**Client Name:** RSK Group Plc
**Reference:** 1922098
**Location:** Shell Welwyn Garden
**Contact:** Johanna Houlahan

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Analysis | Reason |
|---|---|---|---|---|---|---|
| No deviating sample report results for job 22/2011 | | | | | | |

**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.**

***EMT Job No.:*** 22/2011

**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°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°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 HCl (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. |
| SA | ISO17025 (SANAS Ref No.T0729) accredited - South Africa |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | 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 |
| CO | 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 |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |

**EMT Job No:** 22/2011

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM68 | Modified TO-15 method. Volatile Organic Compounds (VOCs) sampled using Gas Canisters, BottleVacs or Tedlar bags and analysed using Entech GC-MS. | PM0 | No preparation is required. | | | | |
| TM68 | Modified TO-15 method. Volatile Organic Compounds (VOCs) sampled using Gas Canisters, BottleVacs or Tedlar bags and analysed using Entech GC-MS. | PM0 | No preparation is required. | Yes | | | |
| TM69 | Analysis of gas samples by direct injection onto a Gas Chromatography (GC) column and analysed using a Flame Ionisation Detector (FID) or a Thermocouple Detector (TD) | PM0 | No preparation is required. | | | | |

Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

# FINAL ANALYTICAL TEST REPORT

## SUPPLEMENT TO TEST REPORT 22/00840/1

**Amendments:** Request to change samples ID

| | | |
|---|---|---|
| **Envirolab Job Number:** | 22/00840 | |
| **Issue Number:** | 2 | **Date:** 22 March, 2022 |

| | |
|---|---|
| **Client:** | RSK Environment Ltd Hemel<br>18 Frogmore Road<br>Hemel Hempstead<br>Hertfordshire<br>UK<br>HP3 9RT |
| **Project Manager:** | Johanna Houlahan/Rhys Jones/William Cook |
| **Project Name:** | Shell Welwyn Garden |
| **Project Ref:** | 1922098 |
| **Order No:** | N/A |
| **Date Samples Received:** | 31/01/22 |
| **Date Instructions Received:** | 01/02/22 |
| **Date Analysis Completed:** | 17/02/22 |

