

## SHELL SUTTON ELMS Environmental Site Assessment

GB-10019140-20230801-SA-Phase II ESA



## **Shell Sutton Elms**

**Environmental Site Assessment** 

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This report dated 01 August 2023 has been prepared for Shell UK Oil Products Ltd (the "Client") in accordance with the terms and conditions of appointment dated 01 October 2020 (the "Appointment") between the Client and **Arcadis UK) Limited** ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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## **Abbreviations**

AECOM	AECOM Infrastructure & Environment UK Limited
AOD	Above Ordnance Datum
Arcadis	Arcadis (UK) Limited
COPC	Constituents of Potential Concern
CPU	Continued Petroleum Use
CSM	Conceptual Site Model
CVOC	Chlorinated Volatile Organic Compounds
EA	Environment Agency
ESA	Environmental Site Assessment
GAC	Generic Assessment Criteria
LNAPL	Light Non-Aqueous Phase Liquid
M AOD	Meters Above Ordnance Datum
m bgl	Meters Below Ground Level
MCerts	Monitoring Certification Scheme
MTBE	Methyl Tertiary Butyl Ether
NAPL	Non-Aqueous Phase Liquid
OS	Ordnance Survey
PAH	Polycyclic Aromatic Hydrocarbons
PFS	Petrol Filling Station
PID	Photo Ionization Detector
ppmV	Parts Per Milli Volt
Shell	Shell UK Oil Products Limited
TPH	Total Petroleum Hydrocarbons
UST	Underground Storage Tanks
VOC	Volatile Organic Compounds
WAC	Waste Acceptance Criteria

## **Executive Summary**

Executive Summary	
Background	Arcadis (UK) Limited (Arcadis) was commissioned by Shell UK Oil Products Limited (Shell) to undertake an environmental Site investigation at Shell Sutton Elms, located at Coventry Road, Broughton, Leicester, LE9 6QD (hereafter 'the Site').
Objectives	The objectives of this phase of works were to:
	<ul> <li>Drilling up to four boreholes and installation of groundwater monitoring wells to allow current soil and groundwater conditions beneath the Site to be assessed; and,</li> <li>Undertake Site-wide groundwater monitoring in order to assess current concentrations of petroleum hydrocarbons in groundwater.</li> </ul>
Borehole Drilling and Monitoring Well Installation	During the period of November 15th to 24th, 2022, four groundwater monitoring wells (MW101, MW104, MW105, and MW106) were installed on the Site. Progression of MW101 was attempted twice, and MW105 and MW106 were attempted once due to obstructions encountered within the initial inspection pits. The maximum depth achieved during drilling was 6.50 meters below ground level (m bgl). Ground conditions within the boreholes comprised Made Ground, which was present to a depth of 1.36 m bgl, and River Terrace Deposits, which were proven to a maximum depth of 6.50 m bgl.
Soil Samples Analysis	A hydrocarbon odour was noted at MW106 within soil samples collected from 0.15m bgl to 1.84m bgl and a hydrocarbon sheen was observed between 1.59 mbgl to 1.79 m bgl. Field screening indicated a maximum Photo Ionization Detector (PID) value of 5,000 Parts per Million (ppm) recorded in MW106 at 1.59 to 1.79m bgl. No visual or olfactory evidence of contamination was identified in soil samples collected during the drilling of MW101, MW104 and MW105.
	The concentration of aliphatic hydrocarbons >C8-C10 sampled in soils from MW106 was the only detection found to exceed the applicable GAC derived for the protection of human health receptors based on continued petroleum use. Constituents of Potential Concern (COPC) analysed in soil samples collected at MW106 also exceeded the Arcadis Generic Assessment Criterial (GAC) protective of water resources (aquifers and surface waters) with exceedances of BTEX and naphthalene; Concentrations of benzo(b,k)fluoranthene, benzo(g,h,i)pyrene and indeno(1,2,3-c,d)pyrene were measured in exceedance of the Arcadis GAC protective of water resources (aquifers) only within shallow soil samples collected from all four sampling locations.
Groundwater Monitoring	The depth to groundwater ranged from 0.61m bgl to 1.49m bgl during the January 2023 groundwater monitoring visit and 0.55m bgl to 1.46m bgl during the March 2023 groundwater elevation survey. The groundwater elevation data from each survey inferred a groundwater flow direction towards the west/southwest.
	No evidence of Non-Aqueous Phase Liquid (NAPL) was encountered within the monitoring well network during the monitoring visit.
	None of the COPC within groundwater samples were detected in exceedance of the Arcadis GAC protective of human health for continued petroleum use. Concentrations of benzene, sum TPH (>C5-C35) Aliphatics/Aromatics, and naphthalene in MW106, along with benzo(a)pyrene in MW105, were detected in exceedance of the Arcadis GAC protective of water resources (aquifers and surface waters) and UK drinking water quality standards within the groundwater samples collected.
Conclusions	Soil and groundwater samples collected from MW106 showed the maximum measured concentrations of COPCs, indicating possible localized contamination in the eastern part of the Site. However, a single COPC was detected exceeding the Arcadis GAC for the protection of human health receptors in soils based on a continued petroleum use. None of the COPC detected in groundwater exceeded the Arcadis GAC derived for the protection of human health receptors. Therefore, the risk to human health receptors is considered low.

ecutive Summary		
	Concentrations of BTEX in some soil and groundwater samples exceeded the GAC protective of water resource receptors, suggesting a potentially significant risk posed by these constituent	
	The subsurface geology at the Site is complex, with interbedded sand, gravel and clay layer The hydrogeology of the Site is also complex, with varying flow directions observed durin previous works.	
	While a direct comparison of soil contaminant concentrations between 2011 and this 202 intrusive investigation cannot be made due to variations in well locations and sampling depth the contaminant concentrations documented in the 2023 investigation are consistent with th previous works (it is noted that sum TPH concentrations >3,000mgkg [sample V7, Figure 44 remained in-situ following the 2011 site redevelopment). The most elevated soil and groundwate detections identified in MW106 during this investigation were in a location not previous investigated.	
	Groundwater results have indicated impact from BTEX and mid-heavy end TPH constituents. A a result of the elevated impacts identified in MW106, there is considered a potential risk to the secondary A aquifer beneath the Site and the River Soar located 37m east of the Site.	

## **1** Introduction

Arcadis (UK) Limited (Arcadis) was commissioned by Shell UK Oil Products Limited (Shell) to undertake an environmental Site investigation at Shell Sutton Elms (hereafter 'the Site'). The Site is an operational Petrol Filling Station (PFS) located at Coventry Road, Broughton, Leicester, LE9 6QD. A Site Location Plan is presented as Figure 1, Appendix A.

#### 1.1 Objectives

The objective of this phase of works was to obtain additional/updated information on the soil and groundwater quality beneath the Site to further assess the Conceptual Site Model (CSM) for the Site developed during previous works (Section 1.4). The Site is planned to be continued to be operated as a Petrol Filling Station (Continued Petroleum Use (CPU)).

#### 1.2 Scope of Work

The scope of work in this report is outlined below:

- Drilling of up to six boreholes and installation of groundwater monitoring wells (MW101 to MW106);
- Logging of soil samples and field headspace screening with a Photo Ionisation Detector (PID);
- Submission of soil samples to an accredited laboratory for analysis of selected Constituents of Potential Concern (COPC);
- Groundwater sampling of newly installed monitoring wells (MW101 to MW106) using low flow sampling methods with measurement of field parameters;
- Submission of groundwater samples to an accredited laboratory for analysis of selected COPC;
- A risk assessment including comparison of measured concentrations of COPC concentrations to Generic Assessment Criteria (GAC) and reporting of findings.

Scope deviation: Prior to commencing works on Site and a review of the proposed location it was deemed that MW102 and MW103 could not be drilled and installed due to impact on HGVs accessing and egressing the Site. Consequently, only four groundwater monitoring wells (MW101, MW104, MW105, and MW106) were installed, which still provided adequate information for the assessment of the groundwater flow direction and COPCs.

#### 1.3 Limitations

Arcadis' liability, pursuant to the terms of the appointment of Arcadis by Shell, is strictly limited to the work undertaken and the matters contained and specifically referred to in this report. A copy of Arcadis' study limitations is presented in Appendix B.

#### 1.4 **Previous Environmental Reports**

#### 1.1.1 Previous Third-Party Reports

The environmental works undertaken by third party consultants appointed by Shell, associated with the Site are detailed in the following reports:

- Petroleum Risk Tier 1 Report by GeoDelft [Ref: C928.SG216.8784] dated October 2001;
- Geo-Environmental Report by GeoDelft [Ref: C2336.SG216] dated December 2003;
- Phase 1 Investigation Report by URS [Ref: 49328043] dated February 2011;
- Comprehensive Environmental Site Assessment by URS [Ref: MARP00002 Final] dated July 2011;
- Environmental Verification Report by URS [49328043/R001] dated June 2012;
- Comprehensive Groundwater Monitoring Events by URS [Ref: R49328043-005] dated January 2014;
- Comprehensive Groundwater Monitoring Event by URS [Ref: R49328043-006] dated August 2014;
- Well Decommissioning Report by URS [R49328043-007] dated September 2014.

Based on the above, there is known available soil and groundwater analytical data for the Site, however all the groundwater monitoring wells were decommissioned during in 2014.

#### 1.1.2 Previous Arcadis Reports

The environmental works undertaken by Arcadis associated with the Site is detailed in the following report:

• Phase 1 Environmental Assessment Report (ESA), Shell Sutton Elms (Report Ref: GB-10019140-20220818-SA-Phase 1 ESA) August 2022.

## 2 Site Investigation Methodology

#### 2.1 Borehole Installation

#### 2.1.1 Borehole Location Rationale

The rationale for the installation of the four groundwater monitoring wells (MW101, MW104, MW105 and MW106) is presented below:

Borehole ID	Location Rationale	Installation
MW101	Located to the southwest of the tank farm in the southwest of the Site and anticipated to be downgradient of fuel infrastructure	50mm High- density polyethylene (HDPE) standpipe. Response zone within the Made Ground and River Terrace Deposits.
MW104	Located between the pump island and shop building to the northwest of the tank farm to assess conditions between commercial shop workers and fuel infrastructure.	50mm High- density polyethylene (HDPE) standpipe. Response zone within the Made Ground and River Terrace Deposits.
MW105	Located in the northeast of the Site and assumed to be upgradient of fuel infrastructure. Location to be used for triangulation of groundwater elevation profile.	50mm High- density polyethylene (HDPE) standpipe. Response zone within the Made Ground and River Terrace Deposits.
MW106	Located in the east of the Site and the current tank farm to assess any lateral migration of COPC.	50mm High- density polyethylene (HDPE) standpipe. Response zone within the Made Ground and River Terrace Deposits.

The locations of the monitoring wells are presented on Figure 2, Appendix A.

Data	Information
Investigation dates	15 to 24 November 2022.
	Public utility plans for the Site were reviewed alongside the Topographical and PAS128 Utility Survey (Drawing Ref: 0922-ARC-15508, dated 28 September 2022) detailing the presence of underground services identified on Site. A copy of the Topographical and PAS128 Utility Survey Plan is presented as Figure 3 under Appendix A.
Utility clearance	Prior to breaking ground, the investigation locations were scanned using a Cable Avoidance Too (CAT).
	Surface clearance pits were advanced to a minimum target depth of 1.2 meters below ground level (m bgl) via vacuum excavation and then backfilled to ground level. The boreholes were subsequently drilled through the backfilled trial pits. Where the target depth of 1.2m bgl could not be achieved drilling activities were not undertake at those locations.
Drilling method	A Comacchio 305 was used initially, followed by a Comacchio 205 to undertake dynamic sampling and rotary coring.
Maximum drilled depth	6.50m bgl.
Monitoring well installation	In each of the borehole locations, a 50mm HDPE monitoring well pipe comprising a slotted screen section and blank casing was installed. The annulus around the screen section was filled with grave and the annulus around the plain pipe was filled with bentonite, to prevent the formation of preferential pathways. The top of the monitoring well was grouted near the ground surface in accordance with industry standard practice.
	Monitoring well covers were installed flush to the ground.
Soil logging	Soil samples were logged with reference to British Standard (BS) 5930:2015+A1:2020, with reference made to any visual or olfactory evidence of contamination.
Soli logging	Borehole logs are presented in Appendix C.
Field screening	<ul> <li>Where possible, soil samples were collected at approximately 0.5m intervals, or more frequently in accordance with changes in geology/field observations and placed into two polythene bags.</li> <li>A Photo Ionization Detector (PID)* fitted with a 10.6eV ultraviolet (UV) lamp was used to measure soil headspace for ionisable hydrocarbons and other detectable COPC.</li> <li>PID readings were recorded and are presented on the borehole logs presented in Appendix C.</li> </ul>
Surveying	The newly installed monitoring wells (MW101, MW104, MW105 and MW106) were levelled on 25 November 2022.
Monitoring well development	Prior to well development, the wells were checked for presence of Non-Aqueous Phase Liquid (NAPL) with an interface probe. Up to ten saturated well volumes were removed from each monitoring well following installation.
Waste disposal	Waste soils were disposed of by under an appropriate duty of care. A soil sample from the skip (waste soil arisings) was also obtained and submitted to the laboratory for waste classification purposes.
-1	Purged groundwater collected during development of the newly installed monitoring wells (MW101 MW104, MW105 and MW106) was disposed of via the on-Site interceptor.

#### 2.1.2 Monitoring Well Instillation and Soil Sampling

\*The PID screening is a semi-quantitative method that results in a representation of the presence of Volatile Organic Compounds (VOC) in soil. The numerical output cannot be directly compared to measured soil concentrations of COPC. Nevertheless, PID readings are a useful field tool for assessing potential impacts in soil.

## 2.2 Groundwater Monitoring

The groundwater monitoring visit comprised a groundwater elevation survey and groundwater sampling, as detailed in the sections below.

#### 2.2.1 Groundwater Elevation Survey

Data	Information	
Date	18 January 2023 and 15 March 2023	
Monitoring wells surveyed	The newly installed monitoring wells (MW101, MW104, MW105 and MW106) were gauged during the monitoring visit conducted on 18 January 2023 and elevation survey conducted on 15 March 2023.	
Equipment used	Oil / water interface probe.	
Details recorded	Depth to NAPL, if present; Depth to groundwater; and, Depth to base of monitoring well.	

#### 2.2.2 Groundwater Monitoring and Sampling

Data	Information	
Date	18 January 2023	
Monitoring wells sampled	The newly installed monitoring wells (MW101, MW104, MW105 and MW106) were gauged during the monitoring visit.	
Sampling method	Purging and sampling was carried out by a battery-powered peristaltic pump, using dedicated sample tubing lowered into the well to the sample depth. The flow rate was set to low (generally <5l/min) to reduce turbidity and thus variability in results. New tubing was used for each monitoring well location. Sampling was undertaken from the approximate mid-point in the water column.	
Data recorded	Water quality parameters, Dissolved Oxygen (DO), Oxidation Reduction Potential (ORP), electrical conductivity and pH, were measured using a multi-parameter meter. Readings were taken at approximately five-minute intervals until the electrical conductivity, DO, and ORP from three consecutive readings differed by less than 10%. Once the readings had stabilised, the water passing through the low flow pump was considered to be representative of the surrounding aquifer and groundwater samples were collected.	

## 2.3 Analytical Strategy

Task	Information
Analytical Laboratory	Element Materials Technology (Element)
Accreditation	Element are United Kingdom Accreditation Service (UKAS) & Monitoring Certification Scheme (MCertS) accredited (for selected chemical analyses) and is an approved Arcadis subcontractor.
Chemical Analyses – Soil	<ul> <li>Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG) by Gas Chromatography-Flame Ionisation Detection (GC-FID);</li> </ul>

Task	Information
	<ul> <li>Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX) and fuel oxygenates [Methyl Tertiary-Butyl Ether (MTBE), Ethyl Tertiary-Butyl Ether (ETBE),</li> <li>Tertiary-Amyl Methyl Ether (TAME), Di-Isopropyl Ether (DIPE), Tertiary-Butyl Alcohol (TBA) and ethanol] by Gas Chromatography-Mass Spectrometry (GC-MS);</li> <li>United States Environmental Protection Agency (US EPA) 16 Polycyclic Aromatic Hydrocarbon compounds (PAH) by GC-MS;</li> <li>Alcohols by GC-MS; Fraction Organic Carbon by Eltra Total Organic Carbon (TOC) analyser</li> <li>n-Hexane by GC-MS;</li> <li>2-methylnaphthalene by GC-MS; and</li> <li>Asbestos screen by asbestos bulk Identification method.</li> </ul>
Chemical analyses (skip soil sample)	<ul> <li>TPH CWG by GC-FID;</li> <li>BTEX by GC-MS;</li> <li>US EPA 16 PAH by GC MS;</li> <li>pH by Metrohm Automated Probe Analyser;</li> <li>Heavy Metals (suite of 12) by Inductively Couple Plasma (ICP) – Optical Emission Spectrometry (OES);</li> <li>Asbestos screen by asbestos bulk Identification method;</li> <li>Speciated Chromium by Discrete Analyser;</li> <li>Free Cyanide by Flow Injection Analyser and;</li> <li>10:1 Full Waste Acceptance Criteria (WAC) testing.</li> </ul>
Chemical Analyses – Water	<ul> <li>Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG) by Gas Chromatography-Flame Ionisation Detection (GC-FID);</li> <li>Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX) and fuel oxygenates by Gas Chromatography-Mass Spectrometry (GC-MS);</li> <li>United States Environmental Protection Agency (US EPA) 16 Polycyclic Aromatic Hydrocarbon compounds (PAH) by GC MS.</li> <li>VOC by GC-MS.</li> </ul>

### 2.4 Quality Assurance and Quality Control

Full details of the Arcadis laboratory QA/QC policy are provided in Appendix D.

#### 2.4.1 Storage, Preservation and Transport of Samples

Measures taken to ensure the quality and integrity of the samples, from collection to receipt of the soil and groundwater samples by the laboratory are summarised below:

Task	Details
	<b>Soil Samples:</b> Plastic tubs and glass jars supplied by the laboratory were used for the collection of the soil samples. Soil samples stored in glass jars were used for the analysis of volatile compounds.
Storage	<b>Groundwater Samples:</b> Glass vials supplied by the laboratory were used for the collection of samples to be analysed for volatile compounds. Samples to be analysed for lower volatility compounds were stored in laboratory prepared glass bottles. Samples were stored in dedicated sample boxes provided by the laboratory.
Preservation	Sample containers were filled as far as practicable to minimise headspace and kept at a low storage temperature to minimise the potential for volatilisation and biodegradation of petroleum hydrocarbon compounds, VOC and Semi-Volatile Organic Compounds (SVOC) prior to analysis.

Task	Details
Decentamination	<b>Soil Samples:</b> Disposable gloves were worn and changed between sample collections to prevent cross-contamination.
Decontamination	<b><u>Groundwater Sample</u></b> : Groundwater samples were collected using dedicated, disposable tubing which was changed between monitoring well locations in order to prevent cross-contamination.
Transport	Samples were stored in dedicated sample cool boxes with cooling aids following collection and during transit to the laboratory. Sample details and analytical requests were recorded on the laboratory chain of custody form included with the samples, prior to dispatching to laboratory for analysis.

#### 2.4.2 Field Duplicate, Trip Blank and Equipment Blank

Task	Information
Field Duplicate	A soil duplicate sample, labelled as DUPSO, was collected from soil boring MW104 on 30h November 2022 and submitted for laboratory analysis.
Field Duplicate	A field duplicate of groundwater sample, labelled as DUP, was collected from monitoring well MW106 on 18 January 2023 and submitted for laboratory analysis.
Equipment Blank	An equipment blank, collected by running deionised water supplied by the laboratory through the sampling equipment, was submitted to the laboratory for analysis on 18 January 2023.
Trip Blank	A trip blank, provided with the sample containers by the laboratory and not opened on Site, was dispatched to the laboratory with the groundwater samples for analysis on 18 January 2023. However, the Trip Blank sample was reported to be lost during transport.

#### 2.5 Waste Characterisation

Waste materials disposed from Site were assessed and classified according to the current UK legislation and guidance. Once the waste was classified as either non-hazardous or hazardous, the Waste Acceptance Criteria (WAC) testing then determined the requirements for the appropriate waste disposal. The results were compared against a set of legislative thresholds. WAC testing is used to indicate if non-hazardous waste is inert and therefore suitable for disposal in an inert landfill. WAC testing is only required for this purpose or to facilitate disposal at hazardous landfills. It is not required for disposal of non-hazardous wastes which are not inert.

The waste producer holds the responsibility for ensuring the proper classification of any waste materials generated on the site. Arcadis collected laboratory data to be provided to the waste receiver, who then made an independent determination of the material based on the data. The Waste Transfer Notes related to soil disposal are included in Appendix I.

## 3 Site Investigation Findings

The sections summarise the findings of the Arcadis investigation.

#### 3.1 Ground Conditions

The ground conditions encountered during the borehole drilling are summarised below:

Soil Type / Geological Unit	Maximum Depth (m bgl)	Soil Description		
Made Ground	1.36	Concrete and bituminous surfacing overlaying dark grey to dark brown clayey gravelly SAND with frequent cobbles of brick.		
River Terrace Deposits	6.50	Soft, greyish dark brown, sandy, gravelly CLAY with bands of clayey sands. Overlaying brown speckled cream clayey gravelly SAND and sandy GRAVEL.		

Investigation locations MW101A, MW101B, MW105A and MW106B were terminated due to the presence of a secondary concrete slab within the inspection pits, these locations were progressed at MW101, MW105 and MW106 respectively.

Detailed ground descriptions can be found on the Borehole Logs in Appendix C.

#### 3.2 Soil Quality

Data	Findings
Visual or olfactory evidence of contamination	A hydrocarbon odour was noted in MW106 within soil samples collected from 0.15m bgl to 1.84m bgl and a hydrocarbon sheen was observed between 1.59 mbgl to 1.79 m bgl.
Asbestos Containing Material (ACM)	There was no detection of asbestos in any of the made ground or skip sample sent for asbestos screening.
	Field screening indicated Photo-Ionisation Detector (PID) readings below the equipment detection limit <1parts per million (ppm) in soils sampled from boreholes MW101, MW104, and MW105.
Field screening	The PID identified a maximum value of 5000 parts ppm recorded in soil samples collected from borehole MW106 at 1.5 and 1.7m bgl, coincidental with the observed sheen.
	The PID readings are shown on the borehole logs presented in Appendix C.
Laboratory Analysis	The laboratory data for the soil samples analysis are presented in Table 1. The results indicate the presence of mid-heavy end TPH constituents in the soils from MW104 and MW106 with detections of BTEX – correlating with the type of fuel stored and distributed at the Site. Majority of the detections are observed in soil sample samples obtained within 2m bgl. The laboratory certificates of analysis are presented in Appendix FF.
	Total 7 out of 12 soil samples were collected from saturated soils. The contaminant concentration in the soil samples in saturated soils can possibly be higher than what is reflected in the laboratory results due to contaminant mobility and migration into the groundwater, Therefore, the groundwater results are considered as the primary basis for the risk assessment.

### 3.3 Hydrogeology

Data	Information
Groundwater strikes	Groundwater strike was observed during the drilling of boreholes MW101, MW104, MW105 and MW106, details of which are presented on the borehole logs presented as Appendix C.
Range in depth to groundwater	Groundwater Elevation Survey conducted on 18 January 2023, depth to groundwater was recorded between 0.61m bgl to 1.49m bgl and groundwater elevations ranged from 75.06m to 75.46m Above Ordnance Datum (AOD).
	Groundwater Elevation Survey conducted on 15 March 2023, depth to groundwater was recorded between 0.55m bgl to 1.46m bgl and groundwater elevations ranged from 75.09m to 75.51m AOD.
	The groundwater monitoring installation details and complete groundwater elevation data recorded on 11 <sup>th</sup> November 2021 are presented on Table 2 in Appendix E.
Groundwater flow direction	A groundwater elevation plan is presented in Figure 2 in Appendix A. Based on the available data, the groundwater flow direction beneath the Site is inferred towards the west/southwest. It should be noted that previous groundwater monitoring events, conducted by URS in August 2014 [Ref: Comprehensive Groundwater Monitoring Event [Ref: R49328043-006], reported an inferred groundwater flow direction toward east.

### 3.4 Groundwater Quality

Data	Findings
Visual or olfactory evidence of contamination	No visual or olfactory evidence of contamination was identified during the monitoring visit.
NAPL	No evidence of NAPL was encountered within the monitoring well network during the monitoring visit.
Hydrogeochemical data	The hydrogeochemical parameters recorded during monitoring are detailed in Table 3 in Appendix E.
Laboratory analysis	The laboratory data for the groundwater analysis are presented in Table 4 to Appendix E. The results indicate the presence of mid-heavy end TPH constituents and BTEX in the groundwater sample collected from MW106. Minimal detections of Poly Aromatic Hydrocarbons (PAH) were recorded within groundwater samples collected across the Site. Laboratory certificates of analysis are presented in Appendix F.

Groundwater quality has been examined in relation to established TPH thresholds. These thresholds, which are founded on the site's sensitivity and the prevalence of particular contaminants, form the basis of our groundwater quality assessment.

### 3.5 Review of Quality Assurance/Quality Control Sampling

The analytical data have been reviewed for QA/QC purposes:

• Concentrations of COPC in the equipment blank sample were below the laboratory limit of detection;

• Sampling variability was measured by the Relative Percent Difference (RPD)<sup>1</sup> from analysis of the duplicate groundwater sample collected from MW106 and MW104. Although the relative percentage difference for ethylbenzene within duplicate soil sample collected at MW104 is slightly above the acceptable limit, the fact that all other analytes are within the prescribed RPD% limits suggests that the data is still fit for the purpose. Based on the results of the QA/QC sampling, the dataset is considered appropriate for use.

<sup>&</sup>lt;sup>1</sup> 1 Acceptable RPD for each Method Detection Limit (MDL) multiplier range are: 80 (1-10 x MDL); 50 (10-20 x MDL); 30 (>20 x MDL)

## 4 Generic Quantitative Risk Assessment

In order to assess the potential significance of the measured concentrations of COPC present in soil and groundwater samples, the concentrations of COPC present in soil and groundwater samples have been compared to Arcadis Generic Assessment Criteria (GAC) protective of human health and water resources receptors.

Based on the proposed continued use of the Site as a PFS and risk assessment findings of Phase 1 Environmental Site Assessment Report completed by Arcadis in August 2022 [Ref: GB-10019140-20220818-SA-Phase 1 ESA], the measured concentrations of COPC in soil and groundwater have been compared to applicable Arcadis GAC protective of human health for CPU. The Site is underlain by River Terrace Deposits, designated as a Secondary A Aquifer and Mercia Mudstone designated as Secondary B aquifer. The nearest surface water feature is River Soar located 37m southeast of the Site; therefore, COPC concentrations in soil and groundwater have also been compared to the Arcadis GAC protective of water resources for aquifers, surface waters and UK Drinking Water Standards applied to groundwater.

The GAC have been derived In line with guidance provided by the Environment Agency (EA). An overview of the derivation of the Arcadis GAC is presented in Appendix G and the Arcadis GAC for CPU are presented in Appendix H. In the absence of suitable legislative criteria for sum TPH, Arcadis typically adopts a value of 10µg/l split between the TPH fractions for more sensitive locations (e.g. Principal Aquifer, drinking water abstraction), and a value of 50µg/l split between the TPH fractions for locations considered less sensitive (e.g. lower permeability aquifers / lower sensitivity resources) or where a site is located in close proximity to a surface watercourse.

The concentrations of COPC in groundwater were also compared with the Shell Universal RBSL where the RBSL are more conservative than the human health GAC (applicable for naphthalene and xylene only).

