04/19	17/04/19	17/04/19	17/04/19	17/04/19
Analyte	Units	LOD	GAC						
Naphthalene	ug/l	0.010	373		<0.01	<0.01	0.0123	0.0284	0.0653

VOCs

Result > Assessment Criteria Limit of detection > Assessment Criteria				PointID	BH001	WS002	WS005
Response Zone				Depth (m bgl)	9.3 - 12.3	1.6 - 5	1.7 - 3
Sample Date					17/04/19	17/04/19	17/04/19
Analyte	Units	LOD	GAC				
iso-Propylbenzene	ug/l	1.00	1,432		<1	<1	<1
n-Propylbenzene	ug/l	1.00	4,255		<1	<1	<1

Appendix J

RISK EVALUATION MATRIX



Appendix J – Context of Risk Estimation and Evaluation

In accordance with the guidance set out in the Environment Agency document CLR11 'Model Procedures for the Management of Land Contamination', the results of the investigation have been assessed using a "Source-Pathway-Receptor" assessment approach. Such an approach recognises that risks from site-based contaminants can only exist where all three components are present (constituting a complete 'contaminant linkage').

The identification of potential "contaminant linkages" is a key aspect of the evaluation of potentially contaminated land. Risks have been evaluated in accordance with the methodology set out within CIRIA C552. This involves the classification of the magnitude of the potential consequence of the risk occurring, and the magnitude of the probability of the risk occurring. These classifications are then compared, in order to determine the risk presented by each identified pollutant linkage.

The process for determining the classification of consequence is detailed within Table 5.1. The classification does not account for the probability of the consequence being realised. With regard to human health, it is important to note that the 'severe' classification relates only to acute risks (arising from short-term exposure). The 'medium' classification relates to chronic harm (which may still be classified as 'significant harm' under Part 2A).

Table J.1: Qualitative Risk Assessment – Classification of Consequence

Classification	Definition
Severe	- Acute risks to human health; - Short-term risk of pollution of controlled waters or significant impact on controlled waters (equivalent to an EA Category 1 pollution incident); - Pollution equivalent to "environmental damage" to surface water or groundwater, as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009; - Catastrophic damage to buildings or property; or - Ecological system effects – immediate risks of major damage which is likely to result in irreversible substantial adverse changes in the functioning of the ecosystem, or harm to a species of special interest that endangers the long-term maintenance of the population.
Medium	- Chronic risks to human health; - Pollution of sensitive water resources (equivalent to an EA Category 2 pollution incident); - Ecological system effects – immediate risks of significant damage which may result in substantial adverse changes to the ecosystem's functioning or harm to a species of special interest that endangers the long-term maintenance of the population; - Substantial loss in value resulting from death, disease or other serious physical damage to livestock or other owned or domesticated animals; or - Significant damage to buildings, structures and services.
Mild	- Non-permanent health effects to human health; - Pollution of controlled waters or non-sensitive waste resources (equivalent to an EA Category 3 pollution incident); - Ecological system effects – minor or short-term damage which is unlikely to result in substantial adverse changes to the ecosystem's functioning or harm to a species of special interest that may endanger the long-term maintenance of the population; or - Substantial damage to non-sensitive environments (unprotected ecosystems).
Minor / Negligible	- No measurable effects on human health, including non-permanent health effects that are easily prevented by appropriate use of PPE, etc; - Minor pollution of controlled waters, including non-sensitive water resources with no discernible effect on water quality or ecosystems; - Minor damage to non-sensitive environments (unprotected ecosystems); or - Easily repairable effects of damage to buildings, structures, services or the environment.

Once the consequence and probability have been determined for a contaminant linkage, these can be compared to produce a risk category, ranging from 'very high risk' to 'negligible risk'.

Table J.2: Comparison of Consequence against Probability

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/ Low Risk
	Likely	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/ Low Risk	Low Risk	Negligible Risk
	Unlikely	Moderate/ Low Risk	Low Risk	Negligible Risk	Negligible Risk

The definitions of classified risk terms, as stated in Table D.2, are defined below in Table D.3.

Table J.3: Qualitative Risk Assessment – Classification of Consequence

Classification	Definition
Very High Risk	Severe harm to a receptor may already be occurring, or a high likelihood severe harm will arise to a receptor, unless immediate remedial works / mitigation measures are undertaken.
High Risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short-term, but likely to be required over the long-term.
Moderate Risk	Possible that harm could arise to a receptor, but low likelihood that such harm would be severe. Harm is likely to be mild. Some remedial works may be required in the long-term.
Moderate / Low Risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as mild. Limited further investigation may be required to clarify the risk. If necessary, remediation works are likely to be limited in extent.
Low Risk	Possible that harm could arise to a receptor. Such harm, at worst, would normally be mild.
Negligible Risk	Low likelihood that harm could arise to a receptor. Such harm is unlikely to be any worse than mild.
No Potential Risk	There is no potential risk where no contaminant linkage has been established.



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