**Approved by:**

Sophie France
Client Service Manager

1247

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| % Moisture at <40C$_A$ | - | - | - | - | - | 10.7 | - | % w/w | 0.1 | A-T-044 |
| % Stones >10mm$_A$ | 33.5 | 1.8 | 16.5 | <0.1 | 2.8 | 18.3 | 43.5 | % w/w | 0.1 | A-T-044 |
| Fraction of organic carbon$_D^{\#}$ | - | 0.0012 | - | - | - | - | - | N/A | 0.0003 | A-T-032 FOC |
| Arsenic$_D^{M\#}$ | 1 | 3 | 18 | 26 | 12 | 34 | 4 | mg/kg | 1 | A-T-024s |
| Boron (water soluble)$_D$ | <1.0 | <1.0 | <1.0 | 1.3 | <1.0 | <1.0 | <1.0 | mg/kg | 1 | A-T-027s |
| Cadmium$_D^{M\#}$ | <0.5 | <0.5 | 0.8 | <0.5 | 0.6 | 1.9 | <0.5 | mg/kg | 0.5 | A-T-024s |
| Cobalt$_D^{M\#}$ | 377 | 12 | 13 | 6 | 11 | 13 | 7 | mg/kg | 1 | A-T-024s |
| Copper$_D^{M\#}$ | 41 | 12 | 15 | 121 | 17 | 44 | 10 | mg/kg | 1 | A-T-024s |
| Chromium$_D^{M\#}$ | 45 | 34 | 35 | 16 | 29 | 29 | 25 | mg/kg | 1 | A-T-024s |
| Lead$_D^{M\#}$ | 5 | 14 | 14 | 70 | 14 | 26 | 7 | mg/kg | 1 | A-T-024s |
| Mercury$_D$ | <0.17 | <0.17 | <0.17 | 0.57 | <0.17 | <0.17 | <0.17 | mg/kg | 0.17 | A-T-024s |
| Nickel$_D^{M\#}$ | 54 | 19 | 35 | 15 | 26 | 83 | 17 | mg/kg | 1 | A-T-024s |
| Selenium$_D^{M\#}$ | 2 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-024s |
| Tin$_D$ | <5 | <5 | <5 | <5 | <5 | <5 | <5 | mg/kg | 5 | A-T-024s |
| Zinc$_D^{M\#}$ | 29 | 61 | 89 | 64 | 72 | 199 | 24 | mg/kg | 5 | A-T-024s |
| TPH total (>C6-C40)$_A^{M\#}$ | - | <10 | - | - | - | - | - | mg/kg | 10 | A-T-007s |
| TAME$_A$ | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | 0.1 | A-T-022s |
| DIPE$_A$ | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | 0.1 | A-T-022s |
| ETBE$_A$ | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | 0.1 | A-T-022s |
| TBA$_A$ | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | mg/kg | 0.5 | A-T-022s |
| Hexane (n-Hexane)$_A^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ethanol$_A$ | <100 | <100 | <100 | 1030 | <100 | <100 | 131 | µg/kg | 100 | Subcon ALS Haw |
| 1,2-Dichloroethane$_A^{\#}$ | <2 | <2 | <2 | <2 | <2 | <2 | <2 | µg/kg | 2 | A-T-006s |
| 1,2-Dibromoethane$_A^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | µg/kg | 1 | A-T-006s |
| 2-Methylnaphthalene$_A$ | <100 | <100 | <100 | <100 | <100 | <100 | <100 | µg/kg | 100 | A-T-052s |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| **Asbestos in Soil (inc. matrix)** | | | | | | | | | | |
| Asbestos in soil$_D$[#] | NAD | - | - | Chrysotile | NAD | NAD | - | | | A-T-045 |
| Asbestos Matrix (visual)$_D$ | - | - | - | Loose Insulation | - | - | - | | | A-T-045 |
| Asbestos Matrix (microscope)$_D$ | - | - | - | - | - | - | - | | | A-T-045 |
| Asbestos ACM - Suitable for Water Absorption Test?$_D$ | N/A | - | - | N/A | N/A | N/A | - | | | A-T-045 |
| | | | | | | | | | | |
| **Asbestos in Soil Quantification % (Hand Picking & Weighing)** | | | | | | | | | | |
| Asbestos in soil % composition (hand picking and weighing)$_D$ | - | - | - | 0.072 | - | - | - | % w/w | 0.001 | A-T-054 |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| **PAH-16MS** | | | | | | | | | | |
| Acenaphthene$_{A}^{M\#}$ | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-019s |
| Acenaphthylene$_{A}^{M\#}$ | <0.01 | <0.01 | <0.01 | 0.04 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-019s |
| Anthracene$_{A}^{M\#}$ | <0.02 | <0.02 | <0.02 | 0.89 | <0.02 | <0.02 | <0.02 | mg/kg | 0.02 | A-T-019s |
| Benzo(a)anthracene$_{A}^{M\#}$ | <0.04 | <0.04 | <0.04 | 2.86 | <0.04 | <0.04 | <0.04 | mg/kg | 0.04 | A-T-019s |
| Benzo(a)pyrene$_{A}^{M\#}$ | <0.04 | <0.04 | <0.04 | 2.31 | <0.04 | <0.04 | <0.04 | mg/kg | 0.04 | A-T-019s |
| Benzo(b)fluoranthene$_{A}^{M\#}$ | <0.05 | <0.05 | <0.05 | 2.67 | <0.05 | <0.05 | <0.05 | mg/kg | 0.05 | A-T-019s |
| Benzo(ghi)perylene$_{A}^{M\#}$ | <0.05 | <0.05 | <0.05 | 0.99 | <0.05 | <0.05 | <0.05 | mg/kg | 0.05 | A-T-019s |
| Benzo(k)fluoranthene$_{A}^{M\#}$ | <0.07 | <0.07 | <0.07 | 0.85 | <0.07 | <0.07 | <0.07 | mg/kg | 0.07 | A-T-019s |
| Chrysene$_{A}^{M\#}$ | <0.06 | <0.06 | <0.06 | 2.66 | <0.06 | <0.06 | <0.06 | mg/kg | 0.06 | A-T-019s |
| Dibenzo(ah)anthracene$_{A}^{M\#}$ | <0.04 | <0.04 | <0.04 | 0.22 | <0.04 | <0.04 | <0.04 | mg/kg | 0.04 | A-T-019s |
| Fluoranthene$_{A}^{M\#}$ | <0.08 | <0.08 | <0.08 | 7.31 | <0.08 | <0.08 | <0.08 | mg/kg | 0.08 | A-T-019s |
| Fluorene$_{A}^{M\#}$ | <0.01 | <0.01 | <0.01 | 0.06 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-019s |
| Indeno(123-cd)pyrene$_{A}^{M\#}$ | <0.03 | <0.03 | <0.03 | 1.32 | <0.03 | <0.03 | <0.03 | mg/kg | 0.03 | A-T-019s |
| Naphthalene $_{A}^{M\#}$ | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | 0.03 | A-T-019s |
| Phenanthrene$_{A}^{M\#}$ | <0.03 | <0.03 | <0.03 | 3.60 | <0.03 | <0.03 | <0.03 | mg/kg | 0.03 | A-T-019s |
| Pyrene$_{A}^{M\#}$ | <0.07 | <0.07 | <0.07 | 6.35 | <0.07 | <0.07 | <0.07 | mg/kg | 0.07 | A-T-019s |
| Total PAH-16MS$_{A}^{M\#}$ | <0.08 | <0.08 | <0.08 | 32.1 | <0.08 | <0.08 | <0.08 | mg/kg | 0.01 | A-T-019s |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| SVOC excluding PAH-16 | | | | | | | | | | |