Receptor	Exceedances of Arcadis GAC for CPU					
On-Site Commercial Workers	>C8-C10 Aliphatics at MW106 (1.5 to 1.8m bgl).					
Water Resources (Aquifers)	Toluene at MW106 (1.0 and 1.5 to 1.8m bgl); Naphthalene at MW106 (1.0m bgl).					
Water Resources	Benzo(b)fluoranthene at MW101(0.2 to 0.5m bgl), MW104(0.5m bgl), MW105(1.0 to 1.2m bgl) and MW106(1.0 and 1.5 to 1.8m bgl);					
	Benzo(k)fluoranthene at MW101(0.2 to 0.5m bgl), MW104(0.5m bgl), MW105(1.0 to 1.2m bgl) and MW106(1.0 m bgl);					
(Surface Water)	Benzo(g,h,i)perylene at MW101(0.2 to 0.5m bgl), MW105(1.0 to 1.2m bgl) and MW106(1.0 m bgl);					
	Indeno(1,2,3-c,d)pyrene at MW101(0.2 to 0.5m bgl), MW104(0.5m bgl), MW105(1.0 to 1.2m bgl) and MW106(1.0 m bgl).					
	Benzene at MW106 (1.0m bgl);					
Water Resources (Both Aquifers	Ethylbenzene at MW106 (1.0 and 1.5 to 1.8m bgl);					
and Surface	Xylene (o) at MW106 (1.0 and 1.5 to 1.8m bgl);					
Waters)	Naphthalene at MW106 (1.5 to 1.8m bgl).					

### 4.1 Comparison of Soil Sample Analysis Results to GAC

### 4.2 Comparison of Groundwater Analysis Results to GAC

Receptor	Exceedances of Arcadis GAC for CPU			
On-Site Commercial Workers	None			
Water Resources (Surface Water)	Ethylbenzene, Xylene (Total) at MW106.			
Water Resources (Both Aquifers and Surface Waters)	TPH >C5-C35 Aliphatics/Aromatics, Benzene and Naphthalene at MW106; Benzo(a)pyrene at MW105.			

#### 4.3 Human Health

The maximum measured concentrations of COPC did not exceed the relevant assessment criteria derived for the protection of human health receptors any of the of the soil and groundwater samples except for >C8-C10 Aliphatics at MW106 (1.5 to 1.8m bgl). This localized exceedance suggests the possibility of low-level risk posed to human health receptors in the eastern part of the Site.

#### 4.4 Water Resources

Concentrations of BTEX and PAHs exceeded the Arcadis GAC for the protection of surface water receptors in soil samples collected from both unsaturated and saturated zones of the Site. However, no corresponding exceedances of these COPC were detected in the groundwater samples collected from MW101, MW104, and MW105. The measured COPC concentrations in soil and groundwater samples collected at MW106 indicate a possible localized contamination in the eastern part of the Site. Further information about the localized exceedance and potential migration of the contaminants is necessary to evaluate the risk posed to the surface water and groundwater receptors.

## **5** Site Conceptualisation

The following section provides an overview for conceptual understanding of the Site, reviewing the most recent intrusive investigation completed by Arcadis in January 2023 and the findings of the previous works undertaken at the Site between 2011 and 2014.

#### 5.1 Geology

The overall geology beneath the Site is interpreted as complex, interbedded sand, gravel, and clay layers, and previous works (URS July 2011) have contributed useful information towards building a clear understanding of the geology. However, the 2023 investigation provides more detailed information on the discontinuous nature of the complex lithology beneath Site, with interbedded sand, gravel, and clay layers that are not separate and distinct but rather interbedded and discontinuous. This poses potential challenges in determining contaminant flow through the subsurface.

#### 5.2 Hydrogeology

Following a review of the Regional Geology using the BGS GeoIndex and DEFRA Magic Maps, accessed on June 20, 2023, it was found that the Environment Agency classifies the superficial River Terrace Deposits beneath the site as a Secondary A Aquifer. This classification suggests that these deposits are capable of supporting local water supplies and are vital for providing base flow to rivers. In contrast, the Mercia Mudstone is classified as a Secondary B Aquifer, which implies that it can store and yield groundwater in limited amounts due to localized features such as fissures, thin permeable layers, and weathering.

The 2011 Site investigation indicated that the average depth to groundwater beneath the Site was observed at 1.08 m bgl, within the shallowest aquifer primarily comprising the superficial River Terrace Deposits. The report also inferred that the groundwater flow direction in the superficial deposits was towards the east. Based on the groundwater elevations measured during the groundwater monitoring rounds in 2014, depth to groundwater was observed to be between 0.47m bgl and 2.15m bgl, and the inferred groundwater flow direction across the Site was towards the east to south-east, and groundwater flow generally appeared to be in the direction of the nearby River Soar. Notably, the groundwater flow directions at all monitoring well locations to determine the inferred groundwater flow direction; this suggests that defining a true flow direction presented some challenges.

The 2023 findings indicate a groundwater flow direction towards west (opposite to that observed in the previous reports). Therefore, it is crucial to gain a clear understanding of the direction in which groundwater and contaminants may migrate through the subsurface to effectively manage potential risks associated with the Site.

#### 5.3 Contaminant Concentrations & Distribution

#### 5.3.1 Soil

A Contaminant Distribution Plot for soil, representing the distribution of Benzene, Xylenes, TPH and PAH<sup>2</sup> during the 2011 and 2023 intrusive works is presented as Figure 4A; The highest concentrations of TPH and BTEX observed during the 2011 works were reported from URSMW103 and URSMW104 located near the forecourt area. The maximum PAH concentrations were detected in URSMW107 located close to the shop building. A comparison of soil analytical results against URS derived GAC protective of human health (on-Site petroleum workers) and controlled water receptors indicated concentrations of Benzene and Xylenes in one deep soil sample exceeded the Human Health GAC. A potential risk to Controlled Water receptors was identified from the measured BTEX, PAH and TPH soil concentrations. Following to the intrusive investigation,

<sup>&</sup>lt;sup>2</sup> Benzene, Xylenes, Total TPH and Total PAH16 were used as key constituents for the distribution plots based on the historical use of the Site as PFS and exceedances/elevated concentrations observed during intrusive investigations conducted on Site to date.

the Site was partially redeveloped in 2011; URS undertook validation sampling around the removed fuel lines and beneath the fuel pump islands. A total of thirteen validation soil samples were collected and analysed for COPC. A Contaminant Distribution Plot for soil validation samples, representing the distribution of Benzene, Xylenes, TPH and PAH during the 2011 verification sampling is presented as Figure 4B. The maximum concentration of COPC's were reported at sample 'V7', collected at 1.5m bgl (in-situ soils) beneath the southwest portion of the pump island.

The contaminant distribution in soils from the 2023 intrusive works indicates relatively higher concentrations of Xylenes and TPH at MW106 located in the eastern part of the Site. The soil samples collected from MW101 and MW104 were shallow unsaturated soils (0.2 to 0.5m bgl) whereas the soil samples collected from MW105 and MW106 were noted to be saturated (1m bgl); the analysis results from both saturated and unsaturated soil samples are considered to be useful in providing insight into the location and magnitude of contaminant mass present beneath the Site.

Based on the findings of the Site investigations conducted in 2011 (incl. soil verification works) and Arcadis' 2023 intrusive works, it is important to note that an accurate comparison of contaminant concentrations in soils cannot be made due to the variation in well locations and sampling depths; a more suitable approach for comparison is considered to be review of the COPC concentrations in groundwater samples collected. Notwithstanding this limitation, a cursory evaluation indicates that the contaminant concentrations documented in 2023 do not conflict with the previous works (it is noted that sum TPH concentrations >3,000mg/kg [sample V7, Figure 4B] remained *in-situ* following the 2011 site redevelopment).

The observed contaminant concentrations in the eastern part of the Site indicate the presence of a localized contamination source within the smear zone.

#### 5.3.2 Groundwater

The most recent groundwater monitoring conducted by URS is reported in the August 2014 GME. The report indicated the presence of BTEX, TPH, PAHs and metals in groundwater samples collected from monitoring wells across the Site. Arcadis' 2023 GME reports the presence of mid-heavy end TPH constituents and BTEX in the groundwater sample collected from MW106 (located in the eastern part of the Site) with minimal detections of PAHs recorded within groundwater samples collected across the Site. A contaminant Distribution Plot for groundwater is presented as Figure 5 representing the distribution of Benzene, Xylenes, Total TPH and PAH16 during 2014 and 2022 groundwater monitoring works. The most elevated groundwater impacts identified during this investigation (MW106) is noted to be in an area not thoroughly investigated previously (nearby monitoring well URSMW104 was not sampled in 2014). With the exception of MW106, groundwater quality across the remaining areas of the site assessed in 2023 appear to be in line with the previous investigation in 2011. The contaminants identified in groundwater have the potential to migrate off-Site via the shallow aquifer and impact nearby receptors, such as surface water bodies. Additionally, the presence of these contaminants in the groundwater may indicate sources of contamination at the Site that have yet to be identified. As a result of the elevated impacts identified in MW106, there is considered a potential risk to the secondary A aquifer beneath the Site and the River Soar located 37m east of the Site.

## **6** Conclusions

The environmental work summarised in this report comprises the installation of four groundwater monitoring wells across the Site in November 2022 and groundwater monitoring of the newly installed monitoring wells undertaken in January 2023. The findings of the environmental investigation indicated the following:

- No visual or olfactory evidence of contamination was identified in soil samples collected during the drilling of MW101, MW104 and MW105. A hydrocarbon odour was noted at MW106 within soil samples collected from 0.15m bgl to 1.84m bgl and a hydrocarbon sheen was observed between 1.59 mbgl to 1.79 m bgl.
- All monitoring wells installed screened the Made Ground and River Terrace Deposits. Groundwater was
  encountered at depths ranging between 0.61m bgl to 1.49m bgl during the January 2023 groundwater
  monitoring visit and between 0.55m bgl to 1.46m bgl during March 2023 groundwater elevation survey. The
  groundwater elevation data from both the groundwater elevation surveys inferred a groundwater flow
  direction towards the west/southwest. However previous groundwater monitoring conducted in August 2014
  indicated the groundwater flow direction towards east.
- The laboratory analysis of COPC in soil samples collected in November 2022 indicated detectable concentrations of TPH, BTEX, PAH16 within shallow soil samples (approximately <2m bgl). The highest concentrations of COPC were observed in soil samples collected from MW106.
- The soil samples collected from MW101 and MW104 were shallow unsaturated soil (0.2 to 0.5m bgl) whereas the soil samples collected from MW105 and MW106 were saturated soil (1m bgl). The analysis results from both saturated and unsaturated soil samples are considered to be useful in providing insight into location and extent of contaminant mass present beneath the Site.
- The laboratory analysis of COPC in groundwater samples collected across the Site in January 2023 indicated detectable concentrations of TPH, BTEX, PAH16. The highest concentrations of COPC were observed in groundwater sample collected from MW106.
- Limited COPC were detected in soil samples collected in November 2022 which exceeded the Arcadis GAC protective of water resources (aquifers and surface waters) with exceedances of BTEX and naphthalene at MW106, benzo(b,k)fluoranthene, benzo(g,h,i)pyrene and indeno(1,2,3-c,d)pyrene within shallow soil samples collected from all four sampling locations.
- A single COPC in soils collected in November 2022 from MW106 exceeded the Arcadis GAC protective of human health for continued petroleum use (>C8-C10 Aliphatic hydrocarbons).
- None of the COPC were detected in exceedance of the Arcadis GAC protective of human health for continued petroleum use within groundwater samples collected from MW106.
- Concentrations of benzene, sum TPH (>C5-C35) Aliphatics/Aromatics, and naphthalene in MW106, along with benzo(a)pyrene in MW105, were detected in exceedance of the Arcadis GAC protective of water resources (aquifers and surface waters) and UK drinking water quality standards within the groundwater samples collected.
- The COPC concentrations measured in soil and groundwater samples collected and the olfactory evidence observed at MW106 indicates the possible presence of localised contamination in the eastern part of the Site.
- The subsurface geology of the Site is complex, with sand, gravel, and clay layers intermixed, presenting challenges in determining the contaminants flow through it. Additionally, the hydrogeology of the Site is complex, the previous reports have revealed varying flow directions.
- Given the findings of the investigations completed to date, there is considered to be a potential risk to the secondary A aquifer under the Site and the River Soar located 37m southeast of the Site.



## **APPENDIX A**

**Report Figures** 

Figure 1 – Site Location Plan

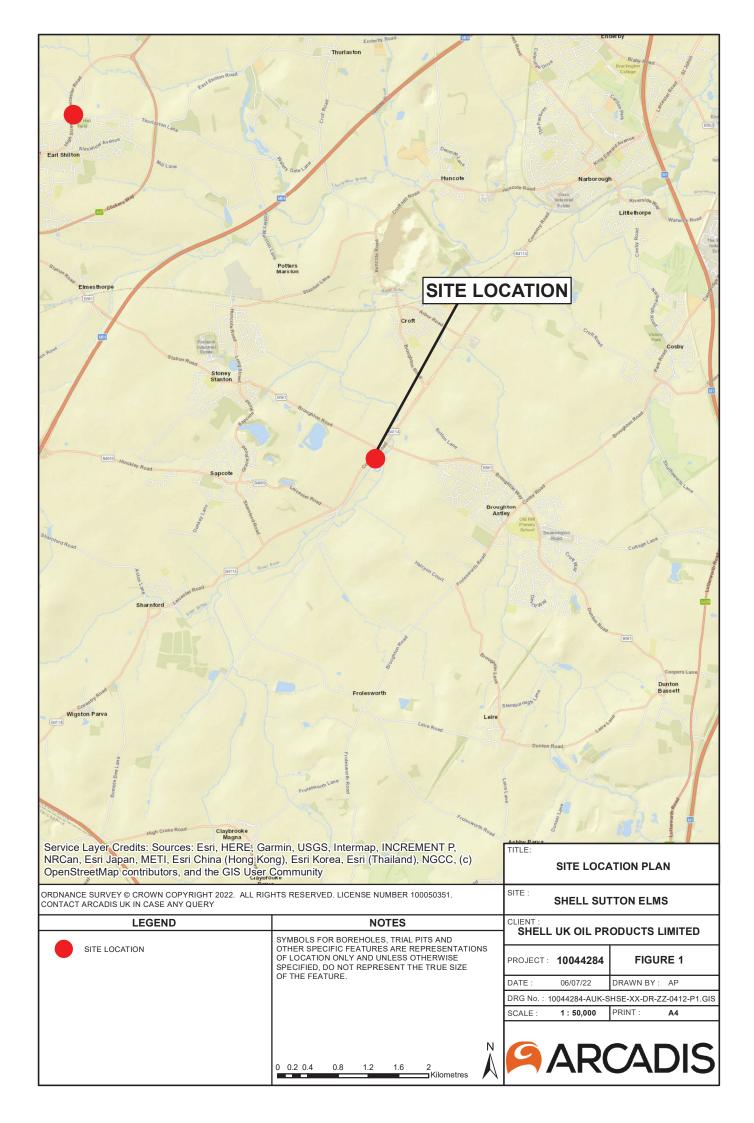
Figure 2 – Site Layout and Groundwater Elevation Plan

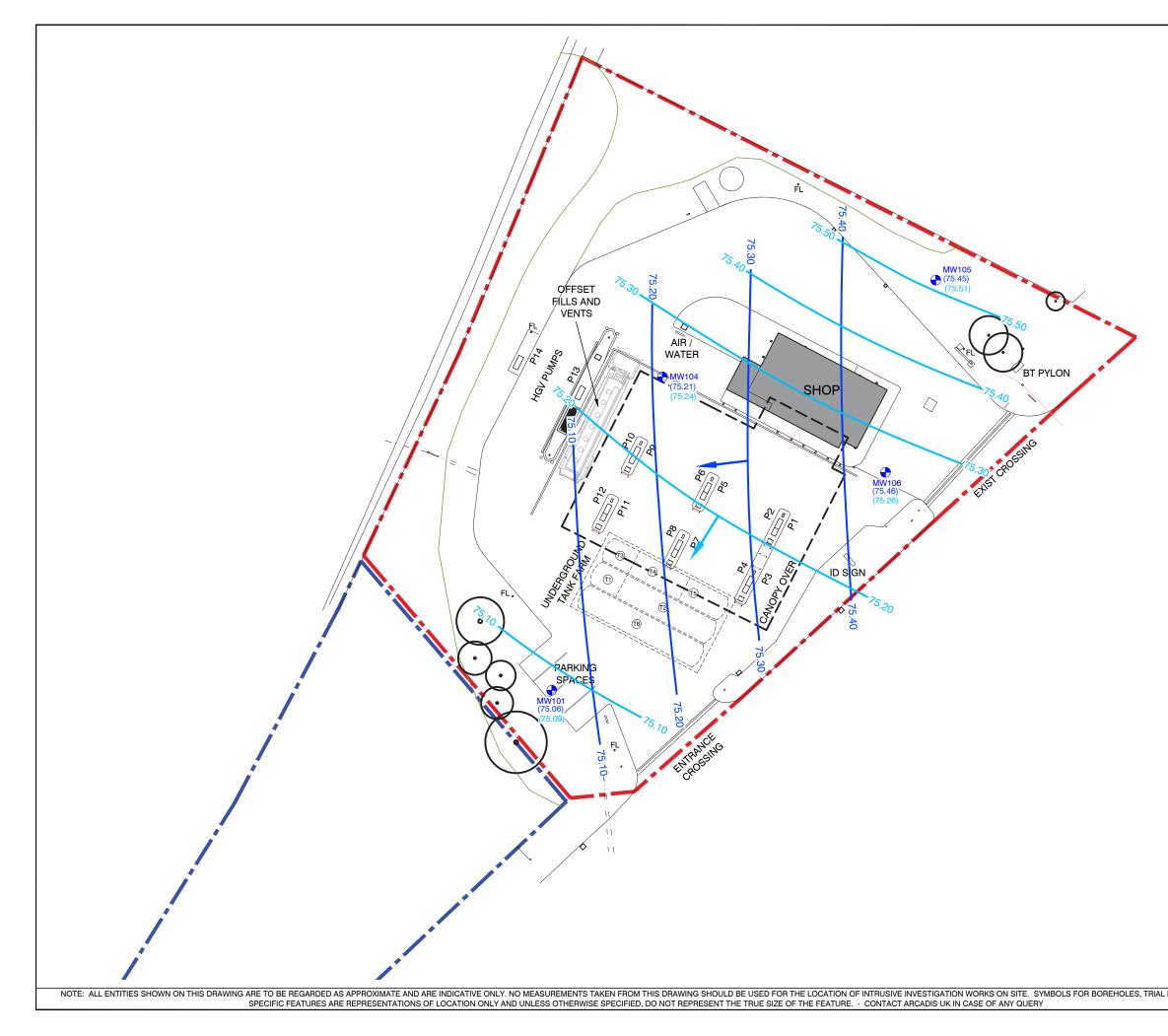
Figure 3 – Topographical and PAS 128 Utility Survey Plan

Figure 4A – Contaminant Distribution in Soil Boring Locations

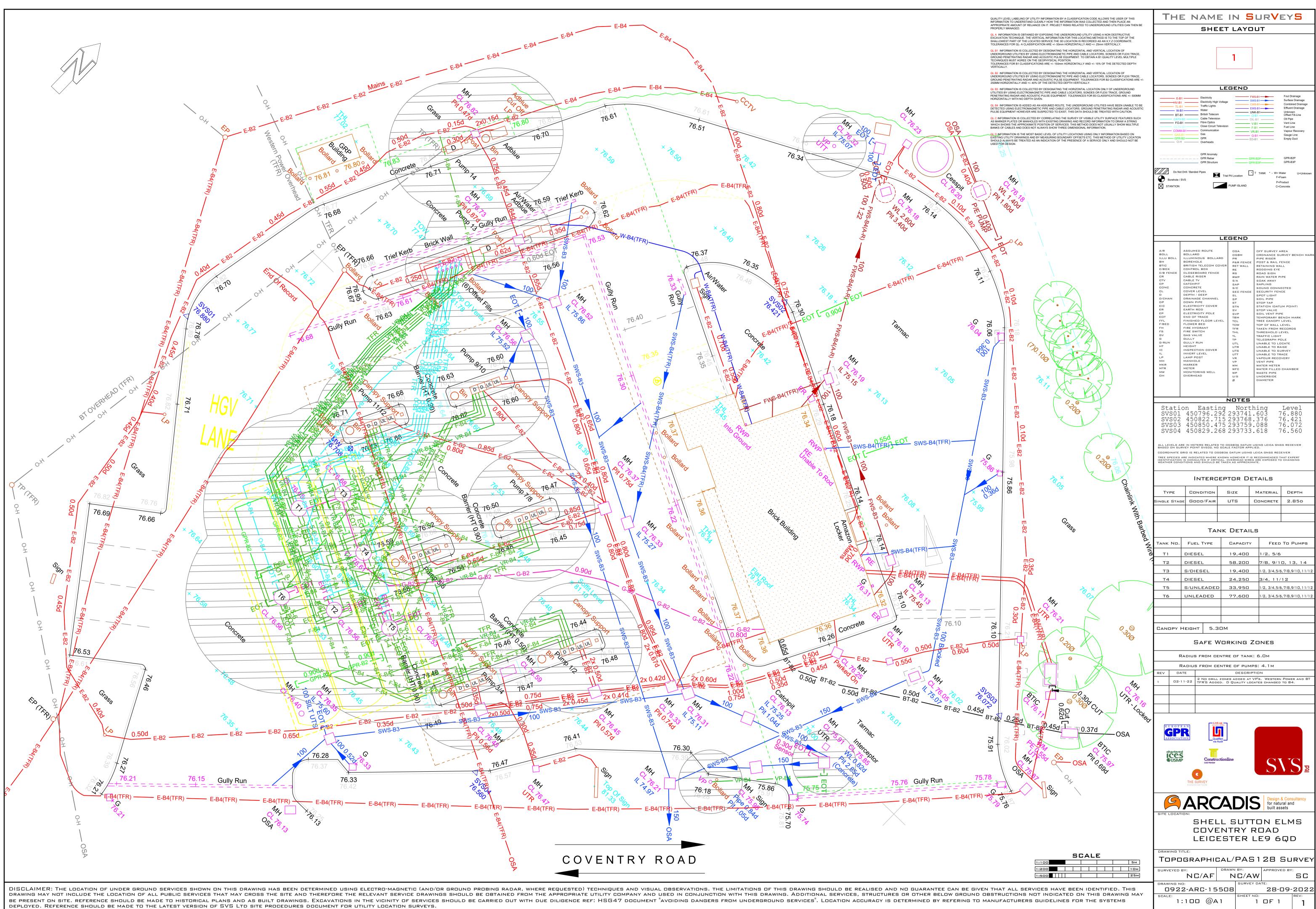
Figure 4B – Contaminant Distribution in Soil Validation Samples.

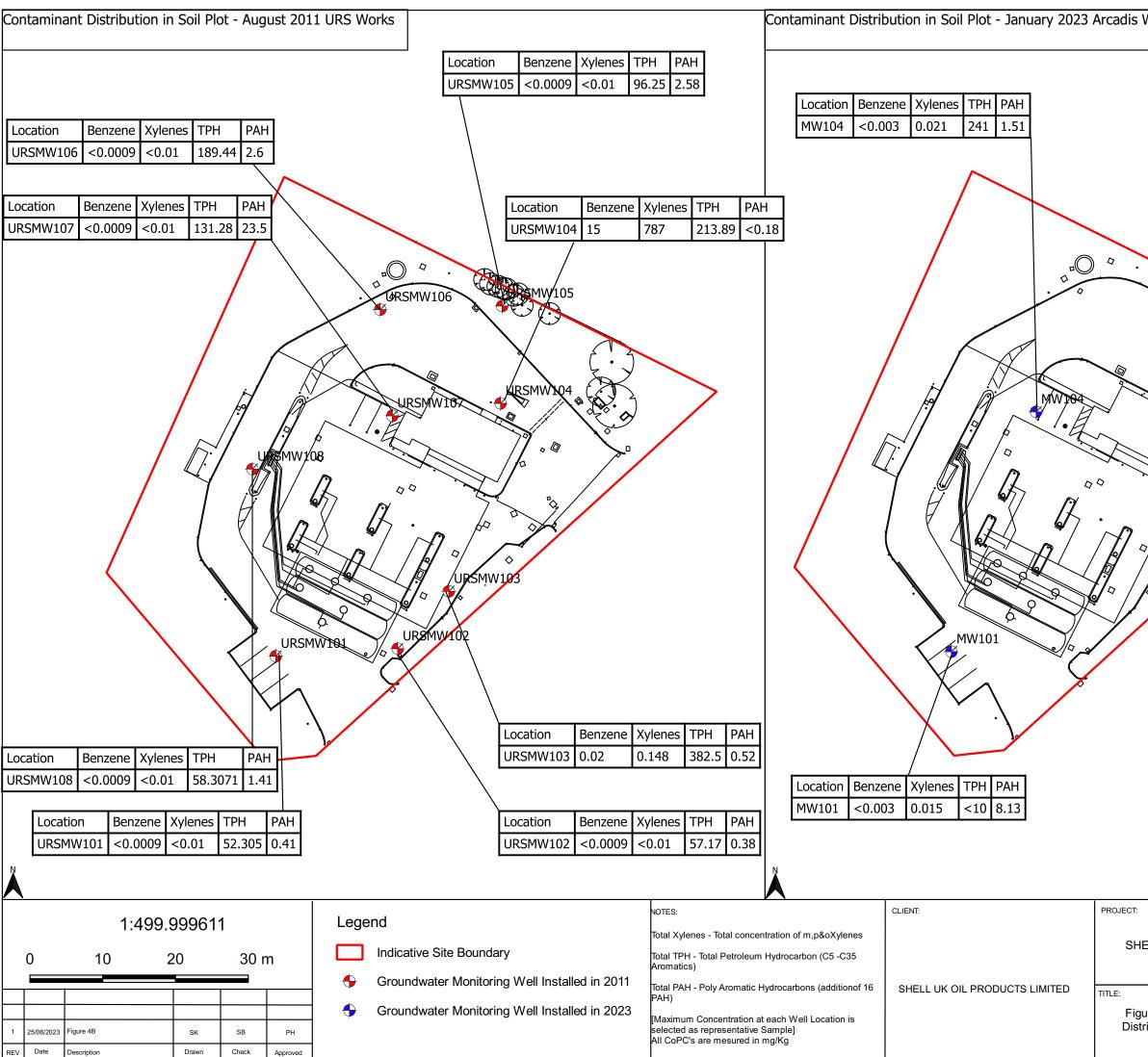
Figure 5 – Contaminant Distribution in Groundwater Plot





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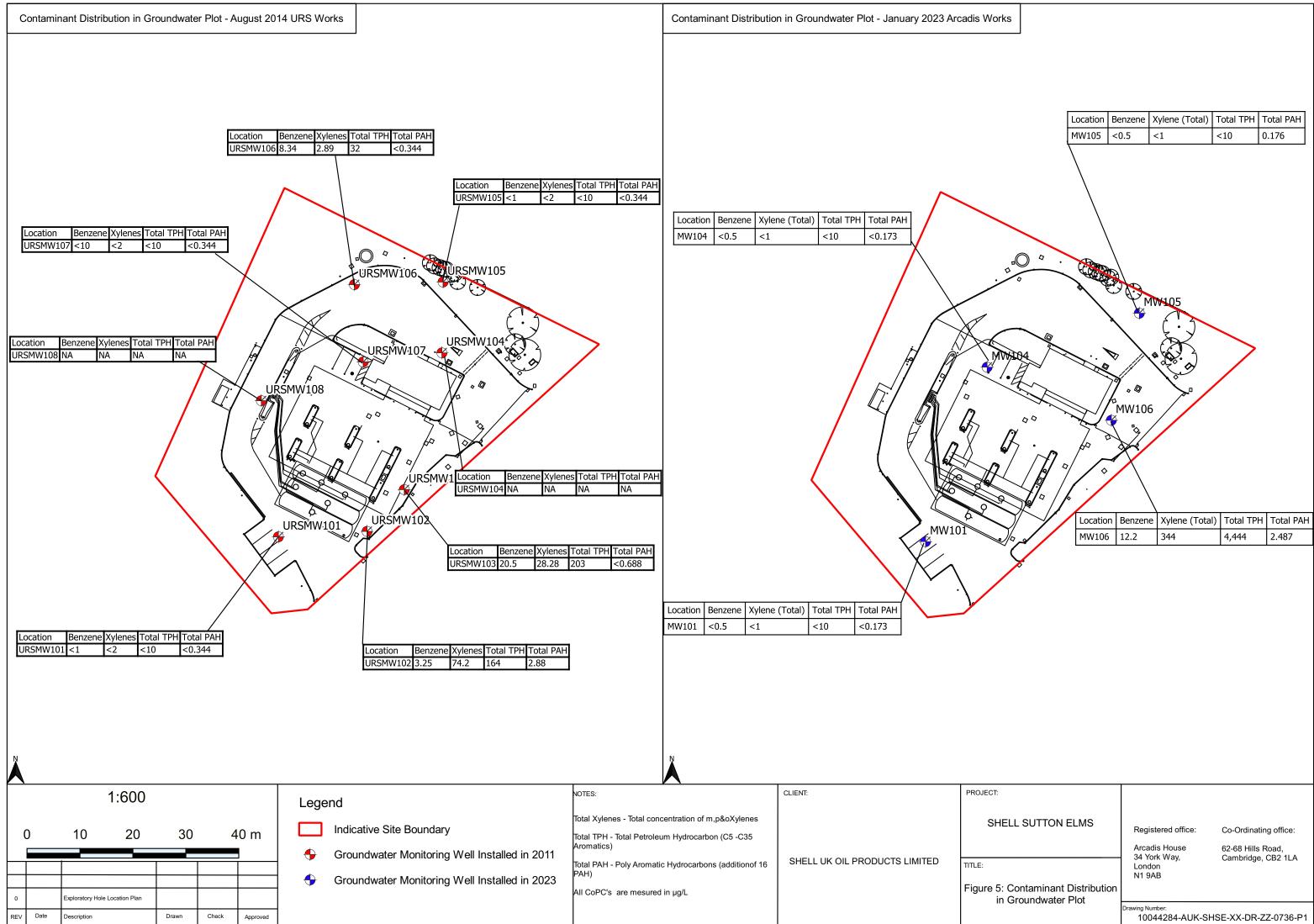
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## APPENDIX B

**Study Limitations** 

#### Arcadis' Study Limitations

**IMPORTANT**. This appendix should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

- This report has been prepared by Arcadis Ltd. (Arcadis), with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with Shell UK Oil Products Limited (the 'Client'). Arcadis does not accept responsibility for any matters outside the agreed scope.
- This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing. The contents of this report may not be used or relied upon by any person other than this party without the express written consent and authorisation of Arcadis.
- 3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Arcadis is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have unpublished, more stringent objectives. Further work may be required by these parties.
- 4. All work carried out in preparing this report has used, and is based on, Arcadis' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice, pending changes in legislation, of which Arcadis is aware, have been considered. Following delivery of the report, Arcadis has no obligation to advise the Client or any other party of such changes or their repercussions.
- This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.
- 6. Whilst this report and the opinions made are correct to the best of Arcadis' belief, Arcadis cannot guarantee the accuracy or completeness of any information provided by third parties. provided by third parties. Arcadis has taken reasonable steps to ensure that the information sources used for this assessment provided accurate information and has therefore assumed this to be the case.
- This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have been received.
- 8. This report refers, within the limitations stated, to the condition of the Site at the time of the inspection. No warranty is given as to the possibility of changes in the condition of the Site since the time of the investigation.
- 9. The content of this report represents the professional opinion of experienced environmental consultants. Arcadis

does not provide specialist legal or other professional advice. The advice of other professionals may be required.