| 4-Bromophenyl phenyl ether$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Diethyl phthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Dimethyl phthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Dibenzofuran$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Carbazole$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Butylbenzyl phthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Bis(2-ethylhexyl)phthalate$_A$ | - | - | <500 | - | - | - | - | µg/kg | 500 | A-T-052s |
| Bis(2-chloroethoxy)methane$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Bis(2-chloroethyl)ether$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 4-Nitrophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 3+4-Methylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 4-Chloro-3-methylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Nitrophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Methylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,2,4-Trichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Chlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,6-Dinitrotoluene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4-Dinitrotoluene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4-Dimethylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4-Dichlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4,6-Trichlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4,5-Trichlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,4-Dichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,3-Dichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,2-Dichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Chloronaphthalene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Bis(2-chloroisopropyl)ether$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Phenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Pentachlorophenol (SVOC)$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| n-Nitroso-n-dipropylamine$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| n-Dioctylphthalate$_A$ | - | - | <500 | - | - | - | - | µg/kg | 500 | A-T-052s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| n-Dibutylphthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Nitrobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Isophorone$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachloroethane$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachlorocyclopentadiene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachlorobutadiene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Perylene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| **VOC** | | | | | | | | | | |
| Dichlorodifluoromethane$_A$ | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Chloromethane$_A$ | <10 | <10 | - | <10 | - | - | - | µg/kg | 10 | A-T-006s |
| Vinyl Chloride (Chloroethene)$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Bromomethane$_A$# | *<1* | *<1* | - | *<1* | - | - | - | µg/kg | 1 | A-T-006s |
| Chloroethane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Trichlorofluoromethane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Carbon Disulphide$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Dichloromethane$_A$ | <5 | <5 | - | <5 | - | - | - | µg/kg | 5 | A-T-006s |
| trans 1,2-Dichloroethene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| cis 1,2-Dichloroethene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 2,2-Dichloropropane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Bromochloromethane$_A$# | <5 | <5 | - | <5 | - | - | - | µg/kg | 5 | A-T-006s |
| Chloroform$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1,1-Trichloroethane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1-Dichloropropene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Carbon Tetrachloride$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Benzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Trichloroethene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,2-Dichloropropane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Dibromomethane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Bromodichloromethane$_A$# | <10 | <10 | - | <10 | - | - | - | µg/kg | 10 | A-T-006s |
| cis 1,3-Dichloropropene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Toluene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| trans 1,3-Dichloropropene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1,2-Trichloroethane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,3-Dichloropropane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Tetrachloroethene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Dibromochloromethane$_A$# | <3 | <3 | - | <3 | - | - | - | µg/kg | 3 | A-T-006s |
| Chlorobenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1,1,2-Tetrachloroethane$_A$ | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |

**Envirolab Job Number: 22/00840** **Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| Ethylbenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| m & p Xylene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| o-Xylene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Styrene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Bromoform$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Isopropylbenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1,2,2-Tetrachloroethane$_A$ | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichloropropane$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| Bromobenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| n-Propylbenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 2-Chlorotoluene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,3,5-Trimethylbenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 4-Chlorotoluene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| tert-Butylbenzene$_A$# | <2 | <2 | - | <2 | - | - | - | µg/kg | 2 | A-T-006s |
| 1,2,4-Trimethylbenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| sec-Butylbenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 4-Isopropyltoluene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,3-Dichlorobenzene$_A$ | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,4-Dichlorobenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| n-Butylbenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,2-Dichlorobenzene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,2-Dibromo-3-chloropropane (DCBP)$_A$ | <2 | <2 | - | <2 | - | - | - | µg/kg | 2 | A-T-006s |
| 1,2,4-Trichlorobenzene$_A$ | <3 | <3 | - | <3 | - | - | - | µg/kg | 3 | A-T-006s |
| Hexachlorobutadiene$_A$# | <1 | <1 | - | <1 | - | - | - | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichlorobenzene$_A$ | <3 | <3 | - | <3 | - | - | - | µg/kg | 3 | A-T-006s |

envirolab

**Envirolab Job Number: 22/00840** **Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | | | |
| Depth to Top | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Solid | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4AB | 6A | 5A | 7 | 6A | 5A | 4AB | | | |
| **TPH CWG with Clean Up *C1** | | | | | | | | | | |
| Ali >C5-C6$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ali >C6-C8$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ali >C8-C10$_A$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C10-C12$_A$ M# | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C12-C16$_A$ M# | <1 | <1 | <1 | 2 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C16-C21$_A$ M# | <1 | <1 | <1 | 11 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C21-C35$_A$ M# | 1 | <1 | <1 | 129 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Total Aliphatics$_A$ | 1 | <1 | <1 | 142 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C5-C7$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Aro >C7-C8$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Aro >C8-C10$_A$ | <5 | <5 | <5 | 7 | <5 | <5 | <5 | mg/kg | 1 | A-T-055s |
| Aro >C10-C12$_A$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C12-C16$_A$ | <1 | <1 | <1 | 4 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C16-C21$_A$ M# | <1 | <1 | <1 | 37 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C21-C35$_A$ | <1 | <1 | <1 | 173 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Total Aromatics$_A$ | <5 | <5 | <5 | 222 | <5 | <5 | <5 | mg/kg | 1 | A-T-055s |
| TPH (Ali & Aro >C5-C35)$_A$ | <5 | <5 | <5 | 363 | <5 | <5 | <5 | mg/kg | 1 | A-T-055s |
| BTEX - Benzene$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - Toluene$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - Ethyl Benzene$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - m & p Xylene$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - o Xylene$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| MTBE$_A$ # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| % Moisture at <40C$_A$ | - | - | - | 9.7 | - | - | - | % w/w | 0.1 | A-T-044 |
| % Stones >10mm$_A$ | 38.8 | 16.6 | 30.3 | 10.3 | 18.4 | <0.1 | <0.1 | % w/w | 0.1 | A-T-044 |
| Arsenic$_D^{M\#}$ | 12 | 8 | 6 | 3 | 2 | <1 | <1 | mg/kg | 1 | A-T-024s |
| Boron (water soluble)$_D$ | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | mg/kg | 1 | A-T-027s |
| Cadmium$_D^{M\#}$ | 0.6 | 0.6 | 0.8 | 0.5 | 0.6 | <0.5 | 0.6 | mg/kg | 0.5 | A-T-024s |
| Cobalt$_D^{M\#}$ | 9 | 11 | 5 | 3 | 8 | 9 | 6 | mg/kg | 1 | A-T-024s |
| Copper$_D^{M\#}$ | 10 | 13 | 17 | 5 | 7 | 11 | 12 | mg/kg | 1 | A-T-024s |
| Chromium$_D^{M\#}$ | 20 | 30 | 24 | 13 | 29 | 36 | 40 | mg/kg | 1 | A-T-024s |
| Lead$_D^{M\#}$ | 15 | 12 | 59 | 5 | 10 | 4 | 4 | mg/kg | 1 | A-T-024s |
| Mercury$_D$ | <0.17 | <0.17 | 0.59 | <0.17 | <0.17 | <0.17 | 0.81 | mg/kg | 0.17 | A-T-024s |
| Nickel$_D^{M\#}$ | 23 | 40 | 20 | 13 | 25 | 34 | 37 | mg/kg | 1 | A-T-024s |
| Selenium$_D^{M\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-024s |
| Tin$_D$ | <5 | <5 | <5 | <5 | <5 | <5 | <5 | mg/kg | 5 | A-T-024s |
| Zinc$_D^{M\#}$ | 54 | 61 | 79 | 30 | 29 | 27 | 24 | mg/kg | 5 | A-T-024s |
| TAME$_A$ | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | 0.1 | A-T-022s |
| DIPE$_A$ | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | 0.1 | A-T-022s |
| ETBE$_A$ | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | 0.1 | A-T-022s |
| TBA$_A$ | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | mg/kg | 0.5 | A-T-022s |
| Hexane (n-Hexane)$_A^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ethanol$_A$ | 177 | <100 | 148 | <100 | 137 | <100 | <100 | µg/kg | 100 | Subcon ALS Haw |
| 1,2-Dichloroethane$_A^{\#}$ | <2 | <2 | <2 | <2 | <2 | <2 | <2 | µg/kg | 2 | A-T-006s |
| 1,2-Dibromoethane$_A^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | µg/kg | 1 | A-T-006s |
| 2-Methylnaphthalene$_A$ | <100 | <100 | <100 | <100 | <100 | <100 | <100 | µg/kg | 100 | A-T-052s |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| **Asbestos in Soil (inc. matrix)** | | | | | | | | | | |
| Asbestos in soil$_D$# | NAD | - | NAD | NAD | - | NAD | NAD | | | A-T-045 |
| Asbestos Matrix (visual)$_D$ | - | - | - | - | - | - | - | | | A-T-045 |
| Asbestos Matrix (microscope)$_D$ | - | - | - | - | - | - | - | | | A-T-045 |