- 10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by Site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the Site have not been investigated.
- 11. If below ground intrusive investigations have been conducted as part of the scope, safe location of exploratory holes has been carried out with reference to the Arcadis ground disturbances procedure. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on Site.
- Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.
- 13. Unless otherwise stated, an inspection of the Site has not been undertaken and there may be conditions present at the Site which have not been identified within the scope of this assessment.
- Unless otherwise stated, samples from the Site (soil, groundwater, building fabric or other samples) have not been obtained.
- 15. Arcadis has relied upon the accuracy of documents, oral information and other material and information provided by the Client and others, and Arcadis assumes no liability for the accuracy of such data, although in the event of apparent conflicts in information, Arcadis would highlight this and seek to resolve.
- 16. Unless otherwise stated, the scope of works has not included an environmental compliance review, health and safety compliance review, hazardous building materials assessment, interviews or contacting Local Authority, requests for information to the petroleum officer, sampling or analyses of soil, ground water, surface water, air or hazardous building materials or a chain of title review.
- 17. Unless otherwise stated, this assessment has considered the ongoing use of the Site and has not been prepared for the purposes of redevelopment which may act as a trigger for Site investigation and remediation works not needed for ongoing use.



## ARCADIS Inspection Pit Log

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## ARCADIS Inspection Pit Log

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										MATER	00055				-					
Trom To	ECHNIQUE Type	HOLE Hole Dia.		G DIAMET Casing Dia.			HISELLI To	NG Duration	Date/Time	WATER Strike	OBSEF Rest	Nins	VS Casing	Sealed		To	DETAILS	S N Type Fro	MATER A	
0.00 0.31	Inspection Pit	300	0.30																	
IN Name	STRUMENTS Type	m AGL		WELL Well Name		EN DES	-	Dia.	Refused on (	concrete	lah			REMA	RKS					
Hame	iype	III AGL	1	TTOI INDITIE			10	Did.	i teiuseu oli (	SOLUTER S	nau									
			1																	
	<u> </u>																			
Unles	s otherwise sta	ated: (mm), Tir I (mAOD) d Level (r				Ed	luipment	Used			Termi	ination D	epth				Lo	gged By	Checke	ed By

# ARCADIS Dynamic Sampling to Rotary Coring Log

#### **MW101**

roject Shell Sutton lient Shell UK Oil				<b>1</b> ( Ea	0044284 sting (OS mE)	76.54	15. End	t Date 11/2022 Date 11/2022	Sca 1:: Sh	50 1eet 1	of 1
Progress	Samples	Tests	s and Measurement			Sti	ata		Depth		Insta
Date / Time Casing / DTW	Type - Depth (m)	Type - Depth (m) - Re		racture con		Description	1	Legend	(Thickness)	Level	Back
22/11/15 14:20	(1) 0.20	PID 0.20m <1p	m		MADE GROUN membrane.	D: CONCRETE with	rebar and plastic		(0.19) 0.19	76.35	4
								el.	(0.46)	1	
-		PID 0.50m <1p	pm			-	•		0.65	75.89	=
	(0) 4 00									-	F
-	(2) 1.00								(0.76)	Ī	
	-				Soft light brown	mottled arey speck	ed white sandy gravelly		1.41	75.13	E
-	-	PID 1.50m <1p	pm		CLAY. Gravel i	s fine to coarse suba	ngular of flint chalk and			Ī	Ê
	-				Sandstone.				(0.96)	1	L
-	-	SPT() 2.00m N>5	50							Ī	
	-		-		Soft to Firm mo	ttled brown and arev	speckled white sandy		2.37	74.17	
-	Products Ltd.         Easting (05 mE) 4608 (V7)         Meeting (05 mE) 32728.24           Samples         Tests and Measurements         Strata           Type - Depth (m)         Type - Depth (m) - Feault         Type - Type (m)         Description           (1) 0.20         PD         0.2m < 1ppn				Ī						
	-										
-		SPT() 3.00m N>5	50						(1 71)	Ť	
	-								(1.71)		ļ
-		PID 3.50m <1p	pm							Ī	
	-										[: F
-	(ES3) 4 20-4 50								4.08	72.46	F
	(200) 1.20 1.00				coarse. Gravel	is fine to coarse sub	rounded of flint and chall	<	(0.51)		E
-	-	PID 4.50m <1p	pm					m <sub>F</sub>	4.59	71.95	
	-				Mottled c	ream and brown sand	ly gravel. Gravel is fine to		(0.45)		
-		PID 5.00m <1p	pm			-	sandstone. 4.67-4.7m bg		5.04 5.12	71.50 71.42	
	-				Mottled c coar	se subangular to sub	rounded of flint, chalk and	/ #	(0.58)		
22/11/24 11:18		PID 5.50m <1p	pm			ttled black sandy GF			5.70	70.84	
· / -	-				Brown slightly of	layey SAND.				-	
-	-				Becomes g	-	flint. 5.25-5.28m bg			Ī	
	-				Becomes	gravelly. Gravel is su	bangular fine to coarse o	F		-	
	-						ano chaik 5.54-5.57m bg			Ī	
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				FLUNG	WAT	ER OBSERVATIONS	EI II	SH DETAILS		ATER A	
om To	Type Hole [	ia. Depth Casing Dia		o Duration	Date/Time Str	ike Rest Mins (		To Rtn%	Type Fro		
		1.23									
		\\//E''					REMARKS				
Name	Type m A	GL Well Name	e From	To Dia.							
MW101	Standpipe 0.00	0 MW101	0.50 5	5.50 50							

# ARCADIS Dynamic Sampling to Rotary Coring Log

#### **MW104**

iect nell Suttor nell UK Oi	n Elms I Products Ltd.						<b>1</b> Ea	0044284 asting (OS mE)	76.3 North	38 ing (OS m	N)		<b>16/1</b> End D	1/2022	1:	<sup>ale</sup> 50 heet 1	of 1
Progress	Samples		Test	s and Me	easuren					S	Strata			- T	Depth	Level	Inst
Date / Time Casing / DTW	Type - Depth (m)	Type - I	Depth (m) - Re	esult		Fractu Detail	re TCR SCR S RQD			Descript	ion			Legend	(Thickness)	) Level	Bac
2/11/16 09:00 / -	-							MADE GROUN	ID: CONC	RETE.		Rebar 0.0	8m bal	-	× (0.16) × 0.16	76.22	4
	-										TERIAL - B	rown sar	idy		× × (0.45)	ļ	$\square$
	(ES1) 0.50	PID	0.50m <1p	pm							•	•			(0.61 (0.14) 0.75	75.77	•
	-							sandy gravelly	CLAY. Gra						- `0.75′	75.63	•
	(ES2) 1.00	PID	1.00m <1p	-				Soft greenish g	rey mottle			itly grave	lly CLA	/	(0.70)	ŧ	
	-	PID	1.20m <1p	pm				Graver is medi			ini it.				*	Ì	
	-	PID	1.50m <1p	pm								CLAY. Gra	avel is		1.45 (0.25)	74.93	• •
	-											e flint gra	vel.		1.70 (0.30)	74.68	•
	-	PID SPT()	2.00m <1p 2.00m N>					Soft mottled gr	ey and bro	wn sand	y slightly g	avelly Cl	AY.		2.00	74.38	
	-		(0 for 0mm/0						coarse su	ubangula	ar to subrou	nded of f	lint and	· · · · · · · · · · · · · · · · · · ·		ļ	•
	-	PID	2.50m <1p	pm											(1.09)	ŧ	
	-															I	
	-	PID	3.00m <1p	pm												+	
				Easting (OS mE)     Nothing (OS mN)     End 1237       and Measurements     Stata       sult     Page 100       mail     Red Colore 100       mail     Red Colore 100       mail     Soft motified provision in the coarse subangular of page 100       mail     Soft motified provi mail grey and brown sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of flint.       mail     Soft motified grey and brown sandy slightly gravelly CLAY.       mail     Soft brownish speckled white grey sandy CLAY.       mail     Soft brownish speckled white grey sandy CLAY.       mail     Soft motified cream clayey sandy CLAY.       mail     Brown motified cream clayey sandy CLAY.       mail     Brown motified cream clayey sandy CLAY.       mail     Brown motified cream clayey sandy CLAY.       mail     Brown motified cream clayey sandy CLAY.       mail     Brown sandy CLAY.       mail     Brown			3.09	73.29									
	-	PID	3.50m <1p	pm											(0.72)	1	
	-	SPT()	3.50m N>	50											: 	ţ	
	-(ES3) 3.80-4.20	PID	4.00m <1p	nm								. Gravel i	s		· 3.81	72.57	
	-		4.0011 11	,pm				-							(0.44) 4.25	72.13	
	-	PID	4.50m <1*										SAND.		4.20	12.15	
	-	PID	4.50m <1p	рп						Bec	omes grave	lly 4.6-4.	7m bgl		(0.60)	Ī	
	-														4.85	71.53	
	3	PID	5.00m <1p	pm					SAND with	rare cha	lik and flint	tine grav	el and		-	Ť	
														- <u></u>	: (1.06)	Į	
	-	PID	5.50m <1p	pm											-	+	7
	-														5.91	70.47	./.
	-	PID	6.00m <1p	pm				Soft greyish br	own sandy	CLAY.					(0.39)	+	
2/11/25 09:03 30 / -	-	PID	6.30m <1p	pm											6.30	70.08	<u> </u>
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RILLING TE		DLE / CAS	SING DIAME	TED			ING						ELLIS	H DETAIL			
m To	Type Hole	Dia. Dep	th Casing Dia	-				Date/Time St	rike Rest	1 1	Casing S	ealed Fro	1		Type Fro	-	
00 1.20 20 6.30 D	Inspection Pit 300 ynamic Sample	) 1.2	0					25/11/2022 08:09 1	.20		5.00						Γ
	TRUMENTS		WEL	L SCREE	I EN DES	BIGN					RI	EMARKS					
Name MW104	Type m A Standpipe 0.0		Well Nam MW104														
					0.00	0.00											

Height Above Ground Level (m AGL)

# ARCADIS Inspection Pit Log

## MW105 A

Project Shell Sutton Client Shell UK Oil I	Elms Products Ltd.			10	oject No. <b>)044284</b> sting (OS mE)	0.00	d Level (m ng (OS mN			1 E	nd Dat	/2022	1:	neet 1	of 1
Progress	Samples	Tests and Mea	asurements				St	rata					Depth		Instal
Date / Time Casing / DTW 022/11/16 14:10 - / - - / -	Type - Depth (m)	Type - Depth (m) - Result	Fracture Details	TCR SCR RQD	MADE GROUN gravelly CLAY v bituminous mat	vith freque	nt cobble	soft ligh s of bric	k red bi	rick		Legend	(Thickness	Level	Backf
-		PID 0.50m <1ppm											(0.60)	- - - - -	
022/11/16 14:30   – -         /   -					MADE GROUN	D: CONCF	RETE Sm	ooth sla	ıb.				0.60	-0.60 -0.60	
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DRILLING TEC	HNIQUE HOL Type Hole Dia	E / CASING DIAMETER	CHISELLIN From To D	G	WATE Date/Time Str	ER OBSEF		S Casing	Sealed		LUSH To	DETAILS	S V Type Fro	/ATER A	1
0.00 0.60 Ins	spection Pit														
INSTF Name	RUMENTS Type m AGL	WELL SCREE Well Name	N DESIGN From To	Dia.	Refused on concre	te slab			REMAF	RKS					
Unless of	therwise stated: ), Diameter (mm), 1		Equipment U	sed		Termi	nation Dep	oth				Lo	gged By	Check	ed By

# ARCADIS Dynamic Sampling to Rotary Coring Log

## MW105

bject hell Sutton ent hell UK Oil	Elms Products Ltd.							1 E	asting	No. <b>4284</b> (OS mE) <b>45.16</b>		76.0 Northir	d Level ( 6 ng (OS m 7 <b>71.3</b>	nN)			End Da	1/2022	1	<sup>:ale</sup> :50 heet 1	l of 1
Progress	Samples		-	Tests ar	nd Mea	sureme	ents						Ś	Strata				T	Depth		Inst
Date / Time Casing / DTW 22/11/16 14:40 / -	Type - Depth (m)	Type -	Depth (m)	- Result			Fractur Details	e TCF SCF RQE	M gr	ADE GRC avelly CL nd bitumin	AY with	Grass of freque	nt cobb	y soft lig les of br	ick cond	crete re		Legend	(Thicknes	s) Level	Bac
		PID	1.00m	<1ppm															× × (1.25) ×		
	-	PID PID	1.20m 1.30m	<1ppm <1ppm					S	oft mottled	d grey ar	nd brow	vn CLA	Y.					× 1.25 - (0.21)	74.8	1
	- - - -(ES2) 1.80-2.00	PID	1.60m	<1ppm					C	oft grey m LAY. Grav	<i>light yell</i> ottled br el is fine	rown ai	nd spec	kled wh	ite/light	grey gr	avelly		(0.21) 1.46 (0.25) 1.71	74.60	- i i -
-		PID SPT()	2.00m 2.00m <i>(0 for 0r</i>		Omm)				Ve	nalk. ery soft to parse suba andstone.	angular	to subr	ounded	l of flint,	chalk, c	quartz a	ind		(0.69)	+	
	- (3) 2.50-2.70 -	PID	2.50m	<1ppm						Grey sp oft grey ba avel.	peckled anded bi				1.9	2-1.93n	1 bgl /		2.40	73.66	6
-	-	PID	3.00m	<1ppm					5										(1.55)	+	
	-	PID SPT()	3.50m 3.50m <i>(0 for 0r</i>		0mm)															+	<b>1</b>
-	-	PID	4.00m	<1ppm						oft grey Cl			ional b	rownish	grey sa	ndy cla	y/		3.95	72.1	1
	-	PID	4.50m	<1ppm					cli	ayey sand			g becom	nes less	frequen	t 3.95n	n bgl		- - - - -		
		PID	5.00m	<1ppm									Bec	omes ve	ery soft 4	1.6-4.9n	n bgl		(2.25)	- - -	
	-	PID	5.50m	<1ppm															  	-	
	-	PID	6.00m	<1ppm																+	
2/11/23 11:06 / -	-																		6.20	69.86	6
-	-																				
	-																				
-	-																				
	-																				
	-																				
RILLING TE	- CHNIQUE HO	LE / CAS	SING DI	AMETE	R	СН	ISELLI	NG		W	VATER (	OBSER	VATIO	NS		F	LUSF		l.s.v	WATER	ADDI
om To 20 6.20 Dy	Type Hole D namic Sample 300			g Dia. [	Depth	From	- 1	Duration	16/11/ 22/11/	ate/Time 2022 14:50 2022 09:00 /2022 11:11	0.65	Rest 3.51	Mins	Casing 2.10	Sealed	I From	То	Rtn%	Type Fr	om To	D L
INS1 Name	RUMENTS Type m AC	GL		VELL S Name	CREEN	N DESI From	GN To	Dia.							REMA	RKS					
MW105	Standpipe 0.00			/105		0.50	5.50	50													

# ARCADIS Inspection Pit Log

# MW106 A

Shell Suf Shell Suf Shell UK		Elms Products	Ltd.						<b>1</b> Ea	oject No. 0044284 asting (OS mE) 50839.66		76.1 Northir	d Level (r 7 ng (OS m 7 <b>51.28</b>	N)			End Da	/2022	1:	<sup>ale</sup> 15 heet 1	of 1
Progres	ss	Samp	les		Tests	and Me	asurem	nents					ŝ	Strata					Depth	<u> </u>	Insta
Date / Tim Casing / D1	ne TW	Type - De	pth (m) T	Type - Depth	h (m) - Resi	ult		Fractu Detail	re TCR SCR RQD				Descript	ion				Legend	(Thickness)	) Level	Back
										MADE GF	ROUND	ASPHA	LT.						(0.15)	-	
	-																		0.15	76.02	
	-									MADE GF	ROUND:	SUB BA	SE MA	TERIAL.					(0.12)		
022/11/16 11 - / -										MADE GF	ROUND:	CONCF	RETE.				/		0.27	75.90 75.90	
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								HISELL			WATER				0.1			DETAILS		VATER A	1
From To	+	Туре	Hole Dia.	Depth C	Casing Dia.	Depth	From	То	Duration	Date/Time	Strike	Rest	Mins	Casing	Sealed	From	То	Rtn%	Type Fro	om To	Litr
Name	INST	RUMENTS Type	m AGL	,	WELL Well Name	SCREE	EN DES	IGN To	Dia.	Refused on o	concrete				REMA	RKS					
. Haille	+	. 790			s. manie		. 1011		Did.	I CIUSCU UII (											
	1		1	1				1	1												

# ARCADIS Dynamic Sampling to Rotary Coring Log

## **MW106**

Date / Time Casing / DTW     Type - Depth (m)     Type - Depth (m) - Result     Fracture Details     TCR SCR RQD     Description     Legend     (Thickness)     Level     B       22/11/16 11:15	oject hell Suttor ient hell UK Oi	n Elms I Products Ltd.			Project No. <b>10044284</b> Easting (OS mE) <b>450839.88</b>	Ground Level (mAOD) 76.14 Northing (OS mN) 293751.14	Start Date 16/11/2022 End Date 22/11/2022	Scale 1:50 Sheet 1	of 1									
Note: The set of the	Progress	Samples	Tests and Measureme			Strata		Depth	Inst									
KS11 100         HD         L00         Oldges           HS         L00         200         Disper         1.7.2           HS         L00         200         Disper         1.7.2           HS         L00         200         Disper         1.7.2           HS         Disper         1.7.2         Disper         1.7.2           HS         Disper         1.0.2         Disper         1.0.2           HS         Disper         1.0.2         Disper         1.0.2           HS         Disper         1.0.2         Disper         1.0.2           HS         Disper         1.0.2 <td< td=""><td>Casing / DTW 2/11/16 11:15</td><td>Type - Depth (m)</td><td></td><td>Fracture Details</td><td>MADE GROUN MADE GROUN SAND with freq fine to coarse su</td><td>D: ASPHALT. D: Dark grey to dark brown clayey uent cobbles of brick and red brick ubangular of brick, bituminous mat</td><td>gravelly . Gravel is</td><td>(111CK1855) × (0.15) 75.99 ×</td><td>Bac</td></td<>	Casing / DTW 2/11/16 11:15	Type - Depth (m)		Fracture Details	MADE GROUN MADE GROUN SAND with freq fine to coarse su	D: ASPHALT. D: Dark grey to dark brown clayey uent cobbles of brick and red brick ubangular of brick, bituminous mat	gravelly . Gravel is	(111CK1855) × (0.15) 75.99 ×	Bac									
BPT0         3.50m         N>820           PID         4.00m         1.2gpm           PID         4.00m         1.2gpm           PID         5.50m         1.5gpm           PID         6.00m         1.0gpm           PID         6.40m< <td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m         1.5gpm           PID         6.</td><td></td><td>(ES2) 1.50-1.80</td><td>PID       1.30m       216.3ppm         PID       1.50m       Over 5000ppm         PID       1.70m       Over 5000ppm         PID       2.00m       223.9ppm         SPT()       2.00m       N&gt;50         (0 for 0mm/0 for 0mm)       PID       2.50m         PID       2.50m       1.6ppm</td><td></td><td>subrounded of f Soft mottled gre CLAY. Gravel is roots and rootle</td><td>lint. Hydrocarbon odour noted. <u>Dark grey to blac</u> Sheen noted 1.59 y and brown speckled white sandy fine to medium subrounded of cha ts</td><td>k staining. 1.79m bgl gravelly Ik. Frequent</td><td>(0.48) (0.48) (0.72)</td><td></td></td></td></td></td></td></td></td></td>	1.5gpm           PID         6.40m< <td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m         1.5gpm           PID         6.</td><td></td><td>(ES2) 1.50-1.80</td><td>PID       1.30m       216.3ppm         PID       1.50m       Over 5000ppm         PID       1.70m       Over 5000ppm         PID       2.00m       223.9ppm         SPT()       2.00m       N&gt;50         (0 for 0mm/0 for 0mm)       PID       2.50m         PID       2.50m       1.6ppm</td><td></td><td>subrounded of f Soft mottled gre CLAY. Gravel is roots and rootle</td><td>lint. Hydrocarbon odour noted. <u>Dark grey to blac</u> Sheen noted 1.59 y and brown speckled white sandy fine to medium subrounded of cha ts</td><td>k staining. 1.79m bgl gravelly Ik. Frequent</td><td>(0.48) (0.48) (0.72)</td><td></td></td></td></td></td></td></td></td>	1.5gpm           PID         6.40m< <td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m         1.5gpm           PID         6.</td><td></td><td>(ES2) 1.50-1.80</td><td>PID       1.30m       216.3ppm         PID       1.50m       Over 5000ppm         PID       1.70m       Over 5000ppm         PID       2.00m       223.9ppm         SPT()       2.00m       N&gt;50         (0 for 0mm/0 for 0mm)       PID       2.50m         PID       2.50m       1.6ppm</td><td></td><td>subrounded of f Soft mottled gre CLAY. Gravel is roots and rootle</td><td>lint. Hydrocarbon odour noted. <u>Dark grey to blac</u> Sheen noted 1.59 y and brown speckled white sandy fine to medium subrounded of cha ts</td><td>k staining. 1.79m bgl gravelly Ik. Frequent</td><td>(0.48) (0.48) (0.72)</td><td></td></td></td></td></td></td></td>	1.5gpm           PID         6.40m< <td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m&lt;<td>1.5gpm           PID         6.40m         1.5gpm           PID         6.</td><td></td><td>(ES2) 1.50-1.80</td><td>PID       1.30m       216.3ppm         PID       1.50m       Over 5000ppm         PID       1.70m       Over 5000ppm         PID       2.00m       223.9ppm         SPT()       2.00m       N&gt;50         (0 for 0mm/0 for 0mm)       PID       2.50m         PID       2.50m       1.6ppm</td><td></td><td>subrounded of f Soft mottled gre CLAY. 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RILLING TECHNIQUE       HOLE / CASING DIAMETER       CHISELLING       WATER OBSERVATIONS       FLUSH DETAILS       WATER ADI         RILLING TECHNIQUE       HOLE / CASING DIAMETER       CHISELLING       WATER OBSERVATIONS       FLUSH DETAILS       WATER ADI         RILLING TECHNIQUE       HOLE / CASING DIAMETER       CHISELLING       WATER OBSERVATIONS       FLUSH DETAILS       WATER ADI         0       0.50       000       1.20       Input from       To       Date/Time       State       1.65       To       To         0       1.20       Input from       To       Date/Time       State       1.65       1.00       To       To <td></td> <td></td> <td>SPT() 3.50m N&gt;50 (0 for 0mm/0 for 0mm) PID 4.00m 1.2ppm PID 4.50m &lt;1ppm PID 5.00m 1.9ppm PID 5.50m &lt;1ppm</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>			SPT() 3.50m N>50 (0 for 0mm/0 for 0mm) PID 4.00m 1.2ppm PID 4.50m <1ppm PID 5.00m 1.9ppm PID 5.50m <1ppm															
n         To         Type         Hole Dia.         Depth         Casing Dia.         Depth         From         To         Date/Time         Strike         Rest         Mins         Casing         Sealed         From         To         To           0         1.20         Inspection Pit 6.50         300         1.20         Image: Strike         1.57         1.57         2.20         2.10         2.10         3.81         Image: Strike         Strike         8.81         Image: Strike         Strike         8.81         Image: Strike         Strike         1.57         2.10         3.81         Image: Strike         Image: Strike         Strike			PID 6.40m <1ppm					6.50 - 69.64										
Name Type m AGL Well Name From To Dia.	m To 0 1.20	Type Hole I Inspection Pit 300	Dia. Depth Casing Dia. Depth From		on Date/Time Stri 22/11/2022 14:23 1.5 22/11/2022 14:54 2.5	ike Rest Mins Casing Sealed 57 2.20 59 2.10			-									
	Name	Type m A	GL Well Name From	To Dia		REMAF	r i RKS											

# APPENDIX D

Arcadis Laboratory QA/QC Policy

#### Appendix D

Arcadis is committed to providing our clients and regulators with robust investigative or monitoring results within the confines of the project. We recognise that a report is only as good as the data that is used to draw conclusions and thus it is important that the consultant and the client be able to have full confidence in data provided by laboratories that we use for analysis.

The first step in assuring said confidence is to ensure that our consultants on Site are using appropriate sampling methodologies and are storing collected samples in the appropriate sample containers and under correct conditions. Laboratories are contacted prior to Site works commencing and required analysis discussed, so that the laboratory can provide the necessary sample containers appropriate for sample storage and testing, as well as any preservatives that may be required. On delivery receipt the Site consultant will visually check the containers to make sure the correct number have been delivered and verify that their condition is appropriate for use.

Once collected, samples are shipped to the laboratory in sealed cold boxes/containers provided by the laboratory with cooling aids and a Chain of Custody attached. The Chain of Custody identifies Arcadis as the client, the Arcadis Project Number, the Consultant/Project Manager, the type of sample e.g. groundwater, soil etc., the parameters to be tested and turnaround required for the analysis. Samples boxes are either hand delivered to the laboratory, picked up directly by the laboratory or picked up by a courier sent by the laboratory.