| Asbestos ACM - Suitable for Water Absorption Test?$_D$ | N/A | - | N/A | N/A | - | N/A | N/A | | | A-T-045 |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| **PAH-16MS** | | | | | | | | | | |
| Acenaphthene$_A^{M\#}$ | <0.01 | <0.01 | 0.18 | <0.01 | <0.01 | <0.01 | 0.02 | mg/kg | 0.01 | A-T-019s |
| Acenaphthylene$_A^{M\#}$ | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-019s |
| Anthracene$_A^{M\#}$ | <0.02 | <0.02 | 0.26 | <0.02 | <0.02 | <0.02 | 0.07 | mg/kg | 0.02 | A-T-019s |
| Benzo(a)anthracene$_A^{M\#}$ | 0.05 | <0.04 | 0.28 | <0.04 | <0.04 | <0.04 | 0.07 | mg/kg | 0.04 | A-T-019s |
| Benzo(a)pyrene$_A^{M\#}$ | 0.05 | <0.04 | 0.54 | <0.04 | <0.04 | <0.04 | 0.05 | mg/kg | 0.04 | A-T-019s |
| Benzo(b)fluoranthene$_A^{M\#}$ | 0.07 | <0.05 | 0.41 | <0.05 | <0.05 | <0.05 | <0.05 | mg/kg | 0.05 | A-T-019s |
| Benzo(ghi)perylene$_A^{M\#}$ | 0.05 | <0.05 | 0.59 | <0.05 | <0.05 | <0.05 | <0.05 | mg/kg | 0.05 | A-T-019s |
| Benzo(k)fluoranthene$_A^{M\#}$ | <0.07 | <0.07 | 0.14 | <0.07 | <0.07 | <0.07 | <0.07 | mg/kg | 0.07 | A-T-019s |
| Chrysene$_A^{M\#}$ | <0.06 | <0.06 | 0.33 | <0.06 | <0.06 | <0.06 | <0.06 | mg/kg | 0.06 | A-T-019s |
| Dibenzo(ah)anthracene$_A^{M\#}$ | <0.04 | <0.04 | 0.06 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | 0.04 | A-T-019s |
| Fluoranthene$_A^{M\#}$ | <0.08 | <0.08 | 0.83 | <0.08 | <0.08 | <0.08 | 0.20 | mg/kg | 0.08 | A-T-019s |
| Fluorene$_A^{M\#}$ | <0.01 | <0.01 | 0.15 | <0.01 | <0.01 | <0.01 | 0.03 | mg/kg | 0.01 | A-T-019s |
| Indeno(123-cd)pyrene$_A^{M\#}$ | 0.05 | <0.03 | 0.52 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | 0.03 | A-T-019s |
| Naphthalene $_A^{M\#}$ | <0.03 | <0.03 | 0.09 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | 0.03 | A-T-019s |
| Phenanthrene$_A^{M\#}$ | 0.03 | <0.03 | 1.12 | <0.03 | <0.03 | <0.03 | 0.22 | mg/kg | 0.03 | A-T-019s |
| Pyrene$_A^{M\#}$ | 0.08 | <0.07 | 0.67 | <0.07 | <0.07 | <0.07 | 0.16 | mg/kg | 0.07 | A-T-019s |
| Total PAH-16MS$_A^{M\#}$ | 0.38 | <0.08 | 6.19 | <0.08 | <0.08 | <0.08 | 0.82 | mg/kg | 0.01 | A-T-019s |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| Speciated PCB-EC7 & WHO12 | | | | | | | | | | |
| PCB BZ 28 A M# | - | - | <0.002 | - | - | - | - | mg/kg | 0.002 | A-T-004s |
| PCB BZ 52 A M# | - | - | <0.002 | - | - | - | - | mg/kg | 0.002 | A-T-004s |
| PCB BZ 81 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 101 A M# | - | - | <0.004 | - | - | - | - | mg/kg | 0.004 | A-T-004s |
| PCB BZ 105 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 114 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 118 A M# | - | - | <0.007 | - | - | - | - | mg/kg | 0.007 | A-T-004s |
| PCB BZ 123 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 126 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 138 A M# | - | - | <0.006 | - | - | - | - | mg/kg | 0.006 | A-T-004s |
| PCB BZ 153 A M# | - | - | <0.004 | - | - | - | - | mg/kg | 0.004 | A-T-004s |
| PCB BZ 156 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 157 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 167 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 169 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 180 A M# | - | - | <0.004 | - | - | - | - | mg/kg | 0.004 | A-T-004s |
| PCB BZ 189 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| PCB BZ 77 A | - | - | <0.005 | - | - | - | - | mg/kg | 0.005 | A-T-004s |
| Total Speciated PCB-EC7 & WHO12 A | - | - | <0.007 | - | - | - | - | mg/kg | 0.002 | A-T-004s |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| **SVOC excluding PAH-16** | | | | | | | | | | |
| 4-Bromophenyl phenyl ether$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Diethyl phthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Dimethyl phthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Dibenzofuran$_A$ | - | - | 127 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Carbazole$_A$ | - | - | 176 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Butylbenzyl phthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Bis(2-ethylhexyl)phthalate$_A$ | - | - | <500 | - | - | - | - | µg/kg | 500 | A-T-052s |
| Bis(2-chloroethoxy)methane$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Bis(2-chloroethyl)ether$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 4-Nitrophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 3+4-Methylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 4-Chloro-3-methylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Nitrophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Methylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,2,4-Trichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Chlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,6-Dinitrotoluene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4-Dinitrotoluene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4-Dimethylphenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4-Dichlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4,6-Trichlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2,4,5-Trichlorophenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,4-Dichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,3-Dichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 1,2-Dichlorobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| 2-Chloronaphthalene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Bis(2-chloroisopropyl)ether$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Phenol$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Pentachlorophenol (SVOC)$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| n-Nitroso-n-dipropylamine$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| n-Dioctylphthalate$_A$ | - | - | <500 | - | - | - | - | µg/kg | 500 | A-T-052s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| n-Dibutylphthalate$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Nitrobenzene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Isophorone$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachloroethane$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachlorocyclopentadiene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Hexachlorobutadiene$_A$ | - | - | <100 | - | - | - | - | µg/kg | 100 | A-T-052s |
| Perylene$_A$ | - | - | 201 | - | - | - | - | µg/kg | 100 | A-T-052s |

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| **VOC** | | | | | | | | | | |
| Dichlorodifluoromethane$_{A}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Chloromethane$_{A}$ | - | - | - | - | - | <10 | <10 | µg/kg | 10 | A-T-006s |
| Vinyl Chloride (Chloroethene)$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Bromomethane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Chloroethane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Trichlorofluoromethane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Carbon Disulphide$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Dichloromethane$_{A}$ | - | - | - | - | - | <5 | <5 | µg/kg | 5 | A-T-006s |
| trans 1,2-Dichloroethene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| cis 1,2-Dichloroethene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 2,2-Dichloropropane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Bromochloromethane$_{A}^{\#}$ | - | - | - | - | - | <5 | <5 | µg/kg | 5 | A-T-006s |
| Chloroform$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,1,1-Trichloroethane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,1-Dichloropropene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Carbon Tetrachloride$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Benzene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Trichloroethene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,2-Dichloropropane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Dibromomethane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Bromodichloromethane$_{A}^{\#}$ | - | - | - | - | - | <10 | <10 | µg/kg | 10 | A-T-006s |
| cis 1,3-Dichloropropene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Toluene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| trans 1,3-Dichloropropene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,1,2-Trichloroethane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,3-Dichloropropane$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Tetrachloroethene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Dibromochloromethane$_{A}^{\#}$ | - | - | - | - | - | <3 | <3 | µg/kg | 3 | A-T-006s |
| Chlorobenzene$_{A}^{\#}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,1,1,2-Tetrachloroethane$_{A}$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| Ethylbenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| m & p Xylene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| o-Xylene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Styrene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Bromoform$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Isopropylbenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,1,2,2-Tetrachloroethane$_A$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichloropropane$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| Bromobenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| n-Propylbenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 2-Chlorotoluene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,3,5-Trimethylbenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 4-Chlorotoluene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| tert-Butylbenzene$_A$ # | - | - | - | - | - | <2 | <2 | µg/kg | 2 | A-T-006s |
| 1,2,4-Trimethylbenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| sec-Butylbenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 4-Isopropyltoluene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,3-Dichlorobenzene$_A$ | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,4-Dichlorobenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| n-Butylbenzene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,2-Dichlorobenzene$_A$ # | - | - | - | - | - | *<1* | <1 | µg/kg | 1 | A-T-006s |
| 1,2-Dibromo-3-chloropropane (DCBP)$_A$ | - | - | - | - | - | <2 | <2 | µg/kg | 2 | A-T-006s |
| 1,2,4-Trichlorobenzene$_A$ | - | - | - | - | - | <3 | <3 | µg/kg | 3 | A-T-006s |
| Hexachlorobutadiene$_A$ # | - | - | - | - | - | <1 | <1 | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichlorobenzene$_A$ | - | - | - | - | - | <3 | <3 | µg/kg | 3 | A-T-006s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW104 | MW104 | MW105 | MW105 | MW105 | VP01 | VP01 | | | |