#### **QA/QC** of Laboratories

Arcadis has a preferred supplier program, and contract laboratories are expected to have analytical test methods UKAS accredited and to use the MCertS standard as far as possible. The MCertS accreditation was initially developed for the analysis of soils but is also now applied to some water types (e.g. effluent water), but is not available on groundwater analysis. The Environment Agency (EA) requires MCertS accredited data for Sites that are within the regulatory process i.e. Part 2A designated contaminated land Sites. For Sites in which work is being undertaken voluntarily or through Planning it is recommended that the analysis be conducted following the MCertS standard wherever possible.

Data quality control is extremely important to Arcadis because we must be able to rely on the data provided in order to make our interpretations and recommendations. Data provided by the laboratory are provided digital formats to minimise potential for transcription errors during reporting. The data and laboratory QA results submitted by the laboratory are reviewed by the Arcadis Project Manager who has support from the Arcadis Analytical Chemistry Technical Lead. As part of the project execution plan the Project Manager will determine if QA/QC samples are required which could include:

• Duplicate samples (recommended for groundwater sampling only as soil samples are heterogeneous)

- Trip Blank Samples
- Field Blank Samples
- Equipment Rinse Blanks
- · Certified Reference Materials submitted as samples.

Arcadis monitor laboratory performance as part of our Integrated Observation (IO) management process. Project teams are encouraged to submit an IO if they experience positive or negative performance during project implementation, the IO's are then reviewed on a monthly basis and if repeat issues are identified with one or more laboratory suppliers a meeting will be convened with the supplier to understand the root cause of the issues experienced.

# **APPENDIX E**

## **Report Tables**

Table 1: Comparison of Measured Concentrations of Contaminants in Soil (mg/kg) to Arcadis GAC for Continued Petroleum Use

Table 2: Groundwater Monitoring Installation Details and Elevation Survey

Table 3: Stabilised Hydrogeochemical Parameters in Groundwater

Table 4: Comparison of Measured Concentrations of Contaminants in Groundwater ( $\mu$ g/I) to Arcadis GAC for Continued Petroleum Use

# **ARCADIS**

#### Project: 10044284 Site Name: Shell Sutton Elms

Table 1													
Comparison of Mea	asured Concentrations of Contamina	ants in Soll (m	ng/kg) to Arc	adis GAC for Continu Arcadis GAC -	ed Petroleum Use Arcadis GAC -	Arcadis GAC -							
	Location Code Date			Human Health -	Water Resources -	Water Resources -	MW101	MW101	MW101	MW104	MW104	MW104	MW104(DUPSO)
	Date Depth (m bgl)			Continued	Aquifers - England	Surface Water -	<u>15-11-2022</u> 0.2 - 0.5	15-11-2022 1.0	24-11-2022 4.2 - 4.5	16-11-2022 0.5	<u>16-11-2022</u> 1.0	24-11-2022 3.8 - 4.2	24-11-2022 3.8 - 4.2
Analyte Group	Analyte Mineral OII (C10-C40)	Unit mg/kg	MDL 30	Petroleum Use	& Wales	England & Wales							
in the second se	PAH 17 Total	mg/kg	0.64				8.20	< 0.64		1.51	<0.64	<0.64	<0.64
TPH CWG	Dry Matter Content Ratio 105C	percent	0.1										
	>C5-C6 Aliphatics	mg/kg	0.1	261	See TPH#	See TPH#7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	>C6-C8 Alphatics >C8-C10 Alphatics	mg/kg mg/kg	0.1	351 (SAT) <sup>#1</sup> 45.3 (SAT) <sup>#1</sup>	See TPH <sup>#</sup> See TPH <sup>#</sup>	See TPH <sup>#7</sup> See TPH <sup>#7</sup>	<0.1	<0.1	<0.1	<0.1	<0.1 <0.1	<0.1	<0.1 ⊲0.1
	>C10-C12 Alphatics	mg/kg	0.2	178 (SAT) <sup>#1</sup>	See TPH#	See TPH"	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	>C12-C16 Alphatics >C16-C21 Alphatics	mg/kg	4	812 (SAT) <sup>81</sup> NR <sup>82</sup>	See TPH# See TPH#	See TPH" See TPH"	<4	<4	<4	22	<4	<4	<4
	>C21-C35 Alphatics	mg/kg mg/kg	7	NR NR	See TPH See TPH	See TPH	<7 <7	<7 <7	<7	103 71	<7	<7	<7
	Total >C5-C35 Alphatics >EC5-EC7 Aromatics	mg/kg	19	15			<19 <0.1	<19	<19	196	<19	<19	<19
	>EC7-EC8 Aromatics	mg/kg mg/kg	0.1	2,750 (SAT) <sup>#1</sup>	0.0019 2.3	0.019 0.24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	>EC8-EC10 Aromatics	mg/kg	0.1	62.8	See TPH#	See TPH <sup>#7</sup>	<0.1	<0.1	<0.1	<10	<0.1	<0.1	⊲0.1
	>EC10-EC12 Aromatics >EC12-EC16 Aromatics	mg/kg mg/kg	0.2	330 (SAT) <sup>#1</sup> 1,660 (SAT) <sup>#1</sup>	50 See TPH <sup>#</sup>	50 See TPH <sup>#7</sup>	<0.2	50 <sup>48</sup>	<10	<0.2	<0.2	<0.2	<0.2
	>EC16-EC21 Aromatics	mg/kg	7	NR <sup>#2</sup>	See TPH#	See TPH"	<7	<7	<7	31	<7	<7	<7
	>EC21-EC35 Aromatics Total >EC5-EC35 Aromatics	mg/kg mg/kg	7	NR <sup>#2</sup>	See TPH <sup>#/</sup>	See TPH <sup>17</sup>	<7 <19	<7 <19	<7 <19	14 45	<7 <19	<7 <19	<7 <19
	TPH >C5-C35 Alphatics/Aromatics	mg/kg	38	na <sup>#3</sup>	R	R	<38	<38	<38	241	<38	<38	<38
BTEX	Benzene	mg/kg	0.003	15	0.0019		<0.003	<0.003	<1	<0.003	<0.003	<0.002	<0.003
	Toluene	mg/kg	0.003	2,750 (SAT)#1	2.3	0.24	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	Ethylbenzene	mg/kg	0.003	221 (SAT) <sup>#1</sup>	1.7	0.11	<0.003	< 0.003	0.004	< 0.003	<0.003	0.008	0.003
	Xylene (o) p/m-Xylene	mg/kg mg/kg	0.003				<0.003 <0.005	<0.003 <0.005	0.003	<0.003	<0.003	0.003	0.009
Fuel oxygenates	Total Xylenes	mg/kg		236	2.9	0.17	<0.005	<0.005	0.015	<5	<5	0.021	0.009
. Ser on genales	Disopropyl ether		0.005				<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	Ethanol Ethyl tertiary butyl ether	mg/kg mg/kg	0.1 0.005	15.8	0.07	0.07	<0.1 <0.005	<0.1 <0.005	<0.1 <0.005	<0.1 <0.005	<0.1 <0.005	<0.1 <0.005	<0.1 <0.005
	MTBE	mg/kg	0.002	360	0.018	0.018	< 0.002	< 0.002	<0.002	< 0.002	< 0.002	<0.002	<0.002
	tert-Amyl methyl ether tert-Butyl alcohol	mg/kg mg/kg	0.005	3,700	0.014	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
ТРН	EPH >C8-C40	mg/kg	30				258	<30	<30	436	<30	<30	<30
	GRO (>C4-C12) #	mg/kg	0.1				<0.1	<0.1	<0.1	436 0.314	<0.1	<0.1	⊲0.1
	GRO (>C4-C8) # GRO (>C8-C12) #	mg/kg mg/kg	0.1				<0.1 <0.1	<0.1 <0.1	<0.1	<0.1 0.314	<0.1 <0.1	<0.1	<0.1 ⊲0.1
PAH									59.0				
PAH 16	Coronene	mg/kg	0.04				0.07	<0.04		<0.04	<0.04	<0.04	<0.04
	Naphthalene	mg/kg	0.04	69.7 (SAT)*1	0.015	0.015	<0.04	< 0.04	<0.04	<0.04	<0.04	<0.04	<0.04
	Acenaphthene Acenaphthylene	mg/kg	0.05	21,600 (SAT) <sup>#1</sup> 34,500 (SAT) <sup>#1</sup>	- <sup>80</sup> 80	- 10	0.13	<0.05 <0.03	<0.05	<0.05	<0.05	<0.05	<0.05
	Fluoranthene	mg/kg mg/kg	0.03	247,000 (SAT) <sup>#1</sup>	. #2	_#)	2.02	<0.03	<0.03	0.12	<0.03	<0.03	<0.03
	Anthracene	mg/kg	0.04	1,430,000 (SAT)#1	- #2 #2	. #2	0.23	< 0.04	<0.04	<0.04	<0.04	<0.04	<0.04
	Phenanthrene Fluorene	mg/kg	0.03	6,120 (SAT) <sup>#1</sup> 43,000 (SAT) <sup>#1</sup>	- 10	- 40	0.68 <0.04	<0.03	<0.03	<0.173	<0.03	<0.03	<0.03
	Chrysene	mg/kg mg/kg	0.04	1,970 (SAT) <sup>#1</sup>			0.80	<0.04	<0.04	0.21	<0.04	<0.04	<0.04
	Pyrene	mg/kg	0.03	579,000 (SAT) <sup>#1</sup>	- 10	-10	1.49	< 0.03	<0.03	0.38	<0.03	< 0.03	<0.03
	Benzo(a)anthracene Benzo(b)fluoranthene	mg/kg mg/kg	0.06	223 (SAT) <sup>#1</sup> 611 (SAT) <sup>#1</sup>	0.026		0.75	<0.06 <0.05	<0.06 <0.05	0.27	<0.06 <0.05	<0.06 <0.05	<0.06 <0.05
	Benzo(k)fluoranthene	mg/kg	0.02	23,800 (SAT)#1	0.037	_#)	0.34	< 0.02	<0.02	0.09	< 0.02	< 0.02	<0.02
	Benzo(a)pyrene Dibenz(a,h)anthracene	mg/kg mg/kg	0.04	632 (SAT) <sup>F1</sup> 40.8 (SAT) <sup>F1</sup>	0.013	0.0002	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
	Benzo(g,h,i)perylene	mg/kg	0.04	136,000 (SAT) <sup>#1</sup>	0.105	- 10	0.32	< 0.04	<0.04	0.09	<0.04	<0.04	<0.04
	Indeno(1,2,3-c,d)pyrene PAH 16 Total	mg/kg mg/kg	0.04	5,940 (SAT)*1	0.022	- 10	0.42	< 0.04	<0.04	0.12	<0.04	<0.04	<0.04
	Benzo(b+k)fluoranthene	mg/kg	0.6				1.20	< 0.07	<0.6	0.32	<0.07	<0.07	<0.07
Metals #8 No UK DWS for total p	Antimony (fitered)	μgL	0.02										
wo no ok prio la totalp	Arsenic (filtered)	μgL	0.025		10	50							
	Barium (filtered) Cadmium (filtered)	µgL µgL	0.03		700	700 0.08-0.25							
	Chromium (hexavalent)	mg/kg	0.3	NVP <sup>ib</sup>									
	Chromium (filtered) Copper (filtered)	µgL µgL	0.015		50 2,000	3.4 <sup>410</sup>							
	Lead (filtered)	µg1.	0.05		10	1.2							
	Mercury (filtered) Molybdenum (filtered)	µgL µgL	0.01		1 70	0.07 70							
	Nickel (fitered) Selenium (fitered)	µg1. µg1.	0.02 0.03		20 10	4							
	Zinc (fitered)	µg1.	0.03		3,000	12.1	-						
Asbestos	Asbestos Containing Material	Detect					NAD	NAD	NAD	NAD	NAD	NAD	NAD
	Asbestos Type Asbestos fibres	None					NAD	NAD	NAD	NAD	NAD	NAD	NAD
VOC		Detect					NAD	NAD	NAD	NAD	NAD	NAD	NAD
SVOC	Hexane	mg/kg	0.05				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
5700	2-methylnaphthalene	mg/kg	0.01				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PCB	Phenol	μgL	0.1		7.7	7.7							
	PCB 101 PCB 118	mg/kg	0.005										
	PCB 138	mg/kg mg/kg	0.005										
	PCB 153 PCB 180	mg/kg mg/kg	0.005										
	PCB 28	mg/kg	0.005										
	PCB 52 Total PCB 7 Congeners	mg/kg mg/kg	0.005										
Inorganics													
	Chloride	mg/L mg/kg	0.3										
	Fluoride Sulphate	μg/L	3										
	Sulphate	mg/L mg/kg	0.5										
Organic Carbon	Dissolved Organic Carbon	μgL	20										
Other													
	Natural Moisture Content ANC at pH 4	percent mol/kg	0.1				15.6	26.1	11.4	11.0	22.7	12.4	13.1
	Total Dissolved Solids	mg/L	35										
	ANC at pH 7	mg/kg mol/kg	0.03										
	Fraction Organic Carbon		0.001						0.002			0.002	0.002
	Loss on ignition	percent %	1										
	Moisture Content 105C pH (Lab)	percent pH_Units	0.1										
	(m. (ma)	Pr_Units	J.U I										

ef Target accedes theoretical soil saturation limit. Concentrations above the soil saturation limit may indicate the presence of separate phase in soil, but does not necessarily present a significant risk #2 NR - No appropriate inhalation reference does identified during review of toxicological data #3 na - Comprises multiple contaminants - no GAC derived #4 Criteria derived for sum yidnes split between isomers. Requires summation of mp & 6 isomers to use sum yienes criteria. #6 NP - No vapour pathway. Contaminant has only a low vapour pressure in soil. #6 NP - No vapour pathway. Contaminant has only a low vapour pressure in soil. #6 NP - No vapour pathway. Contaminant has only a low vapour pressure in soil. #6 ND - Result of modeling indicates pathway not comparised to present a significant risk #7 No GAC for individual TPH fractions aiven that the compliance criteria is for sum TPH #8 No TPH criteria present for soil. Where the CSM supports, water resources risk assessed via groundwater/leachate. If unavailable, soil data is used and TPH >MDL nequire further evaluation. #9 No water quality standard identified as suitable for deriving generic assessment criteria #10 GAC presented is for heavalent. If heavalent chromium (C/NI) data is available, a value of 4.7µg/l may be appropriate for the remaining trivatent chromium (C/III).

Notes:		
	MDL NAD	Method Detection Limit No Asbestos Detected

NAD	No Asbestos Detec
NA	Data not applicable

m bgl

>>

No Asbestos Detected Data not applicable Miders Below Ground Lavel Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.

Analysis not scheduled not applicable
 Analysis not scheduled in ot applicable
 Conservation
 Analysis not scheduled in the device Quantification Limit
 DUPSO
 Duplicate Sini Sample
 DUPSO
 Duplicate Sini Sample
 Analysis
 Concentration exceeds Aradis GAC - Water Resources - Aquifers - Centinued Petroleum Use
 Oracontration exceeds Aradis GAC - Water Resources - Mayifers- Continued Petroleum Use
 Oracontration exceeds Aradis GAC - Water Resources - Aquifers- Continued Petroleum Use
 Oracontration exceeds Aradis GAC - Water Resources - Aquifers- Continued Petroleum Use
 Oracontration exceeds Aradis GAC - Water Resources - Aquifers/Surface Water - Continued Petroleum Use
 Oracontration exceeds both Aradis GAC - Water Resources - Aquifers/Surface Water - Continued Petroleum Use

# **ARCADIS**

#### Project: 10044284 Site Name: Shell Sutton Elms

Table 1														
Comparison of M	leasured Concentrations of Contaminat	nts in Soil (m	g/kg) to Arc	adis GAC for Continu Arcadis GAC -	ed Petroleum Use Arcadis GAC -	America CAC								
	Location Code Date			Human Health -	Water Resources -	Arcadis GAC - Water Resources -	MW105	MW105	MW105	MW106	MW106	MW106	SKIP	SKIP
	Depth (m bgl)			Continued Petroleum Use	Aquifers - England	Surface Water -	15-11-2022	22-11-2022 1.8 - 2	22-11-2022 2.5 - 2.7	<u>16-11-2022</u> 1.0	22-11-2022	22-11-2022 2.3 - 2.5	25-11-2022	25-11-2022
Analyte Group	p Analyte Mineral OII (C10-C40)	Unit mg/kg	MDL 30	Petroleum Use	& Wales	England & Wales							<30	
	PAH 17 Total	mg/kg	0.64				10.94			12.96			<0.64	
TPH CWG	Dry Matter Content Ratio 105C	percent	0.1										82.7	
	>C5-C6 Aliphatics	mg/kg	0.1	261	See TPH#	See TPH#7	<0.1	<0.1	<0.1	1.8	3.3	<0.1	0.3	
	>C6-C8 Alphatics >C8-C10 Alphatics	mg/kg mg/kg	0.1	351 (SAT) <sup>#1</sup> 45.3 (SAT) <sup>#1</sup>	See TPH <sup>#</sup> See TPH <sup>#</sup>	See TPH <sup>#7</sup> See TPH <sup>#7</sup>	<0.1	<0.1	<0.1	5.0 5.3	46.8	<0.1	1.3	
	>C10-C12 Alphatics	mg/kg	0.1	178 (SAT) <sup>#1</sup>	See TPH#	See TPH"	<0.2	<0.2	<0.2	<0.2	4.8	<0.2	<0.2	
	>C12-C16 Alphatics	mg/kg	4	812 (SAT) <sup>F1</sup>	See TPH"	See TPH"	<4	<4	<4	<4	<4	<4	<4	
	>C16-C21 Alphatics >C21-C35 Alphatics	mg/kg mg/kg	7	NR <sup>#2</sup>	See TPH" See TPH"	See TPH <sup>#7</sup> See TPH <sup>#7</sup>	<7 <7	<7 <7	<7 <7	30 205	<7	<7 <7	<7 <7	
	Total >C5-C35 Aliphatics	mg/kg	19				<19	<19	<19	247	145	<19	<19	
	>EC5-EC7 Aromatics >EC7-EC8 Aromatics	mg/kg mg/kg	0.1	1.5 2.750 (SAT)*1	0.0019 2.3	0.019 0.24	<0.1	<0.1 ⊲0.1	<0.1	<0.1	⊲0.1 ⊲11	<0.1	<0.1	
	>EC8-EC10 Aromatics	mg/kg	0.1	62.8	See TPH#	See TPH#7	<0.1	<0.1	<0.1	9.5	14.7	<0.1	1.4	
	>EC10-EC12 Aromatics >EC12-EC16 Aromatics	mg/kg	0.2	330 (SAT) <sup>#1</sup> 1,660 (SAT) <sup>#1</sup>	50 See TPH <sup>#</sup>	50 See TPH <sup>#7</sup>	<0.2	<0.2	<0.2	2.1	50.3	<0.2	7.0	
	>EC12-EC16 Aromatics >EC16-EC21 Aromatics	mg/kg mg/kg	4	1,660 (SAT)**	See TPH" See TPH"	See TPH" See TPH"	<4 20	<4 <7	<4 <7	<4 75	<4 <7	<4 <7	<4 <7	
	>EC21-EC35 Aromatics	mg/kg	7	NR <sup>#2</sup>	See TPH#	See TPH <sup>#7</sup>	103	<7	<7	326	<7	<7	<7	
	Total >EC5-EC35 Aromatics TPH >C5-C35 Aliphatics/Aromatics	mg/kg mg/kg	19 38	na <sup>#3</sup>	8	R	123 123	<19 <38	<19 <38	413 660	65 210	<19 <38	<19 <38	
BTEX							123		20		210	~50	~0	
	Benzene Toluene	mgkg mgkg	0.003	1.5 2,750 (SAT) <sup>#1</sup>	0.0019	0.24	<0.003	<0.003	<0.003	0.081	<0.003	<0.003	<0.003	
	Ethylbenzene	mg/kg	0.003	221 (SAT) <sup>#1</sup>	1.7	0.11	<0.003	<0.003	0.004	>>3.87	11.8	0.015	0.078	
	Xylene (o) p/m-Xylene	mg/kg	0.003				< 0.003	< 0.003	<0.003 0.014	>>4.3	9.22 >>52.900	0.006	0.07	
	Total Xylenes	mg/kg mg/kg	0.005	236	2.9	0.17	<0.005	<0.005	0.014	>>13.300	>>52.900 >>52.900	0.051	0.387	
Fuel oxygenates	Disopropyl ether	-	0.005				<0.005	<0.005	<0.005	<0.005	<0.005	<0.006	<0.005	
	Ethanol	mg/kg	0.1				<0.005	<0.1	<0.1	<0.005	<0.005	<0.005	<0.1	
	Ethyl tertiary butyl ether MTBE	mg/kg mg/kg	0.005	15.8 360	0.07 0.018	0.07 0.018	<0.005 <0.002	<0.005 <0.002	<0.005 <0.002	<0.005 <0.002	<0.005 <0.002	<0.005	<0.005 <0.002	
	tert-Amyl methyl ether	mg/kg	0.005				<0.005	< 0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
трн	tert-Butyl alcohol	mg/kg	0.1	3,700	0.014	0.014	<0.1	<0.1	<0.1	<0.1	⊲0.1	<0.1	<0.1	
	EPH >C8-C40	mg/kg	30				283	<30	<30	1,220	270	113	<30	
	GRO (>C4-C12) # GRO (>C4-C8) #	mgkg mgkg	0.1				<0.1	<0.1	<0.1	19.7 7.3	238.6 53.6	0.398	6.12 1.72	
	GRO (>C8-C12) #	mg/kg	0.1				<0.1	<0.1	<0.1	12.4	185	0.235	4.4	
PAH	Coronene	mg/kg	0.04				0.12			0.17			<0.04	
PAH 16	Nachthalana			69.7 (SAT)*1		0.010					1.00		0.04	
	Naphthalene Acenaphthene	mg/kg mg/kg	0.04	21,600 (SAT) <sup>#1</sup>	0.015	0.015	<0.04 <0.05	<0.04 <0.05	<0.04	0.08	<u>1.96</u> <0.05	<0.04	<0.04 <0.05	
	Acenaphthylene	mg/kg	0.03	34,500 (SAT)#1	- <sup>10</sup>	- #2 #2	0.04	< 0.03	<0.03	0.08	<0.03	< 0.03	<0.03	
	Fluoranthene Anthracene	mg/kg	0.03	247,000 (SAT) <sup>#1</sup> 1.430.000 (SAT) <sup>#1</sup>	-10	- 10	2.11 0.33	< 0.03	<0.03 <0.04	2.33	0.21	<0.03	<0.03	
	Phenanthrene	mg/kg mg/kg	0.04	6,120 (SAT) <sup>#1</sup>	- 10	. #2	0.33	<0.04 <0.03	<0.04	0.48	<0.04	<0.04	<0.04	
	Fluorene	mg/kg	0.04	43,000 (SAT)#1	."	- 10	<0.04	< 0.04	<0.04	0.28	< 0.04	< 0.04	<0.04	
	Chrysene Pyrene	mg/kg mg/kg	0.02	1,970 (SAT) <sup>#1</sup> 579,000 (SAT) <sup>#1</sup>	-**	."'	0.89	<0.02	<0.02	0.82	0.08	<0.02	<0.02	
	Benzo(a)anthracene	mg/kg	0.05	223 (SAT)			0.88	<0.05	<0.05	0.81	0.17	<0.05	<0.06	
	Benzo(b)fluoranthene	mg/kg	0.05	611 (SAT) <sup>#1</sup> 23.800 (SAT) <sup>#1</sup>	0.026		1.10	< 0.05	<0.05	1.14	0.09	<0.05	<0.05	
	Benzo(k)fluoranthene Benzo(a)pyrene	mg/kg mg/kg	0.02	23,800 (SAT)** 632 (SAT) <sup>#1</sup>	0.037 0.013	0.0002	0.43	<0.02	<0.02 <0.04	0.44	<0.03	<0.02 <0.04	<0.02	
	Dibenz(a,h)anthracene	mg/kg	0.04	40.8 (SAT) <sup>#1</sup>	- 10	.**	0.14	< 0.04	<0.04	0.16	<0.04	<0.04	<0.04	
	Benzo(g,h,i)perylene	mg/kg	0.04	136,000 (SAT) <sup>41</sup>	0.105	- 27	0.58	< 0.04	<0.04	0.64	<0.04	<0.04	<0.04	
	Indeno(1,2,3-c,d)pyrene PAH 16 Total	mg/kg mg/kg	0.04	5,940 (SAT) <sup>#1</sup>	0.022	-	0.72	<0.04 <0.6	<0.04 <0.6	0.76	<0.04 2.9	<0.04 <0.6	<0.04	
Metals	Benzo(b+k)fluoranthene	mg/kg	0.07				1.53	< 0.07	<0.07	1.58	0.12	<0.07	<0.07	
	tal pe Antimony (filtered)	μgL	0.02										<0.02	
	Arsenic (filtered) Barium (filtered)	µgl. µgl.	0.025		10 700	50 700							6.9 9	0.069
	Cadmium (filtered)	μgL	0.005		5	0.08-0.25	-						<0.005	
	Chromium (hexavalent) Chromium (filtered)	mg/kg	0.3	NVP <sup>®</sup>		3.4***							<0.3	
	Copper (filtered)	µgL µgL	0.015		50 2,000	1							1.9 <0.07	0.019
	Lead (filtered) Mercury (filtered)	µg/L µg/L	0.05		10	1.2							<0.05	
	Molybdenum (fitered)	µg/L	0.02		70	70							4	0.04
	Nickel (fitered) Selenium (fitered)	µgL µgL	0.02		20	4							<0.02	<0.03
Ashaalaa	Zinc (filtered)	µg'L	0.03		3,000	12.1							<0.03	
Asbestos	Asbestos Containing Material	Detect					NAD	NAD	NAD	NAD	NAD	NAD	NAD	
	Asbestos Type Asbestos fibres	None Detect					NAD NAD	NAD NAD	NAD NAD	NAD NAD	NAD NAD	NAD NAD	NAD NAD	
VOC														
SVOC	Hexane	mg/kg	0.05				<0.05	<0.05	<0.05	0.196	4.97	<0.05	<0.05	
	2-methylnaphthalene	mg/kg	0.01				⊲0.01	<0.01	<0.01	0.023	1.36	<0.01	<0.01	
PCB	Phenol	μgiL	0.1		7.7	7.7							<0.1	
	PCB 101 PCB 118	mg/kg mg/kg	0.005										<0.005	
	PCB 138	mg/kg	0.005										<0.005	
	PCB 153 PCB 180	mgkg mgkg	0.005										<0.005	
	PCB 28	mg/kg	0.005										<0.005	
	PCB 52 Total PCB 7 Congeners	mg/kg mg/kg	0.005										<0.005 <0.035	
Inorganics														
	Chloride	mg/L mg/kg	0.3										7.6 76	
	Fluoride Sulphate	µgL mgL	3 0.5										300 12.8	<
	Sulphate	mg/L mg/kg	0.5										12.8	
Organic Carbon	Dissolved Organic Carbon	µg1.	20										2,000	<20
Other														~2U
	Natural Moisture Content ANC at pH 4	percent molkg	0.1 0.03				23.2	22.2	34.7	20.8	14.9	24.6	30.4 0.49	
	Total Dissolved Solids	mg/L	35										89	
	ANC at pH 7	mg/kg mol/kg	0.03										890 0.07	
	Fraction Organic Carbon		0.001					0.001	0.006		<0.001	0.005		
	Loss on ignition	percent %	1										0.40 3.0	
	Moisture Content 105C pH (Lab)	percent pH_Units	0.1										20.9	
	like (read)	pr_units	0.01										9.50	

Comments
#1 Target exceeds theoretical soil saturation limit. Concentrations above the soil saturation limit may indicate the presence of separate phase in soil
#2 NR - No appropriate inhalation reference does identified during review of toxicological data
#3 na - Comprisse multiple contaminants - no GAC derived
#4 Criteria derived for sum xylenes split between iscorems. Requires summation of m.p. & o iscorers to use sum xylenes criteria.
#5 NN - No apport of sum xylenes gatheway to contaminant has only a low vapour pressure in soil.
#5 NN - No vapour pathway. Contaminant has only a low vapour pressure in soil.
#5 NN - No vapour pathway. Contaminant has only a low vapour pressure in soil.
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#5 NN - No vapour pathway. Contaminant has only a low vapour pressure in soil.
#5 NN - No vapour pathway. Contaminant has only a low vapour pressure in soil.
#6 No - Results of modeling indicates pathway not considered to present a significant risk.
#6 NN - TPH criteria present for soil. Where the CSM supports, water resource risk sessessod via groundwater/leachate. If unavailable, soil data is use
#7 NN variar opping standard derivating accentic assessment criteria.
#10 GAC presented is for hoxavalent. If hexavalent chromium (CVVI) data is available, a value of 4.7µg/l may be appropriate for the remaining trivale

Notes:	
MDL	Method Detection Limit
NAD	No Asbestos Detected
NA	Data not applicable
m bg	Meters Below Ground Level
	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly
>>	higher.