| Depth to Top | 0.70 | 3.00 | 1 | 3 | 5 | 0.3 | 1.7 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Solid | Solid | | | |
| Sample Matrix Code | 5A | 5A | 4ABE | 4A | 5A | 7 | 7 | | | |
| **TPH CWG with Clean Up *C1** | | | | | | | | | | |
| Ali >C5-C6$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ali >C6-C8$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ali >C8-C10$_{A}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C10-C12$_{A}^{M\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C12-C16$_{A}^{M\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C16-C21$_{A}^{M\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C21-C35$_{A}^{M\#}$ | 3 | <1 | 24 | <1 | 4 | 5 | 2 | mg/kg | 1 | A-T-055s |
| Total Aliphatics$_{A}$ | 3 | <1 | 24 | <1 | 4 | 5 | 2 | mg/kg | 1 | A-T-055s |
| Aro >C5-C7$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Aro >C7-C8$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Aro >C8-C10$_{A}$ | <5 | <5 | <5 | <5 | <5 | <5 | 63 | mg/kg | 1 | A-T-055s |
| Aro >C10-C12$_{A}$ | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C12-C16$_{A}$ | <1 | <1 | 5 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C16-C21$_{A}^{M\#}$ | <1 | <1 | 4 | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C21-C35$_{A}$ | 3 | <1 | 28 | <1 | <1 | 4 | 1 | mg/kg | 1 | A-T-055s |
| Total Aromatics$_{A}$ | <5 | <5 | 36 | <5 | <5 | <5 | 64 | mg/kg | 1 | A-T-055s |
| TPH (Ali & Aro >C5-C35)$_{A}$ | 5 | <5 | 60 | <5 | <5 | 9 | 66 | mg/kg | 1 | A-T-055s |
| BTEX - Benzene$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - Toluene$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - Ethyl Benzene$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - m & p Xylene$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - o Xylene$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| MTBE$_{A}^{\#}$ | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/15 | 22/00840/16 | 22/00840/17 | 22/00840/18 | 22/00840/19 | 22/00840/20 | 22/00840/21 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC01 | SKIP | MW101 | MW101 | MW103 | MW103 | MW103 | | | |
| Depth to Top | | | 2.5 | 6 | 0.5 | 2.5 | 3.8 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 27-Jan-22 | 25-Jan-22 | 25-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 6A | 6A | | | | | | | | |
| % Moisture at <40C$_A$ | - | 9.7 | - | - | - | - | - | % w/w | 0.1 | A-T-044 |
| % Stones >10mm$_A$ | 11.3 | 38.2 | - | - | - | - | - | % w/w | 0.1 | A-T-044 |
| Arsenic$_D^{M\#}$ | 4 | - | - | - | - | - | - | mg/kg | 1 | A-T-024s |
| Boron (water soluble)$_D$ | <1.0 | - | - | - | - | - | - | mg/kg | 1 | A-T-027s |
| Cadmium$_D^{M\#}$ | 0.7 | - | - | - | - | - | - | mg/kg | 0.5 | A-T-024s |
| Cobalt$_D^{M\#}$ | 12 | - | - | - | - | - | - | mg/kg | 1 | A-T-024s |
| Copper$_D^{M\#}$ | 31 | - | - | - | - | - | - | mg/kg | 1 | A-T-024s |
| Chromium$_D^{M\#}$ | 24 | - | - | - | - | - | - | mg/kg | 1 | A-T-024s |
| Lead$_D^{M\#}$ | 11 | - | - | - | - | - | - | mg/kg | 1 | A-T-024s |
| Mercury$_D$ | <0.17 | - | - | - | - | - | - | mg/kg | 0.17 | A-T-024s |
| Nickel$_D^{M\#}$ | 40 | - | - | - | - | - | - | mg/kg | 1 | A-T-024s |
| Selenium$_D^{M\#}$ | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-024s |
| Tin$_D$ | <5 | - | - | - | - | - | - | mg/kg | 5 | A-T-024s |
| Zinc$_D^{M\#}$ | 42 | - | - | - | - | - | - | mg/kg | 5 | A-T-024s |
| TAME$_A$ | <0.1 | - | - | - | - | - | - | mg/kg | 0.1 | A-T-022s |
| DIPE$_A$ | <0.1 | - | - | - | - | - | - | mg/kg | 0.1 | A-T-022s |
| ETBE$_A$ | <0.1 | - | - | - | - | - | - | mg/kg | 0.1 | A-T-022s |
| TBA$_A$ | <0.5 | - | - | - | - | - | - | mg/kg | 0.5 | A-T-022s |
| Hexane (n-Hexane)$_A^{\#}$ | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| Ethanol$_A$ | <100 | - | - | - | - | - | - | µg/kg | 100 | Subcon ALS Haw |
| 1,2-Dichloroethane$_A^{\#}$ | <2 | - | - | - | - | - | - | µg/kg | 2 | A-T-006s |
| 1,2-Dibromoethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 2-Methylnaphthalene$_A$ | <100 | - | - | - | - | - | - | µg/kg | 100 | A-T-052s |