>>	higher.
123	Analysis not scheduled/ not applicable Result less than Effective Quantification L

 —
 Analysis not scheduled / nd applicable

 0:123
 Result liss than Efficitive Quantification Limit

 0.123
 Result liss than Efficitive Quantification Limit

 0.123
 Result above Effective Quantification Limit

 0.123
 Result above Effective Quantification Limit

 0.129
 Deujcitals 50l Sample

 0.129
 Concentration exceeds Arcadis GAC - Wana Health - Continued Petroleum Use

 0.129
 Concentration exceeds Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

 0.129
 Concentration exceeds Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

 0.129
 Concentration exceeds Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

 0.120
 Concentration exceeds Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

 0.120
 Concentration exceeds Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

 0.120
 Concentration exceeds Obto Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

 0.121
 Concentration exceeds Obto Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

 0.122
 Concentration exceeds Obto Arcadis GAC - Water Resources - Aquilers - Continued Petroleum Use

Project: 10044284 Site Name: Shell Sutton Elms

# ARCADIS

	Table 2 Groundwater Monitoring Installe and Elevation Supray														
	Groundwater Monitoring Installation Details and Elevation Survey														
Monitoring Well	Installation Type	Date Installed	Dip Point Elevation (m AOD)	Dip Point Description	Response Zone (m bgl)	Response Zone (m AOD)	Depth to Well Base on Install (m bgl)	Depth to NAPL (m bgl)	Depth to Water (m bgl)	Depth to Well Base (m bgl)	NAPL Thickness	Groundwater Elevation (m AOD)	Head of Water Above Base (m)	Difference from Installed Depth/ Silt Thickness (m)	
	Groundwater Elevation Survey Conducted on 18 January 2023														
MW101	50mm ID HDPE Standpipe	18-11-2022	76.55	Ground level	0.5 to 5.5	76.05 to 71.05	5.50	NMP	1.49	4.05	0.00	75.06	2.56	-1.45	
MW104	50mm ID HDPE Standpipe	25-11-2022	76.39	Ground level	0.5 to 5.5	75.89 to 70.89	5.50	NMP	1.18	3.95	0.00	75.21	2.77	-1.55	
MW105	50mm ID HDPE Standpipe	18-11-2022	76.06	Ground level	0.5 to 5.5	78.56 to 70.56	5.50	NMP	0.61	5.52	0.00	75.45	4.91	0.02	
MW106	50mm ID HDPE Standpipe	22-11-2022	76.14	Ground level	0.5 to 5.5	75.64 to 70.64	5.50	NMP	0.68	5.16	0.00	75.46	4.48	-0.34	
				Gr	oundwater Ele	evation Survey	Conducted on	15 March 2023	5						
MW101	50mm ID HDPE Standpipe	18-11-2022	76.55	Ground level	0.5 to 5.5	76.05 to 71.05	5.50	NMP	1.46	4.05	0.00	75.09	2.59	-1.45	
MW104	50mm ID HDPE Standpipe	25-11-2022	76.39	Ground level	0.5 to 5.5	75.89 to 70.89	5.50	NMP	1.14	1.50	0.00	75.24	0.36	-4.00	
MW105	50mm ID HDPE Standpipe	18-11-2022	76.06	Ground level	0.5 to 5.5	78.56 to 70.56	5.50	NMP	0.55	2.55	0.00	75.51	1.99	-2.95	
MW106	50mm ID HDPE Standpipe	22-11-2022	76.14	Ground level	0.5 to 5.5	75.64 to 70.64	5.50	NMP	0.88	4.88	0.00	75.26	4.00	-0.62	

#### Notes:

m AOD Meters Above Ordanance Datum

m bgl Meters Below Ground Level

NAPL Non-Aqueous Phase Liquid

NA Not Applicable

HDPE High-Density Polyethylene

NMP No Measurable Product thickness recorded

Project: 10044284 Site Name: Shell Sutton Elms

# **ARCADIS**

	Table 3 Stabilised Hydrogeochemical Parameters in Groundwater														
Monitoring Well	Date	Sampled Time	Sampling Method	Sample Depth (m bgl)	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	Specific Conductivity (µS/cm)	Conductivity (μS/cm)	рН	ORP (mV)	Sample Comments			
MW101	18-01-2023	10:07 AM	Multiprobe / Peristaltic	2.50	7.20	49.70	6.03	1033.00	683.00	7.31	77.40	Cloudy and odourless sample was obtained			
MW104	18-01-2023	11:15 AM	Multiprobe / Peristaltic	2.50	6.70	17.80	2.16	1050.00	684.00	7.40	54.80	Cloudy and odourless sample was obtained			
MW105	18-01-2023	12:15 PM	Multiprobe / Bladder	2.50	7.30	6.10	0.75	678.20	448.30	7.01	-16.70	Cloudy and odourless sample was obtained			
MW106	18-01-2023	01:15 AM	Multiprobe / Bladder	2.50	8.50	25.40	2.95	1810.00	1241.00	7.35	43.20	Cloudy and odourless sample was obtained			

#### Notes:

mg/l milligrammes per litre

mV millivolts

µs/cm micro-Siemens per centimeter

m bgl meters below ground level

ORP Oxidation-Reduction Potential

- Not applicable

NS Parameters not stabilised after 30 minutes

# ARCADIS

Table 4 Comparison of Me	asured Concentrations of Contam	ninants in Gr	oundwater	· (µɑ/l) to Arcadis	GAC for Contin	ued Petroleum U	se						
	Location ID	Arcadis GAC -	Arcadis GAC ·	Arcadis GAC -			MW101	MW104	MW105	MW106			
	Date			Human Health	Water Resources -	Water Resources -		UK Drinking	18-01-2023	18-01-2023	18-01-2023	18-01-2023	
	- Continued Petroleum	Aquifers -	Surface Water	Shell RBSL	Water Standards	2.50	2.50	2.50	2.50				
Analyte Group	Analyte	Unit	MDL	Use	England & Wales	- England & Wales						2.50	
TPH CWG	>C5-C6 Aliphatics	µg/L	10	>SOL #1	See TPH#4	See TPH#4		See TPH	<10	<10	<10	146	
	>C6-C8 Aliphatics	µg/L	10	>SOL #1	See TPH#4	See TPH#4		See TPH	<10	<10	<10	215	
	>C8-C10 Aliphatics	µg/L	10	>SOL #1	See TPH#4	See TPH#4		See TPH	<10	<10	<10	173	
	>C10-C12 Aliphatics	µg/L	5	>SOL #1	See TPH#4	See TPH#4		See TPH	<5	<5	<5	<5	
	>C12-C16 Aliphatics	µg/L	10	>SOL #1	See TPH#4	See TPH#4		See TPH	<10	<10	<10	<10	
	>C16-C21 Aliphatics	µg/L	10	NR #2	See TPH#4	See TPH#4		See TPH	<10	<10	<10	<10	
	>C21-C35 Aliphatics	µg/L	10	NR #2	See TPH#4	See TPH#4		See TPH	<10	<10	<10	<10	
	Total >C5-C35 Aliphatics	µg/L	10					See TPH	<10	<10	<10	534	
	>EC5-EC7 Aromatics	µg/L	10	12,000	1	10		See TPH	<10	<10	<10	<10	
	>EC7-EC8 Aromatics	µg/L	10	>SOL #1	700	74		See TPH	<10	<10	<10	56	
	>EC8-EC10 Aromatics	µg/L	10	>SOL #1	See TPH#4	See TPH#4		See TPH	<10	<10	<10	353	
	>EC10-EC12 Aromatics	µg/L	5	>SOL #1	See TPH <sup>#4</sup>	See TPH <sup>#4</sup>		See TPH	<5	<5	<5	3,501	
	>EC12-EC16 Aromatics	µg/L	10	>SOL #1	See TPH#4	See TPH <sup>#4</sup>		See TPH	<10	<10	<10	<10	
	>EC16-EC21 Aromatics	µg/L	10	NR #2	See TPH#4	See TPH#4		See TPH	<10	<10	<10	<10	
	>EC21-EC35 Aromatics	µg/L	10	NR #2	See TPH#4	See TPH#4		See TPH	<10	<10	<10	<10	
	Total >EC5-EC35 Aromatics	µg/L	10					See TPH	<10	<10	<10	3,910	
	TPH >C5-C35 Aliphatics/Aromatics	µg/L	10	na #3	50	50		50 <sup>#8</sup>	<10	<10	<10	4,444	
BTEX	Benzene	µg/L	0.5	12,000	1	10		1 <sup>#9</sup>	< 0.5	< 0.5	< 0.5	12.2	
	Toluene	µg/L	5	>SOL #1	700	74		700#10	<5	<5	<5	63	
	Ethylbenzene	µg/L	1	>SOL #1	300	20		300#10	<1	<1	<1	22	
	Xylene (o)	µg/L	1	>SOL #1	250 <sup>#5</sup>	15 <sup>#5</sup>		250 <sup>#11</sup>	<1	<1	<1	80	
	p/m-Xylene	µg/L	2						<2	<2	<2	264	
	Xylene (Total)	µg/L	1	>SOL #1	500 <sup>#5</sup>	30 <sup>#5</sup>	93,000#7	500 <sup>#11</sup>	<1	<1	<1	344	
Fuel oxygenates	Diisopropyl ether	µg/L	1						<1	<1	<1	<1	
	Ethanol	µg/L	100						<100	<100	<100	<100	
	Ethyl tertiary butyl ether	µg/L	1	460,000	47	47		47 <sup>#12</sup>	<1	<1	<1	<1	
	MTBE	µg/L	0.1	5,200,000	15	15		15 <sup>#13</sup>	<0.1	<0.1	<0.1	<0.1	
	tert-Amyl methyl ether	µg/L	1						<1	<1	<1	<1	
	tert-Butyl alcohol	µg/L	100	20,000,000	12	12		12#14	<100	<100	<100	<100	
TPH	EPH >C8-C40	µg/L	10						<10	520	1,860	3,010	
	GRO (>C4-C12) #	µg/L	10						<10	<10	33	1,209	
	GRO (>C4-C8) # GRO (>C8-C12) #	µg/L	10						<10 <10	<10 <10	<10 33	437 772	
PAH 17	Naphthalene	µg/L	10 0.1	>SOL #1	2	2	15,000#7		<0.1	<0.1	<0.1	2.4	
PAH 17		µg/L		>SOL #1	2 #6	2 #6	15,000						
	Acenaphthene	µg/L	0.005	>SOL #1	- #6	46			< 0.005	<0.005	0.005	0.017 <0.005	
	Acenaphthylene	µg/L	0.005	>SOL #1	#6	46			< 0.005	<0.005	< 0.005	0.000	
	Fluoranthene	µg/L			#6	#6			0.005		0.029	< 0.005	
	Anthracene	µg/L	0.005	>SOL #1	#6	- #6			< 0.005	0.008	0.013	0.006	
	Phenanthrene	µg/L	0.005	>SOL #1	- ** - #6	- ** _#6			< 0.005	0.005	0.007	0.009	
	Fluorene	µg/L	0.005	>SOL #1	_ ** _ #6	#6			0.005	0.005	< 0.005	0.013	
	Chrysene	µg/L	0.005	>SOL #1					< 0.005	0.011	0.017	0.008	
	Pyrene	µg/L	0.005	>SOL #1	- <sup>#6</sup> #6	- <sup>#6</sup>			0.007	0.031	0.034	0.023	
	Benzo(a)anthracene	µg/L	0.005	>SOL #1		- #6			<0.005	0.016	0.018	0.011	
	Benzo(b)fluoranthene	µg/L	0.008	>SOL #1	0.025	- #6		0.025#15	< 0.008	<0.008	0.017	< 0.008	
	Benzo(k)fluoranthene	µg/L	0.008	>SOL #1	0.025	. <sup>#6</sup>		0.025#15	<0.008	<0.008	<0.008	< 0.008	
	Benzo(a)pyrene	µg/L	0.005	>SOL #1	0.01	0.00017		0.01#9	< 0.005	< 0.005	<u>0.013</u>	< 0.005	
	Dibenz(a,h)anthracene	µg/L	0.005	>SOL #1	- #6	- #6		#15	< 0.005	<0.005	< 0.005	< 0.005	
	Benzo(g,h,i)perylene	µg/L	0.005	>SOL #1	0.025	- #6		0.025#15	< 0.005	<0.005	0.007	< 0.005	
	Indeno(1,2,3-c,d)pyrene	µg/L	0.005	>SOL #1	0.025	- #6		0.025#15	< 0.005	< 0.005	0.009	< 0.005	
	PAH 16 Total	µg/L	0.173						< 0.173	<0.173	0.176	2.487	
	Benzo(b+k)fluoranthene	µg/L	0.008						<0.008	0.008	0.024	<0.008	
VOC	Hexane	µg/L	50						<50	<50	<50	<50	
SVOC	2-methylnaphthalene	µg/L	1						<1	<1	<1	<1	

#### Comments:

Project: Site Name:

10044284 Shell Sutton Elms

#1 >SOL - Target acceptable risk not exceeded at theoretical solubility concentration #2 NR - No appropriate inhalation reference dose identified during review of toxicological data

#3 na - Comprises multiple contaminants - no GAC derived

#4 No GAC for individual TPH fractions given that the compliance criteria is for sum TPH

#5 Criteria derived for sum xvlenes solit between isomers. Requires summation of m.p & o isomers to use sum xvlenes criteria.

#6 No water quality standard identified as suitable for deriving generic assessment criteria

#7 Universal Human Health Risk-Based Screening Levels (RBSL) Tables for Shell Downstream. SR.14.13826 Rev 2. March 2021

#8 No UK DWS for total petroleum hydrocarbons (TPH), or speciated TPH fractions. A value of 50 µg/l is adopted for sum TPH based on the rescinded

We not over som total perforeum hydrocarbons (PPh, or specialed PPH induitons. A value of so upp is adopted for sum PPH based on the rescinded PPrivate Water Supply (Ryulations, 1991.)
 Water Supply (Water Quality, Regulations 2016.
 Guidelines for Drinking-water Quality, 4th Edition. WHO, 2011.
 Guidelines for Drinking-water Quality, 4th Edition. WHO, 2011. Value of 500µg/l for sum xylenes split between isomers. Requires summation of m, p & o

isomers to use 500µg/l value.

#12 The taste and odour threshold of 47µg/l is commonly adopted as a guide.

#13 The taste and odour threshold of 15µg/l is commonly adopted as a guide.

#14 The taste and odour threshold of 12µg/l is commonly adopted as a guide.

#15 Water Supply (Water Quality) Regulations 2016. Value of 0.1µg/l for PAH split between four individual PAH. Requires summation of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghiperylene and indeno(123cd)pyrene to use 0.1µg/l value.

M	ote	~ •	

MDL	Method Detection Limit
NA	Data not applicable
m bgl	Meters Below Ground Level
	Analysis not scheduled/ not applicable
< 0.123	Result less than Effective Quantification Limit
0.123	Result above Effective Quantification Limit
EB	Equpment Blank Sample
DUP	Duplicate Sample
0.123	Concentration exceeds Arcadis GAC - Human Health - Continued Petroleum Use
0.123	Concentration exceeds Arcadis GAC - Water Resources - Aquifers - Continued Petroleum Use
0.123	Concentration exceeds Arcadis GAC - Water Resources - Surface Water - Continued Petroleum Use
0.402	

Concentration exceeds Shell RBSLs Concentration exceeds Shell RBSLs Concentration exceeds UK Drinking Water Standards Concentration exceedsArcadis GAC - Water Resources - Aquifers/Surface Water and UK Drinking Water Standards 0.123

# ARCADIS

Table 4										
Comparison of Me	easured Concentrations of Contan	ninants in Gr	oundwater	· (μg/l) to Arcadis			se			
	Location ID			Arcadis GAC -		Arcadis GAC -			MW106 [Dup]	EB
	Date			Human Health	Water Resources -	Water Resources -		UK Drinking	18-01-2023	18-01-2023
	Depth (Meters Below Ground	l Level)		- Continued Petroleum	Aquifers -	Surface Water	Shell RBSL	Water Standards	2.50	NA
Analyte Group	Analyte	Unit	MDL	Use	England & Wales	- England & Wales		otundurda		
TPH CWG	>C5-C6 Aliphatics		10	>SOL #1	See TPH#4	See TPH#4		See TPH	147	
IPH GWG	>C6-C8 Aliphatics	µg/L	10	>SOL #1	See TPH <sup>#4</sup>	See TPH <sup>#4</sup>		See TPH	217	
	>C8-C10 Aliphatics	µg/L		>SOL #1	See TPH	See TPH				
	>C10-C12 Aliphatics	µg/L	10 5	>SOL #1	See TPH	See TPH		See TPH See TPH	171 <5	
		µg/L		>SOL #1	See TPH	See TPH				
	>C12-C16 Aliphatics	µg/L	10	>SUL NR #2				See TPH	<10	
	>C16-C21 Aliphatics	µg/L	10		See TPH <sup>#4</sup>	See TPH#4		See TPH	<10	
	>C21-C35 Aliphatics	µg/L	10	NR #2	See TPH#4	See TPH#4		See TPH	<10	
	Total >C5-C35 Aliphatics >EC5-EC7 Aromatics	µg/L	10	12.000	1	10		See TPH See TPH	535	
	>EC7-EC8 Aromatics	µg/L	10 10	>SOL #1	700	74		See TPH	<10 56	
		µg/L		>SOL #1	See TPH#4	74 See TPH <sup>#4</sup>				
	>EC8-EC10 Aromatics	µg/L	10					See TPH	348	
	>EC10-EC12 Aromatics	µg/L	5	>SOL #1	See TPH#4	See TPH#4		See TPH	3,516	
	>EC12-EC16 Aromatics	µg/L	10	>SOL #1	See TPH#4	See TPH#4		See TPH	<10	
	>EC16-EC21 Aromatics	µg/L	10	NR #2	See TPH#4	See TPH#4		See TPH	<10	
	>EC21-EC35 Aromatics	µg/L	10	NR #2	See TPH#4	See TPH#4		See TPH	<10	
	Total >EC5-EC35 Aromatics	µg/L	10	*1				See TPH	3,920	
	TPH >C5-C35 Aliphatics/Aromatics	µg/L	10	na #3	50	50		50 <sup>#8</sup>	<u>4,455</u>	
BTEX	Benzene	µg/L	0.5	12,000	1	10		1#9	<u>12.4</u>	<0.5
	Toluene	µg/L	5	>SOL #1	700	74		700#10	64	<5
	Ethylbenzene	µg/L	1	>SOL #1	300	20		300 <sup>#10</sup>	24	<1
	Xylene (o)	µg/L	1	>SOL #1	250 <sup>#5</sup>	15 <sup>#5</sup>		250 <sup>#11</sup>	80	<1
	p/m-Xylene	µg/L	2						266	<2
	Xylene (Total)	µg/L	1	>SOL #1	500 <sup>#5</sup>	30 <sup>#5</sup>	93,000#7	500 <sup>#11</sup>	346	<1
Fuel oxygenates	Diisopropyl ether	µg/L	1						<1	<1
	Ethanol	µg/L	100						<100	<100
	Ethyl tertiary butyl ether	µg/L	1	460,000	47	47		47 <sup>#12</sup>	<1	<1
	MTBE	µg/L	0.1	5,200,000	15	15		15 <sup>#13</sup>	<0.1	<0.1
	tert-Amyl methyl ether	µg/L	1						<1	<1
	tert-Butyl alcohol	µg/L	100	20,000,000	12	12		12 <sup>#14</sup>	<100	<100
TPH	EPH >C8-C40	µg/L	10						2,440	<10
	GRO (>C4-C12) #	µg/L	10						1,201	<10
	GRO (>C4-C8) # GRO (>C8-C12) #	µg/L	10						440	<10
		µg/L	10	>SOL #1			45.000#7		761	<10
PAH 17	Naphthalene	µg/L	0.1		2	2 - #6	15,000#7		<u>2.2</u>	<0.1
	Acenaphthene	µg/L	0.005	>SOL #1	#6	46			0.018	< 0.005
	Acenaphthylene	µg/L	0.005	>SOL #1	-**	- *** _ #6			< 0.005	< 0.005
	Fluoranthene	µg/L	0.005	>SOL #1	-**	-*0 _#0			< 0.005	< 0.005
	Anthracene	µg/L	0.005	>SOL #1					0.010	<0.005
	Phenanthrene	µg/L	0.005	>SOL #1	. #2 - 12	- #6			0.011	0.006
	Fluorene	µg/L	0.005	>SOL #1	. #6	- #6			0.014	0.007
	Chrysene	µg/L	0.005	>SOL #1	. #6	- #6			0.014	<0.005
	Pyrene	µg/L	0.005	>SOL #1	_#6 _	- #6			< 0.005	< 0.005
	Benzo(a)anthracene	µg/L	0.005	>SOL #1	#6 -	- #6			0.018	<0.005
	Benzo(b)fluoranthene	µg/L	0.008	>SOL #1	0.025	- #6		0.025#15	0.012	<0.008
	Benzo(k)fluoranthene	µg/L	0.008	>SOL #1	0.025	- #6		0.025#15	<0.008	<0.008
	Benzo(a)pyrene	µg/L	0.005	>SOL #1	0.01	0.00017		0.01#9	< 0.005	< 0.005
	Dibenz(a,h)anthracene	µg/L	0.005	>SOL #1	. #6	- #6			< 0.005	< 0.005
	Benzo(g,h,i)perylene	μg/L	0.005	>SOL #1	0.025	- #6		0.025#15	0.005	< 0.005
	Indeno(1,2,3-c,d)pyrene	μg/L	0.005	>SOL #1	0.025	- #6		0.025#15	0.005	<0.005
	PAH 16 Total	μg/L	0.003		0.020			0.020	2.311	<0.003
	Benzo(b+k)fluoranthene	µg/L	0.008						0.016	< 0.008
VOC	Hexane	µg/L	50						<50	
SVOC	2-methylnaphthalene	µg/L	1						<1	<1

#### Comments:

Project: Site Name:

10044284 Shell Sutton Elms

#1 >SOL - Target acceptable risk not exceeded at theoretical solubility concentration #2 NR - No appropriate inhalation reference dose identified during review of toxicological data

#3 na - Comprises multiple contaminants - no GAC derived

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#5 Criteria derived for sum xvlenes solit between isomers. Requires summation of m.p & o isomers to use sum xvlenes criteria.

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#7 Universal Human Health Risk-Based Screening Levels (RBSL) Tables for Shell Downstream. SR.14.13826 Rev 2. March 2021

#8 No UK DWS for total petroleum hydrocarbons (TPH), or speciated TPH fractions. A value of 50 µg/l is adopted for sum TPH based on the rescinded

Private Water Supply Regulations, 1991.

#9 Water Supply (Water Quality) Regulations 2016.

#10 Guidelines for Drinking-water Quality, 4th Edition. WHO, 2011

#10 Guidelines for Drinking-water Quality, 4th Edition. WHO, 2011. Value of 500µg/l for sum xylenes split between isomers. Requires summation of m, p & o isomers to use 500µg/l value.

#12 The taste and odour threshold of 47µg/l is commonly adopted as a guide.

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#15 Water Supply (Water Quality) Regulations 2016. Value of 0.1µg/l for PAH split between four individual PAH. Requires summation of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghiperylene and indeno(123cd)pyrene to use 0.1µg/l value.

ote	

MDL Method Detection Limit Method Detection Limit Data not applicable Meters Below Ground Level Analysis not scheduled/ not applicable Result less than Effective Quantification Limit Result above Effective Quantification Limit NA m bgl

0.123

EB Equpment Blank Sample

DUP Dunlicate Sample

Concentration exceeds Arcadis GAC - Human Health - Continued Petroleum Use Concentration exceeds Arcadis GAC - Water Resources - Aquifers - Continued Petroleum Use Concentration exceeds Arcadis GAC - Water Resources - Surface Water - Continued Petroleum Use 0.123

Concentration exceeds Shell RBSLs 0.123

Concentration exceeds US Drinking Water Standards Concentration exceeds UK Drinking Water Standards Concentration exceeds Arcadis GAC - Water Resources - Aquifers/Surface Water and UK Drinking Water Standards

# **APPENDIX F**

Laboratory Certificates of Analysis for Soil and Groundwater Samples



Element Materials Technology Unit 3 Deeside Point Zone 3 Deeside Industrial Park Deeside CH5 2UA P: +44 (0) 1244 833780 F: +44 (0) 1244 833781

W: www.element.com



Six samples were received for analysis on 18th November, 2022 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

5.6000

Simon Gomery BSc Project Manager

Please include all sections of this report if it is reproduced

Client Name:
Reference:
Location:
Contact:
EMT Job No:

Arcadis 10044284 Shell Sutton Elms Shanth Belagodu 22/18969

#### Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24					
Sample ID	01MW101151 122SO0.2	02MW101151 122SO1.0	03MW105151 122SO1.0-1.2	04MW106161 122SO1.0	05MW104161 122SO0.5	06MW104161 122SO1.0					
Depth	0.20-0.50	1.00	1.00-1.20	1.00	0.50	1.00			Please se	e attached n	otes for all
COC No / misc										ations and a	
Containers	VJB	VJB	VJB	VJB	VJB	VJB					
Sample Date		15/11/2022	15/11/2022		16/11/2022						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil		 			
Batch Number	1	1	1	1	1	1		 	LOD/LOR	Units	Method No.
Date of Receipt	18/11/2022	18/11/2022	18/11/2022	18/11/2022	18/11/2022	18/11/2022					NO.
PAH MS											
Naphthalene <sup>#</sup>	<0.04	<0.04	<0.04	0.08	< 0.04	< 0.04			<0.04	mg/kg	TM4/PM8
Acenaphthylene	< 0.03	< 0.03	0.04	0.08	< 0.03	< 0.03			< 0.03	mg/kg	TM4/PM8
Acenaphthene <sup>#</sup> Fluorene <sup>#</sup>	0.13 <0.04	<0.05 <0.04	<0.05 <0.04	0.27	<0.05 <0.04	<0.05 <0.04			<0.05 <0.04	mg/kg	TM4/PM8 TM4/PM8
Phenanthrene <sup>#</sup>	<0.04 0.68	<0.04	<0.04 0.97	1.75	<0.04	<0.04			<0.04	mg/kg mg/kg	TM4/PM8
Anthracene <sup>#</sup>	0.08	<0.03	0.33	0.48	<0.03	<0.03			<0.03	mg/kg	TM4/PM8
Fluoranthene <sup>#</sup>	2.02	<0.03	2.11	2.33	0.12	<0.03			<0.03	mg/kg	TM4/PM8
Pyrene <sup>#</sup>	1.49	<0.03	1.72	1.86	0.38	<0.03			<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene <sup>#</sup>	0.75	<0.06	0.88	0.81	0.27	<0.06			<0.06	mg/kg	TM4/PM8
Chrysene <sup>#</sup>	0.80	<0.02	0.89	0.82	0.21	<0.02			<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene <sup>#</sup>	1.20	<0.07	1.53	1.58	0.32	<0.07			<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene <sup>#</sup>	<0.04	<0.04	0.91	0.89	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene#	0.42	<0.04	0.72	0.76	0.12	<0.04			<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene <sup>#</sup>	0.09	<0.04	0.14	0.16	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene <sup>#</sup>	0.32	<0.04	0.58	0.64	0.09	<0.04			<0.04	mg/kg	TM4/PM8
Coronene PAH 17 Total	0.07	<0.04	0.12	0.17	< 0.04	< 0.04			< 0.04	mg/kg	TM4/PM8
Benzo(b)fluoranthene	8.20 0.86	<0.64 <0.05	10.94 1.10	12.96	1.51 0.23	<0.64 <0.05			<0.64 <0.05	mg/kg mg/kg	TM4/PM8 TM4/PM8
Benzo(k)fluoranthene	0.34	<0.03	0.43	0.44	0.23	<0.03			<0.03	mg/kg	TM4/PM8
PAH Surrogate % Recovery	99	95	99	99	99	92			<0	%	TM4/PM8
3									-		
Methyl Tertiary Butyl Ether #	<2	<2	<2	<2	<2	<2			<2	ug/kg	TM15/PM10
Benzene <sup>#</sup>	<3	<3	<3	81	<3	<3			<3	ug/kg	TM15/PM10
Toluene <sup>#</sup>	<3	<3	<3	384	<3	<3			<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	<3	<3	>>3870	<3	<3			<3	ug/kg	TM15/PM10
m/p-Xylene <sup>#</sup>	<5	<5	<5	>>13300	<5	<5			<5	ug/kg	TM15/PM10
o-Xylene <sup>#</sup>	<3	<3	<3	>>4300	<3	<3			<3	ug/kg	TM15/PM10
n-Hexane	<50	<50	<50	196	<50	<50			<50	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	104	103	103	86	103	102			<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	92	98	89	86	96	95			<0	%	TM15/PM10
2-Methylnaphthalene #	<10	<10	<10	23	<10	<10			<10	ug/kg	TM16/PM8
EPH (C8-C40) (EH_1D_Total) <sup>#</sup>	258	<30	283	1220	436	<30			<30	mg/kg	TM5/PM8

Client Name:
Reference:
Location:
Contact:
EMT Job No:

Arcadis 10044284 Shell Sutton Elms Shanth Belagodu 22/18969

#### Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	21-24					
Sample ID	01MW101151 122SO0.2	02MW101151 122SO1.0	03MW105151 122SO1.0-1.2	04MW106161 122SO1.0	05MW104161 122SO0.5	06MW104161 122SO1.0					
Depth	0.20-0.50	1.00	1.00-1.20	1.00	0.50	1.00			Please se	e attached n	otes for all
COC No / misc								 		ations and a	
Containers	VJB	VJB	VJB	VJB	VJB	VJB		 			
Sample Date	15/11/2022	15/11/2022	15/11/2022	16/11/2022	16/11/2022	16/11/2022					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil		 			
Batch Number	1	1	1	1	1	1					
									LOD/LOR	Units	Method No.
Date of Receipt	18/11/2022	18/11/2022	18/11/2022	18/11/2022	18/11/2022	18/11/2022					
TPH CWG Aliphatics											
>C5-C6 (HS 1D AL) <sup>#</sup>	<0.1	<0.1	<0.1	1.8	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C6-C8 (HS 1D AL)#	<0.1	<0.1	<0.1	5.0	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	5.3	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2			<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) <sup>#</sup>	<4	<4	<4	<4	22	<4			<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) <sup>#</sup>	<7	<7	<7	30	103	<7			<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	<7	<7	205	71	<7			<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	<19	<19	<19	247	196	<19			<19	mg/kg	TM5/TM38/PM8/PM12/PM18
	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C5-EC7 (HS_1D_AR) <sup>#</sup> >EC7-EC8 (HS_1D_AR) <sup>#</sup>	<0.1	<0.1	<0.1	0.2	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1	9.5	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)*	<0.2	<0.2	<0.2	2.1	<0.2	<0.2			<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	<4	<4	<4	<4	<4			<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) <sup>#</sup>	<7	<7	20	75	31	<7			<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) <sup>#</sup>	<7	<7	103	326	14	<7			<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR)#	<19	<19	123	413	45	<19			<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	<38	<38	123	660	241	<38			<38	mg/kg	TM5/TM36/PM8/PM12/PM16
GRO (>C4-C8) (HS_1D_Total) <sup>#</sup>	<100	<100	<100	7300	<100	<100			<100	ug/kg	TM36/PM12
GRO (>C8-C12) (HS_1D_Total) <sup>#</sup>	<100	<100	<100	12400	314	<100			<100	ug/kg	TM36/PM12
GRO (>C4-C12) (HS_1D_Total) <sup>#</sup>	<100	<100	<100	19700	314	<100			<100	ug/kg	TM36/PM12
Natural Moisture Content	15.6	26.1	23.2	20.8	11.0	22.7			<0.1	%	PM4/PM0
Ethyl Tert Butyl Ether (ETBE)	<5	<5	<5	<5	<5 <sup>sv</sup>	<5			<5	ug/kg	TM83/PM10
Di isopropyl Ether (DIPE)	<5	<5	<5	<5	<5 <sup>sv</sup>	<5			<5	ug/kg	TM83/PM10
Tert Butyl Alcohol (TBA)	<100	<100	<100	<100	<100 <sup>SV</sup>	<100			<100	ug/kg	TM83/PM10
Tert Amyl Methyl Ether (TAME)	<5	<5	<5	<5	<5 <sup>sv</sup>	<5			<5	ug/kg	TM83/PM10
Ethanol	<100	<100	<100	<100	<100 <sup>SV</sup>	<100			<100	ug/kg	TM83/PM10

Client Name:	Arcadis
Reference:	10044284
Location:	Shell Sutton Elms
Contact:	Shanth Belagodu

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos subsamples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/18969	1	01MW101151122SO0.2	0.20-0.50	4	Charlotte Taylor	23/11/2022	General Description (Bulk Analysis)	brown soil/stones
					Charlotte Taylor	23/11/2022	Asbestos Fibres	NAD
					Charlotte Taylor	23/11/2022	Asbestos ACM	NAD
					Charlotte Taylor	23/11/2022	Asbestos Type	NAD
22/18969	1	02MW101151122SO1.0	1.00	8	Charlotte Taylor	23/11/2022	General Description (Bulk Analysis)	brown soil/stones
					Charlotte Taylor	23/11/2022	Asbestos Fibres	NAD
					Charlotte Taylor	23/11/2022	Asbestos ACM	NAD
					Charlotte Taylor	23/11/2022	Asbestos Type	NAD
22/18969	1	03MW105151122SO1.0-1.2	1.00-1.20	12	Charlotte Taylor	23/11/2022	General Description (Bulk Analysis)	brown soil/stones
					Charlotte Taylor	23/11/2022	Asbestos Fibres	NAD
					Charlotte Taylor	23/11/2022	Asbestos ACM	NAD
					Charlotte Taylor	23/11/2022	Asbestos Type	NAD
22/18969	1	04MW106161122SO1.0	1.00	16	Charlotte Taylor	23/11/2022	General Description (Bulk Analysis)	brown soil/stones
					Charlotte Taylor	23/11/2022	Asbestos Fibres	NAD
					Charlotte Taylor	23/11/2022	Asbestos ACM	NAD
					Charlotte Taylor	23/11/2022	Asbestos Type	NAD
22/18969	1	05MW104161122SO0.5	0.50	20	Charlotte Taylor	23/11/2022	General Description (Bulk Analysis)	brown soil/stones
					Charlotte Taylor	23/11/2022	Asbestos Fibres	NAD
					Charlotte Taylor	23/11/2022	Asbestos ACM	NAD
					Charlotte Taylor	23/11/2022	Asbestos Type	NAD
22/18969	1	06MW104161122SO1.0	1.00	24	Charlotte Taylor	23/11/2022	General Description (Bulk Analysis)	brown soil/stones
					Charlotte Taylor	23/11/2022	Asbestos Fibres	NAD
					Charlotte Taylor	23/11/2022	Asbestos ACM	NAD
					Charlotte Taylor	23/11/2022	Asbestos Type	NAD

Client Name:	Arcadis
Reference:	10044284
Location:	Shell Sutton Elms
Contact:	Shanth Belagodu

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason				
	No deviating sample report results for job 22/18969									

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

**EMT Job No.:** 22/18969

#### SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at  $35^{\circ}C \pm 5^{\circ}C$  unless otherwise stated. Moisture content for CEN Leachate tests are dried at  $105^{\circ}C \pm 5^{\circ}C$ . Ash samples are dried at  $37^{\circ}C \pm 5^{\circ}C$ .

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCI (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

#### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

#### STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

#### **DEVIATING SAMPLES**

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

#### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

#### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

#### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

#### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation. Laboratory records are kept for a period of no less than 6 years.

#### **REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

#### **Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

#### **Customer Provided Information**

Sample ID and depth is information provided by the customer.

### ABBREVIATIONS and ACRONYMS USED

ISO17025 (UKAS Ref No. 4225) accredited - UK.
ISO17025 (SANAS Ref No.T0729) accredited - South Africa
Indicates analyte found in associated method blank.
Dilution required.
MCERTS accredited.
Not applicable
No Asbestos Detected.
None Detected (usually refers to VOC and/SVOC TICs).
No Determination Possible
Calibrated against a single substance
Surrogate recovery outside performance criteria. This may be due to a matrix effect.
Results expressed on as received basis.
AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
Analysis subcontracted to an Element Materials Technology approved laboratory.
Samples are dried at 35°C ±5°C
Suspected carry over
Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
Matrix Effect
No Fibres Detected
AQC Sample
Blank Sample
Client Sample
Trip Blank Sample
Outside Calibration Range

#### HWOL ACRONYMS AND OPERATORS USED

[	
HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/18969

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes

EMT Job No: 22/18969

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co- elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
ТМ36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co- elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM83	Modified USEPA method 8260B v2:1996. Determination of Alcohols, Acetates, Acetone, Fuel Oxygenates, THF and Cyclohexane by Headspace GC-MS	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

Method Code Appendix



Element Materials Technology Unit 3 Deeside Point Zone 3 Deeside Industrial Park Deeside CH5 2UA P: +44 (0) 1244 833780 F: +44 (0) 1244 833781

W: www.element.com



Five samples were received for analysis on 25th November, 2022 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Paul Boden BSc Senior Project Manager

Please include all sections of this report if it is reproduced

Client Name:			
Reference:			
Location:			
Contact:			
EMT Job No:			

Arcadis 10044284 Shell Sutton Elms Shanth Belagodu 22/19428

#### Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Job No:	22/19428					 	 			
EMT Sample No.	1-4	5-8	9-12	13-16	17-20					
Sample ID	01MW105221 122SO1.8-2.0	02MW105221 122SO2.5-2.7	03MW106221 122SO1.5-1.8	04MW106221 122SO2.3-2.5	05MW101241 122SO4.2-4.5					
Depth	1.8-2.0	2.5-2.7	1.5-1.8	2.3-2.5	4.2-4.5			 Please se	e attached n	otes for all
COC No / misc									ations and a	
Containers	VJB	VJB	VJB	VJB	VJB					
Sample Date	22/11/2022	22/11/2022	22/11/2022	22/11/2022	24/11/2022					
Sample Type	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1					
								 LOD/LOR	Units	Method No.
Date of Receipt	25/11/2022	25/11/2022	25/11/2022	25/11/2022	25/11/2022					
PAH MS Naphthalene <sup>#</sup>	<0.04	<0.04	1.96	<0.04	<0.04			<0.04	ma/ka	TM4/PM8
Acenaphthylene	<0.04	<0.04	<0.03	<0.04	<0.04			<0.04	mg/kg mg/kg	TM4/PM8
Acenaphthene <sup>#</sup>	<0.05	<0.05	<0.05	<0.05	< 0.05			 <0.05	mg/kg	TM4/PM8
Fluorene <sup>#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Phenanthrene <sup>#</sup>	<0.03	< 0.03	0.22	< 0.03	< 0.03			<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04			 <0.04	mg/kg	TM4/PM8
Fluoranthene <sup>#</sup>	<0.03	<0.03	0.21	<0.03	<0.03			<0.03	mg/kg	TM4/PM8
Pyrene <sup>#</sup>	<0.03	<0.03	0.17	<0.03	<0.03			<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene <sup>#</sup>	<0.06	<0.06	0.10	<0.06	<0.06			<0.06	mg/kg	TM4/PM8
Chrysene <sup>#</sup>	<0.02	<0.02	0.08	<0.02	<0.02			<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene <sup>#</sup>	<0.07	<0.07	0.12	<0.07	<0.07			<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene <sup>#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04			 <0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene <sup>#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04	 		 <0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene <sup>#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene <sup>#</sup>	<0.04	<0.04	<0.04	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6	2.9	<0.6	<0.6			<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	0.09	< 0.05	< 0.05			<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	0.03	<0.02	<0.02			<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	93	89	95	75	91			<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	<2	<2	<2	<2	<2			<2	ug/kg	TM15/PM10
Benzene <sup>#</sup>	<3	<3	<3	<3	<3	 		 <3	ug/kg	TM15/PM10
Toluene <sup>#</sup>	<3	<3	353	<3	<3			<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	4	11800 <sub>AA</sub>	15	4	 		 <3	ug/kg	TM15/PM10
m/p-Xylene #	<5	14	>>52900 <sub>AA</sub>		15			<5	ug/kg	TM15/PM10
o-Xylene <sup>#</sup>	<3	<3	9220 <sub>AA</sub>	6	<3			<3	ug/kg	TM15/PM10
n-Hexane	<50	<50	4970 <sub>AA</sub>	<50	<50			<50	ug/kg	TM15/PM10 TM15/PM10
Surrogate Recovery Toluene D8 Surrogate Recovery 4-Bromofluorobenzene	98 93	87 66	100 94	91 73	107 94			<0 <0	%	TM15/PM10 TM15/PM10
ourrogate recovery + Dromondorobenzene	95	00	54	75	54			~0	70	
2-Methylnaphthalene #	<10	<10	1360	<10	<10			<10	ug/kg	TM16/PM8
EPH (C8-C40) (EH_1D_Total) <sup>#</sup>	<30	<30	270	113	<30			<30	mg/kg	TM5/PM8
EPH (C8-C40) (EH_1D_Total) <sup>#</sup>	<30	<30	270	113	<30			<30	mg/kg	TM5/PN

Client Name:			
Reference:			
Location:			
Contact:			
EMT Job No:			

Arcadis 10044284 Shell Sutton Elms Shanth Belagodu 22/19428

#### Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Job No:	22/19428					 	 			
EMT Sample No.	1-4	5-8	9-12	13-16	17-20					
Sample ID	01MW105221 122SO1.8-2.0	02MW105221 122SO2.5-2.7	03MW106221 122SO1.5-1.8	04MW106221 122SO2.3-2.5	05MW101241 122SO4.2-4.5					
Depth	1.8-2.0	2.5-2.7	1.5-1.8	2.3-2.5	4.2-4.5			 Please see	e attached n	otes for all
COC No / misc									ations and a	
Containers	VJB	VJB	VJB	VJB	VJB					
Sample Date	22/11/2022	22/11/2022	22/11/2022	22/11/2022	24/11/2022					
Sample Type	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1					Method
Date of Receipt	25/11/2022	25/11/2022	25/11/2022	25/11/2022	25/11/2022			 LOD/LOR	Units	No.
TPH CWG										
Aliphatics										
>C5-C6 (HS_1D_AL) <sup>#</sup>	<0.1	<0.1	3.3	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) <sup>#</sup>	<0.1	<0.1	46.8	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	90.3	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	4.8	<0.2	<0.2			<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) <sup>#</sup>	<4	<4	<4	<4	<4			<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) <sup>#</sup>	<7	<7	<7	<7	<7			<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)*	<7	<7	<7	<7	<7			 <7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	<19	<19	145	<19	<19			<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics										
>C5-EC7 (HS_1D_AR)*	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) <sup>#</sup>	<0.1	<0.1	<0.1	<0.1	<0.1			 <0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	<0.1	14.7	<0.1	<0.1			 <0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	50.3	<0.2	<0.2			<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)*	<4 <7	<4 <7	<4 <7	<4 <7	<4 <7			<4 <7	mg/kg	TM5/PM8/PM16 TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) <sup>#</sup> >EC21-EC35 (EH_CU_1D_AR) <sup>#</sup>	<7	<7	<7	<7	<7			<7	mg/kg mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR)	<19	<19	65	<19	<19			<19	mg/kg	TM5/TM38/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	<38	<38	210	<38	<38			 <38	mg/kg	TM5/TM36/PM8/PM12/PM16
GRO (>C4-C8) (HS_1D_Total) <sup>#</sup>	<100	<100	53600	163	<100			<100	ug/kg	TM36/PM12
GRO (>C8-C12) (HS_1D_Total) <sup>#</sup>	<100	<100	185000	235	<100			<100	ug/kg	TM36/PM12
GRO (>C4-C12) (HS_1D_Total) <sup>#</sup>	<100	<100	238600	398	<100			<100	ug/kg	TM36/PM12
Natural Moisture Content	22.2	34.7	14.9	24.6	11.4			<0.1	%	PM4/PM0
Fraction Organic Carbon	0.001	0.006	<0.001	0.005	0.002			<0.001	None	TM21/PM24
Ethyl Tert Butyl Ether (ETBE)	<5	<5	<5	<5	<5			<5	ug/kg	TM83/PM10
Di isopropyl Ether (DIPE)	<5	<5	<5	<5	<5			<5	ug/kg	TM83/PM10
Tert Butyl Alcohol (TBA)	<100	<100	<100	<100	<100			 <100	ug/kg	TM83/PM10
Tert Amyl Methyl Ether (TAME)	<5	<5	<5	<5	<5			<5	ug/kg	TM83/PM10
Ethanol	<100	<100	<100	<100	<100			<100	ug/kg	TM83/PM10

Asbestos	Analysis
10000000	7 analyo10

Client Name:	Arcadis
Reference:	10044284
Location:	Shell Sutton Elms
Contact:	Shanth Belagodu

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos subsamples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/19428	1	01MW105221122SO1.8-2.0	1.8-2.0	4	Catherine Coles	30/11/2022	General Description (Bulk Analysis)	red sand/stone
					Catherine Coles	30/11/2022	Asbestos Fibres	NAD
					Catherine Coles	30/11/2022	Asbestos ACM	NAD
					Catherine Coles	30/11/2022	Asbestos Type	NAD
22/19428	1	02MW105221122SO2.5-2.7	2.5-2.7	8	Catherine Coles	30/11/2022	General Description (Bulk Analysis)	soil/clay
					Catherine Coles	30/11/2022	Asbestos Fibres	NAD
					Catherine Coles	30/11/2022	Asbestos ACM	NAD
					Catherine Coles	30/11/2022	Asbestos Type	NAD
22/19428	1	03MW106221122SO1.5-1.8	1.5-1.8	12	Anthony Carman	30/11/2022	General Description (Bulk Analysis)	Brown Soil/Stones
					Anthony Carman	30/11/2022	Asbestos Fibres	NAD
					Anthony Carman	30/11/2022	Asbestos ACM	NAD
					Anthony Carman	30/11/2022	Asbestos Type	NAD
22/19428	1	04MW106221122SO2.3-2.5	2.3-2.5	16	Anthony Carman	30/11/2022	General Description (Bulk Analysis)	Brown Soil/Stones
					Anthony Carman	30/11/2022	Asbestos Fibres	NAD
					Anthony Carman	30/11/2022	Asbestos ACM	NAD
					Anthony Carman	30/11/2022	Asbestos Type	NAD
22/19428	1	05MW101241122SO4.2-4.5	4.2-4.5	20	Catherine Coles	30/11/2022	General Description (Bulk Analysis)	redsoil
					Catherine Coles	30/11/2022	Asbestos Fibres	NAD
					Catherine Coles	30/11/2022	Asbestos ACM	NAD
					Catherine Coles	30/11/2022	Asbestos Type	NAD

Client Name:	Arcadis
Reference:	10044284
Location:	Shell Sutton Elms
Contact:	Shanth Belagodu

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason				
	No deviating sample report results for job 22/19428									

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

**EMT Job No.:** 22/19428

#### SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at  $35^{\circ}C \pm 5^{\circ}C$  unless otherwise stated. Moisture content for CEN Leachate tests are dried at  $105^{\circ}C \pm 5^{\circ}C$ . Ash samples are dried at  $37^{\circ}C \pm 5^{\circ}C$ .

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCI (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

#### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

#### STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

#### **DEVIATING SAMPLES**

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

#### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

#### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

#### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

#### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation. Laboratory records are kept for a period of no less than 6 years.

#### **REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

#### **Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

#### **Customer Provided Information**

Sample ID and depth is information provided by the customer.

1	
#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
В	Indicates analyte found in associated method blank.
DR	Dilution required.
М	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
со	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
ТВ	Trip Blank Sample
ос	Outside Calibration Range
AA	x10 Dilution
-	

#### HWOL ACRONYMS AND OPERATORS USED

[	
HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/19428

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes

EMT Job No: 22/19428

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co- elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co- elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM83	Modified USEPA method 8260B v2:1996. Determination of Alcohols, Acetates, Acetone, Fuel Oxygenates, THF and Cyclohexane by Headspace GC-MS	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes



Element Materials Technology Unit 3 Deeside Point Zone 3 Deeside Industrial Park Deeside CH5 2UA P: +44 (0) 1244 833780 F: +44 (0) 1244 833781

W: www.element.com



Three samples were received for analysis on 30th November, 2022 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

5.6000

Simon Gomery BSc Project Manager

Please include all sections of this report if it is reproduced

Client Name:
Reference:
Location:
Contact:
EMT Job No:

Arcadis 10044284 Shell Sutton Elms Shanth Belagodu 22/19728

### Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Job No:	22/19728			 	 	 	 _		
EMT Sample No.	1-4	5-8	9-13						
Sample ID	01MW104241 122SO3.8-4.2	02DUPSO	03SKIP251122 SO						
Depth	3.80-4.20								- to - f 11
COC No / misc								e attached n ations and a	
Containers	VJB	VJB	VJTB		 				
Sample Date	24/11/2022	<>	25/11/2022						
Sample Type	Soil	Soil	Soil						
Batch Number	1	1	1		 		 LOD/LOR	Units	Method No.
Date of Receipt	30/11/2022	30/11/2022	30/11/2022		 				110.
PAH MS									
Naphthalene <sup>#</sup>	<0.04	<0.04	<0.04		 		<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	< 0.03	< 0.03				< 0.03	mg/kg	TM4/PM8
Acenaphthene <sup>#</sup>	<0.05	< 0.05	< 0.05				<0.05	mg/kg	TM4/PM8
Fluorene <sup>#</sup>	< 0.04	< 0.04	< 0.04				<0.04	mg/kg	
Phenanthrene <sup>#</sup> Anthracene <sup>#</sup>	<0.03 <0.04	<0.03 <0.04	<0.03 <0.04				<0.03 <0.04	mg/kg mg/kg	TM4/PM8 TM4/PM8
Fluoranthene <sup>#</sup>	<0.04	<0.04	<0.04				<0.04	mg/kg	TM4/PM8
Pyrene <sup>#</sup>	<0.03	<0.03	<0.03				<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene <sup>#</sup>	<0.05	<0.05	<0.05				<0.06	mg/kg	TM4/PM8
Chrysene <sup>#</sup>	<0.02	<0.02	<0.02		 		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene <sup>#</sup>	<0.02	<0.02	<0.02		 		<0.02	mg/kg	TM4/PM8
Benzo(a)pyrene <sup>#</sup>	<0.04	<0.04	<0.04				<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene <sup>#</sup>	<0.04	<0.04	<0.04		 		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene <sup>#</sup>	<0.04	<0.04	<0.04				<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04				<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04	<0.04				<0.04	mg/kg	TM4/PM8
PAH 17 Total	<0.64	<0.64	<0.64				<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05				<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02				<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	93	95	103				<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	<2	<2	<2				<2	ug/kg	TM15/PM10
Benzene <sup>#</sup>	<3	<3	<3				<3	ug/kg	TM15/PM10
Toluene <sup>#</sup>	<3	<3	8				<3	ug/kg	TM15/PM10
Ethylbenzene #	8	3	78				<3	ug/kg	TM15/PM10
m/p-Xylene <sup>#</sup>	21	9	387		 		<5	ug/kg	TM15/PM10
o-Xylene <sup>#</sup>	<3	<3	70				<3	ug/kg	TM15/PM10
n-Hexane	<50	<50	<50				<50	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	93	98	105				<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	87	85	95				<0	%	TM15/PM10
2-Methylnaphthalene <sup>#</sup>	<10	<10	<10				<10	ug/kg	TM16/PM8
	10							ugnig	
EPH (C8-C40) (EH_1D_Total) <sup>#</sup>	<30	<30	<30				<30	mg/kg	TM5/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	-	-	<30		 		<30	mg/kg	TM5/PM8/PM16

Client Name:
Reference:
Location:
Contact:
EMT Job No:

Arcadis 10044284 Shell Sutton Elms Shanth Belagodu 22/19728

### Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Job No:	22/19/28			. <u> </u>	. <u> </u>	. <u> </u>	 . <u> </u>	 			
EMT Sample No.	1-4	5-8	9-13								
Sample ID	01MW104241 122SO3.8-4.2	02DUPSO	03SKIP251122 SO								
Depth	3.80-4.20								Plaasa sa	e attached r	otos for all
COC No / misc										ations and a	
Containers	VJB	VJB	VJTB								
Sample Date	24/11/2022	<>	25/11/2022								
Sample Type	Soil	Soil	Soil								
Batch Number	1	1	1								Method
Date of Receipt	30/11/2022	30/11/2022	30/11/2022						LOD/LOR	Units	No.
TPH CWG											
Aliphatics											
- >C5-C6 (HS_1D_AL) <sup>#</sup>	<0.1	<0.1	0.3						<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)*	<0.1	<0.1	1.3						<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	2.2						<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) <sup>#</sup>	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>C10-C12 (EH_CU_1D_AL)*	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>C12-C10 (EH_CU_1D_AL)*	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>C10-C21 (EII_C0_10_AL) >C21-C35 (EH_CU_1D_AL) <sup>#</sup>	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	<19	<19	<19						<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics	10	\$15	10						10	ing/kg	
>C5-EC7 (HS_1D_AR) <sup>#</sup>	<0.1	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)*	<0.1	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)*	<0.1	<0.1	1.4						<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)*	<0.2	<0.2	7.0						<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)*	<4	<4	<4						<4	mg/kg	TM5/PM8/PM16
>EC12-EC10 (EH_CU_1D_AR)*	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
>EC10-EC21 (EH_CU_1D_AR)*	<7	<7	<7						<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR)*	<19	<19	<19						<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	<38	<38	<38						<38	mg/kg	TM5/TM36/PM8/PM12/PM16
	-00	-00	-00						-00	ing/ig	
GRO (>C4-C8) (HS_1D_Total)#	<100	<100	1720						<100	ug/kg	TM36/PM12
GRO (>C8-C12) (HS 1D Total)#	<100	<100	4400						<100	ug/kg	TM36/PM12
GRO (>C4-C12) (HS_1D_Total)#	<100	<100	6120						<100	ug/kg	TM36/PM12
PCB 28 <sup>#</sup>	-	-	<5						<5	ug/kg	TM17/PM8
PCB 52#	-	-	<5						<5	ug/kg	TM17/PM8
PCB 101 <sup>#</sup>	-	-	<5						<5	ug/kg	TM17/PM8
PCB 118 <sup>#</sup>	-	-	<5						<5	ug/kg	TM17/PM8
PCB 138 <sup>#</sup>	-	-	<5						<5	ug/kg	TM17/PM8
PCB 153#	-	-	<5						<5	ug/kg	TM17/PM8
PCB 180 <sup>#</sup>	-	-	<5						<5	ug/kg	TM17/PM8
Total 7 PCBs <sup>#</sup>	-	-	<35						<35	ug/kg	TM17/PM8
Natural Moisture Content	12.4	13.1	30.4						<0.1	%	PM4/PM0
Hexavalent Chromium <sup>#</sup>	-	-	<0.3						<0.3	mg/kg	TM38/PM20
*			0.40						.0.00	0/	THEFT
Total Organic Carbon <sup>#</sup>	-	-	0.40						< 0.02	%	TM21/PM24
Fraction Organic Carbon	0.002	0.002	0.004						<0.001	None	TM21/PM24
		_	_						_		-
Ethyl Tert Butyl Ether (ETBE)	<5	<5	<5						<5	ug/kg	TM83/PM10
Di isopropyl Ether (DIPE)	<5	<5	<5						<5	ug/kg	TM83/PM10
Tert Butyl Alcohol (TBA)	<100	<100	<100						<100	ug/kg	TM83/PM10

Client Name:
Reference:
Location:
Contact:
EMT Job No:

10044284 Shell Sutton Elms Shanth Belagodu 22/19728

Arcadis

### Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Job No:	22/19/28								
EMT Sample No.	1-4	5-8	9-13						
Sample ID	01MW104241 122SO3.8-4.2	02DUPSO	03SKIP251122 SO						
Depth	3.80-4.20						 Please se	e attached n	otos for all
COC No / misc								ations and a	
Containers	VJB	VJB	VJTB						
Sample Date	24/11/2022	$\diamond$	25/11/2022						
Sample Type	Soil	Soil	Soil						
Batch Number	1	1	1						Method
Date of Receipt	30/11/2022	30/11/2022	30/11/2022				LOD/LOR	Units	No.
Tert Amyl Methyl Ether (TAME)	<5	<5	<5				<5	ug/kg	TM83/PM10
Ethanol	<100	<100	<100				<100	ug/kg	TM83/PM10
ANC at pH4	-	-	0.49				<0.03	mol/kg	TM77/PM0
ANC at pH7	-	-	0.07				<0.03	mol/kg	TM77/PM0
Loss on Ignition #	-	-	3.0				<1.0	%	TM22/PM0
рН #	-	-	9.50				<0.01	pH units	TM73/PM11

# CEN 10:1 LEACHATE RESULTS BS EN 12547-2

Element Materia						
Mass of sample taken (kg)	-		Moisture Content Ratio (%) =		20.9	
Mass of dry sample (kg) =	0.09		Dry Matter Content Ratio (%) =		82.7	
Particle Size <4mm =	>95%					
EMT Job No			22/19728	Lond	ill Maata Aa	oontonoo
Sample No			12	Land	ill Waste Ac Criteria Lin	-
· ·			03SKIP251122SO			
Client Sample No Depth/Other			035RF 251 12250	1	Stable Non-reactive	
Sample Date			25/11/2022	Inert Waste	Hazardous	Hazardous Waste
Batch No			1	Landfill	Waste in Non- Hazardous	Landfill
			•	4	Landfill	
Solid Waste Analysis Total Organic Carbon (%)	0.40			3	5	6
Loss on Ignition (%)	3.0				5	10
Sum of BTEX (mg/kg)	0.543			6	-	
Sum of 7 PCBs (mg/kg)	<0.035			1	_	-
Mineral Oil (mg/kg) (EH_CU_1D_AL)	<30			500		-
PAH Sum of 17(mg/kg)	<0.64			100	-	-
pH (pH Units)	9.50			100	>6	
ANC to pH 7 (mol/kg)	0.07			-	to be evaluated	to be evaluated
ANC to pH 4 (mol/kg)	0.49					to be evaluated
	0.40			-		
Eluate Analysis		conc <sup>n</sup> ched		le	values for co aching test 12457-2 at l	using
	C <sub>10</sub>	<b>A</b> <sub>10</sub>				
	mg/l	mg/kg			mg/kg	
Arsenic	0.0069	0.069		0.5	2	25
Barium	0.009	0.09		20	100	300
Cadmium	<0.0005	<0.005		0.04	1	5
Chromium						
	0.0019	0.019		0.5	10	70
Copper	0.0019 <0.007	0.019 <0.07		0.5 2	10 50	70 100
-						-
Copper Mercury Molybdenum	<0.007 <0.001 0.004	<0.07		2	50	100
Copper Mercury	<0.007 <0.001	<0.07 <0.01		2 0.01	50 0.2	100 2
Copper Mercury Molybdenum	<0.007 <0.001 0.004 <0.002 <0.005	<0.07 <0.01 0.04		2 0.01 0.5 0.4 0.5	50 0.2 10 10 10	100 2 30 40 50
Copper Mercury Molybdenum Nickel	<0.007 <0.001 0.004 <0.002 <0.005 <0.002	<0.07 <0.01 0.04 <0.02 <0.05 <0.02		2 0.01 0.5 0.4 0.5 0.06	50 0.2 10 10 10 0.7	100 2 30 40 50 5
Copper Mercury Molybdenum Nickel Lead	<0.007 <0.001 0.004 <0.002 <0.005 <0.002 0.003	<0.07 <0.01 0.04 <0.02 <0.05		2 0.01 0.5 0.4 0.5	50 0.2 10 10 10	100 2 30 40 50
Copper Mercury Molybdenum Nickel Lead Antimony	<0.007 <0.001 0.004 <0.002 <0.005 <0.002	<0.07 <0.01 0.04 <0.02 <0.05 <0.02		2 0.01 0.5 0.4 0.5 0.06	50 0.2 10 10 10 0.7	100 2 30 40 50 5
Copper Mercury Molybdenum Nickel Lead Antimony Selenium	<0.007 <0.001 0.004 <0.002 <0.005 <0.002 0.003	<0.07 <0.01 0.04 <0.02 <0.05 <0.02 <0.03		2 0.01 0.5 0.4 0.5 0.06 0.1	50 0.2 10 10 0.7 0.5 50 15000	100 2 30 40 50 5 7 200 25000
Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc	<0.007 <0.001 0.004 <0.002 <0.005 <0.002 0.003 <0.003	<0.07 <0.01 0.04 <0.02 <0.05 <0.02 <0.03 <0.03		2 0.01 0.5 0.4 0.5 0.06 0.1 4	50 0.2 10 10 10 0.7 0.5 50	100 2 30 40 50 5 7 200
Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc Chloride Fluoride Sulphate as SO4	<0.007 <0.001 0.004 <0.002 <0.005 <0.002 0.003 <0.003 7.6	<0.07 <0.01 0.04 <0.02 <0.05 <0.02 <0.03 <0.03 76		2 0.01 0.5 0.4 0.5 0.06 0.1 4 800	50 0.2 10 10 0.7 0.5 50 15000	100 2 30 40 50 5 7 200 25000
Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc Chloride Fluoride	<0.007 <0.001 0.004 <0.002 <0.005 <0.002 0.003 <0.003 7.6 0.3	<0.07 <0.01 0.04 <0.02 <0.05 <0.02 <0.03 <0.03 76 <3		2 0.01 0.5 0.4 0.5 0.06 0.1 4 800 10	50 0.2 10 10 10 0.7 0.5 50 15000 150	100 2 30 40 50 5 7 200 25000 500
Copper Mercury Molybdenum Nickel Lead Antimony Selenium Zinc Chloride Fluoride Sulphate as SO4	<0.007 <0.001 0.004 <0.002 <0.005 <0.002 0.003 <0.003 7.6 0.3 12.8	<0.07 <0.01 0.04 <0.02 <0.05 <0.02 <0.03 <0.03 <0.03 76 <3 128		2 0.01 0.5 0.4 0.5 0.06 0.1 4 800 10 1000	50 0.2 10 10 0.7 0.5 50 15000 150 20000	100 2 30 40 50 5 7 200 25000 500 5000

Client Name:	Arcadis
Reference:	10044284
Location:	Shell Sutton Elms
Contact:	Shanth Belagodu

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos subsamples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/19728	1	01MW104241122SO3.8-4.2	3.80-4.20	4	Catherine Coles	02/12/2022	General Description (Bulk Analysis)	soil,stone
					Catherine Coles	02/12/2022	Asbestos Fibres	NAD
					Catherine Coles	02/12/2022	Asbestos ACM	NAD
					Catherine Coles	02/12/2022	Asbestos Type	NAD
22/19728	1	02DUPSO		8	Catherine Coles	02/12/2022	General Description (Bulk Analysis)	soil,stone
					Catherine Coles	02/12/2022	Asbestos Fibres	NAD
					Catherine Coles	02/12/2022	Asbestos ACM	NAD
					Catherine Coles	02/12/2022	Asbestos Type	NAD
22/19728	1	03SKIP251122SO		13	Simon Postlewhite	01/12/2022	General Description (Bulk Analysis)	Brown soil/stones
					Simon Postlewhite	01/12/2022	Asbestos Fibres	NAD
					Simon Postlewhite	01/12/2022	Asbestos ACM	NAD
					Simon Postlewhite	01/12/2022	Asbestos Type	NAD

Client Name:	Arcadis
Reference:	10044284
Location:	Shell Sutton Elms
Contact:	Shanth Belagodu

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
22/19728	1	02DUPSO		5-8	All analyses	No sampling date given

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

Matrix : Solid

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

**EMT Job No.:** 22/19728

### SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at  $35^{\circ}C \pm 5^{\circ}C$  unless otherwise stated. Moisture content for CEN Leachate tests are dried at  $105^{\circ}C \pm 5^{\circ}C$ . Ash samples are dried at  $37^{\circ}C \pm 5^{\circ}C$ .

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCI (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

#### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

#### STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

### **DEVIATING SAMPLES**

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation. Laboratory records are kept for a period of no less than 6 years.

### **REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

#### **Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

### **Customer Provided Information**

Sample ID and depth is information provided by the customer.

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
В	Indicates analyte found in associated method blank.
DR	Dilution required.
М	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
СО	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
Ν	Client Sample
ТВ	Trip Blank Sample
OC	Outside Calibration Range

### HWOL ACRONYMS AND OPERATORS USED

[	
HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/19728

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 22/19728

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C- 440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co- elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co- elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes		AR	Yes

EMT Job No: 22/19728

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377- 3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM77	Modified DDCEN/TS method 15364:2006. Determination of Acid Neutralization Capacity by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	No
TM83	Modified USEPA method 8260B v2:1996. Determination of Alcohols, Acetates, Acetone, Fuel Oxygenates, THF and Cyclohexane by Headspace GC-MS	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM170	Determination of Trace Metals by ICP-MS (Inductively Coupled Plasma – Mass Spectrometry): Modified USEPA Method 200.8, Rev. 5.4, 1994; Modified EPA Method 6020A, Rev.1, Feb 2007; Modified BS EN ISO 17294-2:2016	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes		AR	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	



Issue :

Element Materials Technology Unit 3 Deeside Point Zone 3 Deeside Industrial Park Deeside CH5 2UA P: +44 (0) 1244 833780 F: +44 (0) 1244 833781

W: www.element.com

Arcadis Consulting (UK) Limited 10 Medawar Road Surrey Research Park Guildford GU2 7AR diala TESTING 4225 Attention : Jon Raven Date : 24th January, 2023 Your reference : 10052912 Our reference : Test Report 23/751 Batch 1 Shell Sutton Elms Location : Date samples received : 19th January, 2023 Status : Final Report

Six samples were received for analysis on 19th January, 2023 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

1

Authorised By:

Paul Boden BSc Senior Project Manager

Please include all sections of this report if it is reproduced

Client Name:
Reference:
Location:
Contact:
EMT Job No:

Arcadis Consulting (UK) Limited 10052912 Shell Sutton Elms Jon Raven 23/751

### Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HN0<sub>3</sub>

EMT Sample No.	1-3	4-10	11-17	18-24	25-31	32-38					
Sample ID	EB	MW10118012 3WG1000	MW10418012 3WG1115	MW10518012 3WG1215	MW10618012 3WG1215	DUP					
Depth									Please se	e attached n	otes for all
COC No / misc										ations and a	
Containers	V G	VPG	VPG	VPG	VPG	VPG					
Sample Date	18/01/2023 09:00	18/01/2023 10:00	18/01/2023 11:15	18/01/2023 12:15	18/01/2023 13:15	<>					
Sample Type			Ground Water		Ground Water						
Batch Number	1	1	1	1	1	1			LOD/LOR	Units	Method No.
Date of Receipt	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023					
PAH MS	-0.4	-0.4	-0.4	sv	sv				-0.4		T144/D1400
Naphthalene <sup>#</sup> Acenaphthylene <sup>#</sup>	<0.1 <0.005	<0.1 <0.005	<0.1 <0.005	<0.1 <sup>sv</sup> <0.005 <sup>sv</sup>	2.4 <sup>sv</sup> <0.005 <sup>sv</sup>	2.2 <0.005			<0.1 <0.005	ug/l ug/l	TM4/PM30 TM4/PM30
Acenaphthylene #	< 0.005	< 0.005	< 0.005	<0.005 0.005 <sup>SV</sup>	<0.005 0.017 <sup>SV</sup>	0.018			<0.005	ug/l	TM4/PM30
Fluorene <sup>#</sup>	0.007	0.005	0.005	<0.005	0.017 0.013 <sup>SV</sup>	0.014			<0.005	ug/l	TM4/PM30
Phenanthrene <sup>#</sup>	0.006	< 0.005	0.005	0.007 <sup>SV</sup>	0.009 <sup>sv</sup>	0.011			< 0.005	ug/l	TM4/PM30
Anthracene #	<0.005	<0.005	0.008	0.013 <sup>SV</sup>	0.006 <sup>sv</sup>	0.010			<0.005	ug/l	TM4/PM30
Fluoranthene <sup>#</sup>	<0.005	0.005	0.015	0.029 <sup>SV</sup>	<0.005 <sup>SV</sup>	<0.005			<0.005	ug/l	TM4/PM30
Pyrene <sup>#</sup>	<0.005	0.007	0.031	0.034 <sup>sv</sup>	0.023 <sup>SV</sup>	<0.005			<0.005	ug/l	TM4/PM30
Benzo(a)anthracene <sup>#</sup>	<0.005	<0.005	0.016	0.018 <sup>SV</sup>	0.011 <sup>SV</sup>	0.018			<0.005	ug/l	TM4/PM30
Chrysene <sup>#</sup>	<0.005	<0.005	0.011	0.017 <sup>SV</sup>	0.008 <sup>sv</sup>	0.014			<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene#	<0.008	<0.008	0.008	0.024 <sup>SV</sup>	<0.008 <sup>SV</sup>	0.016			<0.008	ug/l	TM4/PM30
Benzo(a)pyrene <sup>#</sup>	<0.005	<0.005	<0.005	0.013 <sup>SV</sup>	<0.005 <sup>SV</sup>	<0.005			<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene#	< 0.005	< 0.005	< 0.005	0.009 <sup>SV</sup>	<0.005 <sup>SV</sup>	0.005			< 0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene <sup>#</sup>	<0.005 <0.005	<0.005 <0.005	< 0.005	<0.005 <sup>sv</sup> 0.007 <sup>sv</sup>	<0.005 <sup>SV</sup>	<0.005 0.005			<0.005	ug/l	TM4/PM30 TM4/PM30
Benzo(ghi)perylene <sup>#</sup> PAH 16 Total <sup>#</sup>	<0.003	<0.003	<0.005 <0.173	0.007	<0.005 <sup>SV</sup> 2.487	2.311			<0.005 <0.173	ug/l ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008	<0.008	<0.008	0.017	<0.008	0.012			<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008	<0.008	<0.008	<0.008	< 0.008			<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	92	88	90	64 <sup>sv</sup>	65 <sup>sv</sup>	86			<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM15/PM10
Benzene <sup>#</sup>	<0.5	<0.5	<0.5	<0.5	12.2	12.4			<0.5	ug/l	TM15/PM10
Toluene <sup>#</sup>	<5	<5	<5	<5	63	64			<5	ug/l	TM15/PM10
Ethylbenzene #	<1	<1	<1	<1	22	24			<1	ug/l	TM15/PM10
m/p-Xylene #	<2	<2	<2	<2	264	266			<2	ug/l	TM15/PM10
o-Xylene#	<1	<1	<1	<1	80	80			<1	ug/l	TM15/PM10
n-Hexane	-	<50	<50	<50	<50	<50			<50	ug/l	TM15/PM10 TM15/PM10
Surrogate Recovery Toluene D8 Surrogate Recovery 4-Bromofluorobenzene	106 98	104 97	106 96	109 95	104 95	107 99			<0 <0	%	TM15/PM10 TM15/PM10
5 , <u> </u>									Ŭ		
2-Methylnaphthalene <sup>#</sup>	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Surrogate Recovery 2-Fluorobiphenyl	119	112	108	113	117	118			<0	%	TM16/PM30
Surrogate Recovery p-Terphenyl-d14	117	115	113	119	120	120			<0	%	TM16/PM30
GRO (>C4-C8)#	<10	<10	<10	<10	437	440			<10	ug/l	TM36/PM12
GRO (>C8-C12)#	<10	<10	<10	33	772	761			<10	ug/l	TM36/PM12
GRO (>C4-C12) <sup>#</sup>	<10	<10	<10	33	1209	1201			<10	ug/l	TM36/PM12
	-10	-10	E00	1900	2040	2440			~10		
EPH (C8-C40) <sup>#</sup>	<10	<10	520	1860	3010	2440			<10	ug/l	TM5/PM30

Client Name:
Reference:
Location:
Contact:
EMT Job No:

Arcadis Consulting (UK) Limited 10052912 Shell Sutton Elms Jon Raven 23/751

### Report : Liquid

 $\label{eq:liquids} \mbox{ Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle H=H_2SO_4, Z=ZnAc, N=NaOH, HN=HN0_3$ 

							2 40	•		0	_		
EMT Sample No.	1-3	4-10	11-17	18-24	25-31	32-38							
Sample ID	ЕВ	MW10118012 3WG1000	MW10418012 3WG1115	MW10518012 3WG1215	MW10618012 3WG1215	DUP							
Depth											Please se	e attached n	otes for all
COC No / misc												ations and a	
Containers	V G	VPG	VPG	VPG	VPG	VPG							
Sample Date	18/01/2023 09:00	18/01/2023 10:00	18/01/2023 11:15	18/01/2023 12:15	18/01/2023 13:15	<>							
Sample Type	Equipment Blank	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	1	1	1	1	1	1						Units	Method
Date of Receipt	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023	19/01/2023					LOD/LOR	Units	No.
TPH CWG													
Aliphatics													
>C5-C6 #	-	<10	<10	<10	146	147					<10	ug/l	TM36/PM12
>C6-C8 <sup>#</sup>	-	<10	<10	<10	215	217					<10	ug/l	TM36/PM12
>C8-C10 <sup>#</sup>	-	<10	<10	<10	173	171					<10	ug/l	TM36/PM12
>C10-C12 <sup>#</sup>	-	<5	<5	<5	<5	<5					<5	ug/l	TM5/PM16/PM30
>C12-C16 <sup>#</sup>	-	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM16/PM30
>C16-C21 #	-	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM16/PM30
>C21-C35#	-	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-35 <sup>#</sup>	-	<10	<10	<10	534	535					<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics													
>C5-EC7#	-	<10	<10	<10	<10	<10					<10	ug/l	TM36/PM12
>EC7-EC8 #	-	<10	<10	<10	56	56					<10	ug/l	TM36/PM12
>EC8-EC10#	-	<10	<10	<10	353	348					<10	ug/l	TM36/PM12
>EC10-EC12#	-	<5	<5	<5	3501	3516					<5	ug/l	TM5/PM16/PM30 TM5/PM16/PM30
>EC12-EC16 <sup>#</sup>	-	<10	<10 <10	<10 <10	<10 <10	<10 <10					<10	ug/l	TM5/PM16/PM30
>EC16-EC21 <sup>#</sup> >EC21-EC35 <sup>#</sup>	-	<10 <10	<10	<10	<10	<10					<10 <10	ug/l ug/l	TM5/PM16/PM30
Total aromatics C5-35 <sup>#</sup>	-	<10	<10	<10	3910	3920					<10	ug/l	TM5/TM56/PM12/PM16/PM30
Total aliphatics and aromatics(C5-35)	-	<10	<10	<10	4444	4455					<10	ug/l	TM5/TM36/PM12/PM16/PM30
												-3.	
Ethyl Tert Butyl Ether (ETBE)#	<1	<1	<1	<1	<1	<1					<1	ug/l	TM83/PM10
Di isopropyl Ether (DIPE) <sup>#</sup>	<1	<1	<1	<1	<1	<1					<1	ug/l	TM83/PM10
Tert Butyl Alcohol (TBA)	<100	<100	<100	<100	<100	<100					<100	ug/l	TM83/PM10
Tert Amyl Methyl Ether (TAME) <sup>#</sup>	<1	<1	<1	<1	<1	<1					<1	ug/l	TM83/PM10
Ethanol	<100	<100	<100	<100	<100	<100					<100	ug/l	TM83/PM10
		1	I	1	I				1		I		i

Client Name: Arcadis Consulting (UK) Limited Reference: 10052912

Location: Shell Sutton Elms

**Contact:** Jon Raven

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
23/751	1	DUP		32-38	All analyses	No sampling date given

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

**Notification of Deviating Samples** 

Matrix : Liquid

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

**EMT Job No.:** 23/751

### SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at  $35^{\circ}C \pm 5^{\circ}C$  unless otherwise stated. Moisture content for CEN Leachate tests are dried at  $105^{\circ}C \pm 5^{\circ}C$ . Ash samples are dried at  $37^{\circ}C \pm 5^{\circ}C$ .

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCI (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

#### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

#### STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

### **DEVIATING SAMPLES**

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation. Laboratory records are kept for a period of no less than 6 years.

### **REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

#### **Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

### **Customer Provided Information**

Sample ID and depth is information provided by the customer.

### ABBREVIATIONS and ACRONYMS USED

ISO17025 (UKAS Ref No. 4225) accredited - UK.
ISO17025 (SANAS Ref No.T0729) accredited - South Africa
Indicates analyte found in associated method blank.
Dilution required.
MCERTS accredited.
Not applicable
No Asbestos Detected.
None Detected (usually refers to VOC and/SVOC TICs).
No Determination Possible
Calibrated against a single substance
Surrogate recovery outside performance criteria. This may be due to a matrix effect.
Results expressed on as received basis.
AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
Analysis subcontracted to an Element Materials Technology approved laboratory.
Samples are dried at 35°C ±5°C
Suspected carry over
Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
Matrix Effect
No Fibres Detected
AQC Sample
Blank Sample
Client Sample
Trip Blank Sample
Outside Calibration Range

### HWOL ACRONYMS AND OPERATORS USED

[	
HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/751

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co- elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			

EMT Job No: 23/751

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
ТМ83	Modified USEPA method 8260B v2:1996. Determination of Alcohols, Acetates, Acetone, Fuel Oxygenates, THF and Cyclohexane by Headspace GC-MS	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.				
ТМ83	Modified USEPA method 8260B v2:1996. Determination of Alcohols, Acetates, Acetone, Fuel Oxygenates, THF and Cyclohexane by Headspace GC-MS	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			

# **APPENDIX G**

**Arcadis GAC Derivation** 

#### SUMMARY

The purpose of this document is to describe the general principles adopted in the derivation of the Arcadis' Generic Assessment Criteria (GAC). The document and associated GAC underpins the generic quantitative risk assessments Arcadis undertakes for its clients and is not intended for any other use or use by others. Guidance has been provided by the EA to aid development of GAC which are appropriate for a typical England or Wales site, incorporating conservatism where warranted. Arcadis has used the EA guidance to develop in-house GAC to aid assessment of land contamination sites, and in particular to assess risks to human health receptors from chronic health effects and risks to water resource receptors. The GAC do not consider potential risks to ecological receptors, which may need to be assessed on specific sites. The following non-statutory technical guidance has been referred to in deriving the GAC.

- EA Science Reports SC050021/SR2, SC050021/SR3 and SC050021/SR7.
- Related Toxicity and Soil Guideline Value reports
- EA Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination
- EA. Groundwater Protection and Water Quality, March 2017 (accessible online https://www.gov.uk/government/collections/groundwater-protection)
- SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination

The GAC used within this report have been derived for "continued petroleum end use". Based on the typical use and design of these sites, with buildings and/or hard standing present across the majority of the site, direct exposure to shallow soils is not considered active. A building typical of a petrol filling station shop (represented by the size of a bungalow) is adopted in the derivation of the GAC. A neighbouring resident is assumed present, comprising a small terraced house without basement.

Arcadis has undertaken environmental works on hundreds of potentially contaminated sites across the UK. The typical shallow geology encountered comprises granular soils or made ground, with a low organic matter content. As such, Arcadis has taken the decision to derive in-house GAC for a *sand* rather than sandy loam soil-type used by the EA to derive Soil Guideline Values, with an organic matter content of 0.34% (fraction of organic carbon content 0.002, typical of many sites).

To derive Human Health GAC (HH-GAC), the following exposure pathways are considered active for potential soil, groundwater or soil gas exposures:

Site End-Use	On-Site Pathways
Continued petroleum use	<ul> <li>Inhalation of vapours outside from a soil or groundwater source</li> <li>Inhalation of vapours inside from a soil, groundwater or soil gas source</li> </ul>
Neighbouring resident	<ul> <li>Inhalation of vapours inside from a soil gas source (assumed that the neighbouring residential property directly overlies the soil gas source); and,</li> <li>Migration of impacted groundwater beneath neighbouring property, and subsequently:         <ul> <li>Inhalation of indoor air in an off-site property (originating from an on-site soil or groundwater source)</li> <li>Inhalation of outdoor air in an off-site garden (originating from an on-site soil or groundwater source)</li> </ul> </li> </ul>

Two levels of water quality standard have been considered to enable Water Resource GAC (WR-GAC) to be developed depending on the environmental setting of a site. The WR-GAC have been derived based on adopted Environmental Quality Standards and Drinking Water Standards. No attenuation with transport off-site is assumed.

The following modelling tools have been utilised in the derivation of the GAC:

HH-GAC (on-site):	CLEA 1.07 and RBCA Toolkit v2.6
HH-GAC (off-site):	CLEA 1.07, RBCA Toolkit v2.6 and Remedial
	Targets Worksheet v3.2
WR-GAC:	Remedial Targets Worksheet v3.2

Selected model inputs and outputs are presented in the following tables.



	Air-water part	ition co-efficient	Diffusion co	o-efficient in air	Diffusion co-effici	ent in water	Relative molecular mass		Vapour pres	ssure	Water solubility		Koc	
	cm3 cm3	Notes	m2 s-1	Notes	m2 s-1	Notes	g mol-1	Notes	Pa	Notes	mg L-1	Notes	Log (dimensio	Notes
Benzene	1.16E-01	Science Report – SC050021/SR7	8.77E-06	Science Report – SC050021/SR7	6.64E-10	Science Report – SC050021/SR7	78.11	Science Report – SC050021/SR7	6.24E+03	Science Report – SC050021/SR7	1.78E+03	Science Report – SC050021/SR7	1.83E+00	Science Report – SC050021/SR7
Toluene	1.15E-01	Science Report – SC050021/SR7	7.78E-06	Science Report – SC050021/SR7	5.88E-10	Science Report – SC050021/SR7	92.14	Science Report – SC050021/SR7	1.73E+03	Science Report – SC050021/SR7	5.90E+02	Science Report – SC050021/SR7	2.31E+00	Science Report – SC050021/SR7
Ethylbenzene	1.39E-01	Science Report – SC050021/SR7	7.04E-06	Science Report – SC050021/SR7	5.31E-10	Science Report – SC050021/SR7	106.17	Science Report – SC050021/SR7	5.53E+02	Science Report – SC050021/SR7	1.80E+02	Science Report – SC050021/SR7	2.65E+00	Science Report – SC050021/SR7
Sum xylenes	1.04E-01	Average for three xylenes	7.03E-06	Average for three xylenes	5.3E-10	Average for three xylenes	106.17	Average for three xylenes	4.52E+02	Average for three xylenes	1.91E+02	Average for three xylenes	2.66E+00	Average for three xylenes
МТВЕ	2.04E-02	Literature review	7.10E-06	Literature review	9.00E-10	Literature review	88.17	Literature review	3.45E+04	Literature review	4.80E+04	Literature review	1.08E+00	Literature review
Aliphatic >C5-6	3.40E+01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	81	Literature review	3.60E+04	Literature review	3.60E+01	Literature review	2.90E+00	Literature review
Aliphatic>C6-8	5.10E+01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	100	Literature review	6.40E+03	Literature review	5.40E+00	Literature review	3.60E+00	Literature review
Aliphatic>C8-10	8.20E+01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	130	Literature review	6.40E+02	Literature review	4.30E-01	Literature review	4.51E+00	Literature review
Aliphatic>C10-12	1.30E+02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	160	Literature review	6.50E+01	Literature review	3.40E-02	Literature review	5.40E+00	Literature review
Aliphatic>C12-16	5.40E+02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	200	Literature review	4.80E+00	Literature review	7.60E-04	Literature review	6.70E+00	Literature review
Aliphatic>C16-35	6.40E+03	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	270	Literature review	7.70E-01	Literature review	1.30E-06	Literature review	9.00E+00	Literature review
Aromatic >C8-10	4.90E-01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	120	Literature review	6.40E+02	Literature review	6.50E+01	Literature review	3.20E+00	Literature review
Aromatic >C10-12	1.40E-01	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	130	Literature review	6.40E+01	Literature review	2.50E+01	Literature review	3.40E+00	Literature review
Aromatic >C12-16	5.40E-02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	150	Literature review	4.80E+00	Literature review	5.80E+00	Literature review	3.70E+00	Literature review
Aromatic >C16-21	1.30E-02	TPHCWG	1.00E-05	Literature review	0.000000001	Literature review	190	Literature review	7.70E-01	Literature review	5.10E-01	Literature review	4.20E+00	Literature review
Aromatic >C21-35	6.80E-04	TPHCWG	1.00E-05	Literature review	0.00000001	Literature review	240	Literature review	4.40E-04	Literature review	6.60E-03	Literature review	5.11E+00	Literature review



			-	Oral	HCV				-	Inhalatio	on HCV			()	Oral MDI fo	r adults	Inhalation MD	I for adults
Chemical Name	Chemical Type	Type	µg kg-1 BW day-1	Notes	Oral exposure	Dermal exposure	Inhalation exposure	Type	µg kg-1 BW day-1	Notes	Oral exposure	Dermal exposure	Inhalation exposure	Combine oral and inhalation AC	µg kg-1 ВW day-1	Notes	1-vab VVB 1-99 pu	tes
Benzene	organic	ID	2.90E-01	UK TOX (March 2009)	Yes	Yes	No	ID	1.40E+00	UK TOX (March 2009)	No	No	Yes	Yes	NR	NA	NR	NA
Toluene	organic	TDI	2.23E+02	UK TOX (March 2009)	Yes	Yes	No	TDI	1.40E+03	UK TOX (March 2009)	No	No	Yes	Yes	1.00E+01	UK TOX (March 2009)	5.20E+02	UK TOX (March 2009)
Ethylbenzene	organic	TDI	1.00E+02	UK TOX (March 2009)	Yes	Yes	No	TDI	7.43E+01	Literature review	No	No	Yes	Yes	5.00E+00	UK TOX (March 2009)	1.30E+02	UK TOX (March 2009)
Sum xylenes	organic	TDI	1.80E+02	UK TOX (March 2009)	Yes	Yes	No	TDI	6.00E+01	UK TOX (March 2009)	No	No	Yes	Yes	1.10E+01	UK TOX (March 2009)	1.40E+02	UK TOX (March 2009)
МТВЕ	organic	TDI	8.60E+02	Literature review	Yes	Yes	No	TDI	8.60E+02	Literature review	No	No	Yes	Yes	3.00E+01	EU Risk Assessment Report	1.89E+02	EU Risk Assessment Report
Aliphatic >C5-6	organic	TDI	5.00E+03	TPHCWG	Yes	Yes	No	TDI	5.26E+03	TPHCWG	No	No	Yes	Yes	3.50E+05	TDI x 70kg (MDI unknown)	3.68E+05	TDI x 70kg (MDI unknown)
Aliphatic>C6-8	organic	TDI	5.00E+03	TPHCWG	Yes	Yes	No	TDI	5.26E+03	TPHCWG	No	No	Yes	Yes	3.50E+05	TDI x 70kg (MDI unknown)	3.68E+05	TDI x 70kg (MDI unknown)
Aliphatic>C8-10	organic	TDI	1.00E+02	TPHCWG	Yes	Yes	No	TDI	2.70E+02	TPHCWG	No	No	Yes	Yes	7.00E+03	TDI x 70kg (MDI unknown)	1.89E+04	TDI x 70kg (MDI unknown)
Aliphatic>C10-12	organic	TDI	1.00E+02	TPHCWG	Yes	Yes	No	TDI	2.70E+02	TPHCWG	No	No	Yes	Yes	7.00E+03	TDI x 70kg (MDI unknown)	1.89E+04	TDI x 70kg (MDI unknown)
Aliphatic>C12-16	organic	TDI	1.00E+02	TPHCWG	Yes	Yes	No	TDI	2.70E+02	TPHCWG	No	No	Yes	Yes	7.00E+03	TDI x 70kg (MDI unknown)	1.89E+04	(MDI
Aliphatic>C16-35	organic	TDI	2.00E+03	TPHCWG	Yes	Yes	No	NR			NR	NR	NR	NR	1.40E+05	TDI x 70kg (MDI unknown)		
Aromatic >C8-10	organic	TDI	4.00E+01	TPHCWG	Yes	Yes	No	TDI	5.50E+01	TPHCWG	No	No	Yes	Yes	2.80E+03	TDI x 70kg (MDI unknown)	3.85E+03	TDI x 70kg (MDI unknown)
Aromatic >C10-12	organic	TDI	4.00E+01	TPHCWG	Yes	Yes	No	TDI	5.50E+01	TPHCWG	No	No	Yes	Yes	2.80E+03	TDI x 70kg (MDI unknown)	3.85E+03	TDI x 70kg (MDI unknown)
Aromatic >C12-16	organic	TDI	4.00E+01	TPHCWG	Yes	Yes	No	TDI	5.50E+01	TPHCWG	No	No	Yes	Yes	2.80E+03	TDI x 70kg (MDI unknown)	3.85E+03	TDI x 70kg (MDI unknown)
Aromatic >C16-21	organic	TDI	3.00E+01	TPHCWG	Yes	Yes	No	NR			NR	NR	NR	NR	2.10E+03	TDI x 70kg (MDI unknown)		
Aromatic >C21-35	organic	TDI	3.00E+01	TPHCWG	Yes	Yes	No	NR			NR	NR	NR	NR	2.10E+03	TDI x 70kg (MDI unknown)		



PHYSICAL PROPERTIES			
		Commercial Land Use	Source
Soil type	na	Sand	Professional experience
Porosity (total)	cm3 cm-3	0.54	SC050021/SR3
Porosity (air-filled)*	cm3 cm-3	0.30	SC050021/SR3
Porosity (water-filled)*	cm3 cm-3	0.24	SC050021/SR3
Capillary fringe porosity (air-filled)	cm3 cm-3	0.01	Literature value
Capillary fringe porosity (water-filled)	cm3 cm-3	0.53	Literature value
Thickness of capillary fringe	m	0.1	Literature value
Residual soil water content	cm3 cm-3	0.07	SC050021/SR3
Saturated hydraulic conductivity	cm s-1	7.36E-03	SC050021/SR3
van Genuchten shape parameter	dimensionless	3.51E-01	SC050021/SR3
Bulk density	g cm-3	1.18	SC050021/SR3
Soil organic matter content	%	0.34	Professional experience
Threshold value of wind speed at 10m	m s-1	7.20	SC050021/SR3
Ambient soil temperature	K	283	SC050021/SR3
Mean annual windspeed (10m)	m s-1	5.00	SC050021/SR3
Fraction of site with hard or vegetative cover	m2 m-2	1.00	Conceptual Site Model
Depth to groundwater (RBCA)	m	1	Assumption
Infiltration rate in vadose zone	m day-1	6.80E-04	Likely worst-case
A must for a famo a state			
Aquifer type**	na	Sand	Assumption
Source width	m	40	Likely worst-case
Source length	m	40	Likely worst-case
Saturated aquifer thickness	m	10	Assumption
Mixing zone depth	m	5.5	Calculated in RTW
Hydraulic conductivity	m day-1	20	Literature value
Hydraulic gradient	m m-1	0.001	Typical value for sand
Aquifer soil organic matter content	%	0.34	Professional experience
Effective Porosity (total)**	cm3 cm-3	0.3	Literature value
Aquifer bulk density**	g cm-3	1.18	SC050021/SR3
Distance to neighbouring resident**	m	5	Likely worst-case

Notes:

\* Assumed to be present in foundation cracks when modelling in RBCA Toolkit

\*\* Only used to generate GAC for neighbouring residents through off-site migration of impact in groundwater

For the purpose of assessing the risk to on-Site commercial workers from impacts in soil it is assumed that the soil source is present 50cm below the grounds surface (based on the typical minimum depth of petroleum infrastructure beneath the ground). For soil gas it is assumed that the source is present 20cm beneath the grounds surface (in relation to both on-Site commercial worker and off-Site residents).



### **BUILDING PROPERTIES**

BUILDING PROPERTIES				
		Neighbouring Residential	Continued Petroleum Use	Source
Building footprint	m2	2.80E+01	7.80E+01	SC050021/SR3
Living space air exchange rate	hr-1	0.50	1.00	SC050021/SR3
Living space height (above ground)	m	4.8	2.4	SC050021/SR3
Living space height (below ground)	m	0.0	0.0	SC050021/SR3
Pressure difference	Pa	3.1	2.6	SC050021/SR3
Foundation thickness	m	1.50E-01	1.50E-01	SC050021/SR3
Floor crack area	cm2	4.23E+02	7.07E+02	SC050021/SR3

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### Notes:

Petrol filling station shop modelled as a bungalow, with increased ventilation

CLEA 1.07 EXPOSURE DATA	Age Class									
				Commercial Worker						
Age class	-	1	2	3	4	5	6	17		
Frequency of inhalation (dust and vapour indoors)	days yr-1	365	365	365	365	365	365	230		
Frequency of inhalation (dust and vapour outdoors)	days yr-1	365	365	365	365	365	365	170		
Occupancy period (indoors)	hr day-1	23	23	23	23	19	19	8.3		
Occupancy period (outdoors)	hr day-1	1	1	1	1	1	1	0.7		
Body weight	kg	5.6	9.8	12.7	15.1	16.9	19.7	70		
Body height	m	0.7	0.8	0.9	0.9	1	1.1	1.6		
Inhalation rate*	m3 day-1	5.4	8	8.9	10.1	10.1	10.1	15.7		

\* Inhalation rate adopted from Category 4 Screening Levels



RBCA Toolkit EXPOSURE DATA	Age Class				
		0-6	17		
Averaging time	yrs	6	49		
Body weight	kg	13.3	70		
Exposure duration	yrs	6	49		
Averaging time (vapour flux)	yrs	6	49		
Exposure frequency (indoors)*	days yr-1	365	29.9		
Exposure frequency (outdoors)*	days yr-1	16.8	1.87		

### Notes:

Time-weighted average used for 0-6 year old female child

\* RBCA Toolkit compares an acceptable air concentration to a predicted air concentration. Only the exposure frequency can be modified (i.e. inhalation rate, time exposed cannot). As such, the TDSI (or ID) was converted to an acceptable indoor air concentration using the time-weighted properties for a 0-6 year old female child as defined within the Category 4 Screening Levels. The exposure frequency for other scenarios was modified to account for the differing exposure scenarios for the remaining pathways, to be equivalent to modifying the inhalation rate and time exposed.



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STEP	5: RESULTS	Find AC	Print Rep	orts Back to	Guide											
		Ratio of ADE	to relevant Health	Criteria Value	Soil	Assessment Cr	riteria	SAC Flag	Soil Saturation Limit					Pathway C	ontributions (9	%)
		oral HCV	inhal HCV	Combined	oral HCV	inhal HCV	Combined	Current SAC used for determining pathway contributions		direct soil ingestion	sum of consumption of homegrown produce and attached soil	dermal contact (indoor)	dermal contact (outdoor)	inhalation of dust (indoor)	inhalation of dust (outdoor)	inhalation of vapour (indoor
Number	Chemical	(dimensionless	(dimensionless)	(dimensionless)	ma ka <sup>-1</sup>	ma ka <sup>-1</sup>	mg kg <sup>-1</sup>	(unitless)	mg kg <sup>-1</sup>	%	%	%	%	%	%	%
1	Benzene	0.00	1.00	1.00	NR	1.50E+00	1.50E+00	Combined	6.52E+02	0.00	0.00	0.00	0.00	0.00	0.00	99.96
2	Toluene	0.00	1.00	1.00	NR	2.75E+03	2.75E+03	Combined	3.74E+02	0.00	0.00	0.00	0.00	0.00	0.00	99.86
3	Ethylbenzene	0.00	1.00	1.00	NR	2.21E+02	2.21E+02	Combined	2.01E+02	0.00	0.00	0.00	0.00	0.00	0.00	99.59
4	Sum xylenes	0.00	1.00	1.00	NR	2.36E+02	2.36E+02	Combined	2.16E+02	0.00	0.00	0.00	0.00	0.00	0.00	97.46
5	MTBE	0.00	1.00	1.00	NR	3.60E+02	3.60E+02	Combined	1.11E+04	0.00	0.00	0.00	0.00	0.00	0.00	99.68
6	ETBE	0.00	1.00	1.00	NR	1.58E+01	1.58E+01	Combined	3.50E+03	0.00	0.00	0.00	0.00	0.00	0.00	100.00
7	ТВА	0.00	1.00	1.00	NR	3.70E+03	3.70E+03	Combined	2.35E+05	0.00	0.00	0.00	0.00	0.00	0.00	99.92
8	All-1-1-1-05-05	0.00	1.00	1.00	ND	2 645.02	2.045.02	Overhieved	0.755.00	0.00	0.00		0.00	0.00		10.00
9 10	Aliphatic >C5-C6 Aliphatic >C6-C8	0.00	1.00	1.00	NR	2.61E+02 3.51E+02	2.61E+02 3.51E+02	Combined	3.75E+02 1.12E+02	0.00	0.00	0.00	0.00	0.00	0.00	49.99 49.99
10	Aliphatic >C8-C10	0.00	1.00	1.00	NR	4.53E+02	3.51E+02 4.53E+01	Combined Combined	3.65E+01	0.00	0.00	0.00	0.00	0.00	0.00	49.99
12	Aliphatic >C10-C12	0.00	1.00	1.00	NR	4.53E+01	4.53E+01 1.78E+02	Combined	1.80E+01	0.00	0.00	0.00	0.00	0.00	0.00	49.99
13	Aliphatic >C12-C16	0.00	1.00	1.00	NR	8.12E+02	8.12E+02	Combined	7.57E+00	0.00	0.00	0.00	0.00	0.00	0.00	49.96
14	Aliphatic >C16-C35	0.00	NR	NR	NR	NR	NR	Combined	2.57E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	Aromatic >EC5-EC7	0.00	1.00	1.00	NR	3.24E+01	3.24E+01	Combined	7.53E+02	0.00	0.00	0.00	0.00	0.00	0.00	49.99
16	Aromatic >EC7-EC8	0.00	1.00	1.00	NR	5.07E+01	5.07E+01	Combined	3.99E+02	0.00	0.00	0.00	0.00	0.00	0.00	49.98
17	Aromatic >EC8-EC10	0.00	1.00	1.00	NR	6.28E+01	6.28E+01	Combined	2.24E+02	0.00	0.00	0.00	0.00	0.00	0.00	49.97
18	Aromatic >EC10-EC12	0.00	1.00	1.00	NR	3.30E+02	3.30E+02	Combined	1.30E+02	0.00	0.00	0.00	0.00	0.00	0.00	49.94
19	Aromatic >EC12-EC16	0.00	1.00	1.00	NR	1.66E+03	1.66E+03	Combined	5.72E+01	0.00	0.00	0.00	0.00	0.00	0.00	49.86
20	Aromatic >EC16-EC21	0.00	NR	NR	NR	NR	NR		1.60E+01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Aromatic >EC21-EC35	0.00	NR	NR	NR	NR	NR		1.68E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22																
23																
24 25	l		+								<u>+</u>				+	+
25																+
20												+				+
28											+	+			+	+
			+								+	+			+	+
29																



# **APPENDIX H**

Arcadis GACs for CPU



ARCADIS	GENERIC ASSES		OR GROUNDWATER	
	- CONTINU	JED PETROLEUM US	E	
	Human He	alth - CPU	Water Res	sources
Compound	Petrol Filling Station	Neighbouring	Surface Waters	Aquifers
	Worker	Resident		
	µg/l	µg/l	μg/l	µg/l
enzene	1.20E+04	1010	10	1
oluene	>SOL	>SOL	74	700
hylbenzene	>SOL	5.87E+04	20	300
lenes	>SOL	4.99E+04	30	500
TBE	5.20E+06	4.00E+05	15	15
TBE 3A	4.60E+05 2.00E+07	3.80E+04 1.38E+06	47 12	47
	2.002107	1.502100	12	12
iphatic >C5-6	>SOL	>SOL	#	#
iphatic >C6-8	>SOL	>SOL	#	#
iphatic >C8-10	>SOL	>SOL	#	#
iphatic >C10-12	>SOL	>SOL	#	#
iphatic >C12-16	>SOL	>SOL	#	#
iphatic >C16-35	NR 1 20E+04	NR 1010	# 10	#
romatic >C5-C7 (as benzene) romatic >C7-C8 (as toluene)	1.20E+04 >SOL	>SOL	74	700
omatic >C8-10	>SOL	1.15E+04	#	#
romatic >C10-12	>SOL	9490	#	#
romatic >C12-16	>SOL	>SOL	#	#
romatic >C16-21	NR	NR	#	#
romatic >C21-35	NR	NR	#	#
РН	na	na	10	10
an bib al an a	2001	4440	0	
aphthalene	>SOL >SOL	4110 >SOL	2	2
cenaphthylene cenaphthene	>SOL	>SOL	-	-
uorene	>SOL	>SOL	-	-
henanthrene	>SOL	>SOL	-	
nthracene	>SOL	>SOL	-	-
uoranthene	>SOL	>SOL	-	-
yrene	>SOL	>SOL	-	-
enzo(a)anthracene	>SOL	>SOL	-	-
nrysene	>SOL	>SOL	-	-
enzo(b)fluoranthene	>SOL	>SOL	-	0.025
enzo(k)fluoranthene	>SOL	>SOL	-	0.025
enzo(a)pyrene	>SOL >SOL	>SOL >SOL	0.00017	0.01
deno(123cd)pyrene ibenzo(ah)anthracene	>SOL	>SOL		0.025
enzo(ghi)perylene	>SOL	>SOL	-	0.025
onizo(grin)por yiono				0.020
ichloroethane (1,1)	3.70E+05	3.33E+04	2.7	2.7
ichloroethane (1,2)	820	69.8	10	3
richloroethane (111)	>SOL	2.97E+05	100	2000
ichloroethene (1,1)	1.70E+05	1.42E+04	7	140
ichloroethene (cis 1,2)	2.70E+04	2240	25 <sup>3</sup>	25 <sup>3</sup>
ichloroethene (trans 1,2)	9.50E+04	7220	25 <sup>3</sup>	25 <sup>3</sup>
richloroethene	3200	274	5 <sup>3</sup>	5 <sup>3</sup>
etrachloroethene	3.30E+04	2840	5 <sup>3</sup>	5 <sup>3</sup>
hloroform (Trichloromethane)	1.90E+05	1.54E+04	2.5	100 4
inyl Chloride (chloroethene)	1200	108	0.5	0.5
hlorobenzene	2.90E+04	2850	100	100
henol	2.50E+07	1.42E+06	7.7	7.7
	10.00	10.00	50	
rsenic (inorganic)	NVP	NVP	50	10
arium oron	NVP NVP	NVP NVP	700 2000	700
admium	NVP	NVP	0.08 - 0.25	5
nromium (as VI)	NVP	NVP	3.4	
nromium (as III)	NVP	NVP	4.7	50
opper	NVP	NVP	1 <sup>1</sup>	2000
ad	NVP	NVP	1.2 <sup>1</sup>	10
ercury (inorganic)	NVP	NVP		
ercury (elemental)	>SOL	9.7	0.07	1
ercury (methylated)	>SOL	1.90E+04		
olybdenum	NVP	NVP	70	70
ickel	NVP	NVP	4 <sup>1</sup>	20
elenium	NVP	NVP	10	10
inc	NVP	NVP	12.1 <sup>1,2</sup>	3000

Notes:	
>SOL	Target acceptable risk not exceeded at theoretical solubility concentration
NR	No appropriate inhalation reference dose identified during review of toxicological data
#	No GAC for individual TPH fractions given that the compliance criteria is for sum TPH
na	Comprises multiple contaminants - no GAC derived
-	No water quality standard identified as suitable for deriving generic assessment criteria
NVP	Contaminant has only a low vapour pressure in groundwater
	Bioavailable fraction. The fraction of the dissolved concentration likely to
	result in toxic effects as determined using the UKTAG Metal Bioavailability Assessment Tool
1	(also
2	Adjusted to account for background concentrations

Adjusted to account for background concentrations Based on values of 10µg/l combined for TCE and PCE and 50µg/l combined for cis-DCE and trans-DCE Total value for trihalomethanes (chloroform, bromoform, dibromochloromethane and bromodichloromethane).

# **ARCADIS**

	CONTI	NUED PETROLEUM U	SE -			
Commonweak	Theoratical Soil	Petrol Filling Station		Water Resources		
Compound	Saturation Limit	Worker - Inhalation	Neighbouring Resident	Waters	Aquifers	
		mg/kg	mg/kg	mg/kg	mg/kg	
enzene	652	1.5	1.84	0.019	0.0019	
bluene	374	2750	ND	0.24	2.3	
hylbenzene	201	221	ND	0.11	1.7	
lenes	216	236	ND	0.17	2.9	
TBE	1.11E+04	360	467	0.018	0.018	
ſBE	3500	15.8	55.9	0.07	0.07	
3A	2.35E+05	3700	1600	0.014	0.014	
phatic >C5-6	375	261	ND	#	#	
iphatic >C6-8	112	351	ND	#	#	
phatic >C8-10	36.5	45.3	ND	#	#	
phatic >C10-12	18	178	ND	#	#	
phatic >C12-16	7.57	812	ND	#	#	
phatic >C16-35	2.57	NR	NR	#	#	
omatic >C5-C7 (as benzene)	652	1.5	1.84	0.019	0.0019	
omatic >C7-C8 (as toluene)	374	2750	ND	0.24	2.3	
omatic >C8-10	224	62.8	ND	#	#	
omatic >C10-12	130	330	ND	#	#	
omatic >C12-16	57.2	1660	ND	#	#	
omatic >C16-21	16	NR	NR	#	#	
omatic >C21-35	1.68	NR	NR	#	#	
Ч	na	na	na	see Soil Asses	sment foot	
aphthalene	28.1	69.7	ND	0.015	0.015	
cenaphthylene	72.7	3.45E+04	ND	-	0.013	
cenaphthene	15.6	2.16E+04	ND			
Jorene	12	4.30E+04	ND	-	-	
ienanthrene	4.83	6120	ND			
thracene	0.706	1.43E+06	ND	-	-	
Joranthene	6.46	2.47E+05	ND	-	-	
rene	0.75	5.79E+05	ND	-	-	
nzo(a)anthracene	0.582	223	ND	-	-	
nrysene	0.15	1970	ND	-	-	
enzo(b)fluoranthene	0.413	611	ND	-	0.026	
enzo(k)fluoranthene	0.234	2.38E+04	ND	-	0.037	
enzo(a)pyrene	0.31	632	ND	0.0002	0.013	
deno(123cd)pyrene	0.0209	5940	ND	-	0.022	
benzo(ah)anthracene	0.00134	40.8	ND	-	-	
enzo(ghi)perylene	0.00634	1.36E+05	ND	-	0.105	
ablancethans (1.1)	1500	0.02	E0.6	0.0042	0.0042	
chloroethane (1,1)	1580	9.02	50.6	0.0042	0.0042	
chloroethane (1,2)	2160	0.0429 32.7	0.0861 ND	0.013	0.0038	
ichloroethane (111) chloroethene (1,1)	1310	1.28	37.7	0.28	0.372	
chloroethene (1,1) chloroethene (cis 1,2)	1310	0.682	37.7	0.02	0.372	
chloroethene (trans 1,2)	2040	10.1	11.9	0.041	0.041	
ichloroethene	724	0.057	0.73	0.041	0.041	
trachloroethene	183	0.775	11.7	0.013	0.013	
loroform (Trichloromethane)	2880	5.55	25	0.0041	0.16	
nyl Chloride (chloroethene)	1180	0.00536	0.227	0.0011	0.0011	
lorobenzene	279	2.24	10.1	0.37	0.37	
ienol	2.02E+04	9870	2570	0.014	0.014	
senic (inorganic)	NVP	NVP	NVP			
irium	NVP	NVP	NVP			
pron	NVP	NVP	NVP			
idmium	NVP	NVP	NVP			
iromium (as VI)	NVP	NVP	NVP			
nromium (as III)	NVP	NVP	NVP			
opper	NVP NVP	NVP	NVP			
ad arcury (inorganic)		NVP	NVP			
ercury (inorganic)	NVP 1.47	0.567	NVP 1.43			
ercury (elemental) ercury (methylated)	36	165	34.7			
blybdenum	NVP	NVP	NVP			
ckel	NVP	NVP	NVP			
elenium	NVP	NVP	NVP			
nc	NVP	NVP	NVP			

 For benzo(ghi)perylene, calculated GAC is 1.4E+08 mg/kg. The theoretical maximum concentration of 1.0E+06 mg/kg presented as GAC

 Italics
 Target exceeds theoretical soil saturation limit. Concentrations above the soil saturation limit may
 indicate the presence of separate phase in soil, but does not necessarily present a significant risk

 NR
 No appropriate inhalation reference dose identified during review of toxicological data

 #
 No GAC for individual TPH fractions given that the compliance criteria is for sum TPH

 na
 Comprises multiple contaminants - no GAC derived

 No water quality standard identified as uitable for deriving generic assessment criteria

 NVP
 Contaminant has only a low vapour pressure in soil

 ND
 Results of modelling indicates pathway not considered to present a significant risk

 Soil Assessment: Potential risk to
 Where supported by the CSM, the risk to water resource receptors is generally best assessed via

water resources

Where supported by the CSM, the risk to water resource receptors is generally best assessed via groundwater, or alternatively leachate. However, in the absence of suitable groundwater or leachate data, soil data is used. For TPH in soil no criteria are present for water resources (see #). TPH concentrations measured above the laboratory MDL indicate the need for further consideration and could present a potential risk to water resource receptors.

# APPENDIX I

Waste Transfer Notes

Job no. CON	S/22304	<b>D</b>		and the second	1	A	cum	lei
PRODUCER'S/HOL	DERISICONSIGNO	Booking Re	ef L2	212094		١	Vaste Se	ervic
PRODUCER'S/HOL Part A Notification	Details	R S/CARRIE	R'S/CONSI	GNEE'S C	<b>OPY</b> (Please	delete as app	ropriate)	
1. Consignment Note Con			and a card					12.000
2. The waste described b	elow is to be served of	ARCADI/22304		4. The wa	iste will be take	en to (name ar	Idress and no	at and at
postcode, telephone, e	-mail facsimile)	m (name, addres	SS					sicodej
ARCADIS LLP	man recommer			Stamford	hants Resource	e Manageme	nt Facility	
Shell Sutton Elms				Kings Clif				
Coventry Road				Peterboro	ugh			
Broughton Astley LE9 60	D			PE8 6XX				
				5. The was	ste producer wa	as (if different t	from A2)(name	, addre
3. Premises Code (Where	applicable)	ARCADI		As A2	elephone, e-ma	ail, facsimile)		
PART B Description	of the waste			AS AZ				
Coordination	or the waste	and constraints from a		lf	continuation	sheet used	tick here:	
1. The process giving rise to the waste(s) was:			Demolition			continuation sheet used, tick here:		
						2. SIC	for process:	43.
3. WASTE DETAILS (where	more than one waste type is colle	cled all of the information	stion given below a	nust be completed	for each EWC iden	liifadi	100 00000	
Description of waste	Components /		Color-	Container				
Subsoils with possible	Concentrations (%)	Weight (kg)	Quantity	size	Physical form	Hazardous	EWC	ID
Heavy Metals	n/a	4000						
contamination		4000	1	4yrd Skip	Solid	HP10, HP14	17 05 03*	Colle
he information given belo	w is to be completed to	Lanah Dura Li						
	to be completed to	reach EWC ide	ntified					
EWC Code UN No.	Pro	per Shipping N	lame		Class		Tunnel	
17 05 03° n/a	WASTE NON DAM				Class	PG	Code	EAG
APPROA			NUAD CARR	IAGE	n/a	n/a	n/a	n/a
a schedule of carriers is a certify that I today collected dB3 are correct and I h quirements Carrier's name behalf of (name, address, p	ttached tick here the consignment and that have been advised of a R <sub>1</sub> i3.54	iny specific har	2, A4 of exem waste is 1 confirm Re	Inat the inform pt and was add packaged and a that I have ful igulation 12 of	onSignor's lation in A, B an vised of the app labelled correc special handl ifilled my duty to the Waste (Eng	certificate d C is correct, i ropriate precau dy and the carr ing requiremen	that the carner tionary measur ier has been ac ts.	is registi es. All o Ivised of
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