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**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/15 | 22/00840/16 | 22/00840/17 | 22/00840/18 | 22/00840/19 | 22/00840/20 | 22/00840/21 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC01 | SKIP | MW101 | MW101 | MW103 | MW103 | MW103 | | | |
| Depth to Top | | | 2.5 | 6 | 0.5 | 2.5 | 3.8 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 27-Jan-22 | 25-Jan-22 | 25-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 6A | 6A | | | | | | | | |
| **Asbestos in Soil (inc. matrix)** | | | | | | | | | | |
| Asbestos in soil$_D$# | NAD | NAD | - | - | - | - | - | | | A-T-045 |
| Asbestos Matrix (visual)$_D$ | - | - | - | - | - | - | - | | | A-T-045 |
| Asbestos Matrix (microscope)$_D$ | - | - | - | - | - | - | - | | | A-T-045 |
| Asbestos ACM - Suitable for Water Absorption Test?$_D$ | N/A | N/A | - | - | - | - | - | | | A-T-045 |

Envirolab Job Number: 22/00840

Client Project Name: Shell Welwyn Garden

Client Project Ref: 1922098

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|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC01 | SKIP | MW101 | MW101 | MW103 | MW103 | MW103 | | | |
| Depth to Top | | | 2.5 | 6 | 0.5 | 2.5 | 3.8 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 27-Jan-22 | 25-Jan-22 | 25-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 6A | 6A | | | | | | | | |
| **PAH-16MS** | | | | | | | | | | |
| Acenaphthene$_A^{M\#}$ | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-019s |
| Acenaphthylene$_A^{M\#}$ | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-019s |
| Anthracene$_A^{M\#}$ | <0.02 | - | - | - | - | - | - | mg/kg | 0.02 | A-T-019s |
| Benzo(a)anthracene$_A^{M\#}$ | <0.04 | - | - | - | - | - | - | mg/kg | 0.04 | A-T-019s |
| Benzo(a)pyrene$_A^{M\#}$ | <0.04 | - | - | - | - | - | - | mg/kg | 0.04 | A-T-019s |
| Benzo(b)fluoranthene$_A^{M\#}$ | <0.05 | - | - | - | - | - | - | mg/kg | 0.05 | A-T-019s |
| Benzo(ghi)perylene$_A^{M\#}$ | <0.05 | - | - | - | - | - | - | mg/kg | 0.05 | A-T-019s |
| Benzo(k)fluoranthene$_A^{M\#}$ | <0.07 | - | - | - | - | - | - | mg/kg | 0.07 | A-T-019s |
| Chrysene$_A^{M\#}$ | <0.06 | - | - | - | - | - | - | mg/kg | 0.06 | A-T-019s |
| Dibenzo(ah)anthracene$_A^{M\#}$ | <0.04 | - | - | - | - | - | - | mg/kg | 0.04 | A-T-019s |
| Fluoranthene$_A^{M\#}$ | <0.08 | - | - | - | - | - | - | mg/kg | 0.08 | A-T-019s |
| Fluorene$_A^{M\#}$ | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-019s |
| Indeno(123-cd)pyrene$_A^{M\#}$ | <0.03 | - | - | - | - | - | - | mg/kg | 0.03 | A-T-019s |
| Naphthalene $_A^{M\#}$ | <0.03 | - | - | - | - | - | - | mg/kg | 0.03 | A-T-019s |
| Phenanthrene$_A^{M\#}$ | <0.03 | - | - | - | - | - | - | mg/kg | 0.03 | A-T-019s |
| Pyrene$_A^{M\#}$ | <0.07 | - | - | - | - | - | - | mg/kg | 0.07 | A-T-019s |
| Total PAH-16MS$_A^{M\#}$ | <0.08 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-019s |

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|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC01 | SKIP | MW101 | MW101 | MW103 | MW103 | MW103 | | | |
| Depth to Top | | | 2.5 | 6 | 0.5 | 2.5 | 3.8 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 27-Jan-22 | 25-Jan-22 | 25-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 6A | 6A | | | | | | | | |
| **VOC** | | | | | | | | | | |
| Dichlorodifluoromethane$_A$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Chloromethane$_A$ | <10 | - | - | - | - | - | - | µg/kg | 10 | A-T-006s |
| Vinyl Chloride (Chloroethene)$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Bromomethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Chloroethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Trichlorofluoromethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Carbon Disulphide$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Dichloromethane$_A$ | <5 | - | - | - | - | - | - | µg/kg | 5 | A-T-006s |
| trans 1,2-Dichloroethene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| cis 1,2-Dichloroethene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 2,2-Dichloropropane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Bromochloromethane$_A^{\#}$ | <5 | - | - | - | - | - | - | µg/kg | 5 | A-T-006s |
| Chloroform$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1,1-Trichloroethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1-Dichloropropene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Carbon Tetrachloride$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Benzene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Trichloroethene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,2-Dichloropropane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Dibromomethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Bromodichloromethane$_A^{\#}$ | <10 | - | - | - | - | - | - | µg/kg | 10 | A-T-006s |
| cis 1,3-Dichloropropene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Toluene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| trans 1,3-Dichloropropene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1,2-Trichloroethane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,3-Dichloropropane$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Tetrachloroethene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| Dibromochloromethane$_A^{\#}$ | <3 | - | - | - | - | - | - | µg/kg | 3 | A-T-006s |
| Chlorobenzene$_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| 1,1,1,2-Tetrachloroethane$_A$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

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| Lab Sample ID | 22/00840/15 | 22/00840/16 | 22/00840/17 | 22/00840/18 | 22/00840/19 | 22/00840/20 | 22/00840/21 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC01 | SKIP | MW101 | MW101 | MW103 | MW103 | MW103 | | | |
| Depth to Top | | | 2.5 | 6 | 0.5 | 2.5 | 3.8 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 27-Jan-22 | 25-Jan-22 | 25-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 6A | 6A | | | | | | | | |
| $Ethylbenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $m \& p Xylene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $o\text{-}Xylene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $Styrene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $Bromoform_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $Isopropylbenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,1,2,2\text{-}Tetrachloroethane_A$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,2,3\text{-}Trichloropropane_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $Bromobenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $n\text{-}Propylbenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $2\text{-}Chlorotoluene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,3,5\text{-}Trimethylbenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $4\text{-}Chlorotoluene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $tert\text{-}Butylbenzene_A^{\#}$ | <2 | - | - | - | - | - | - | µg/kg | 2 | A-T-006s |
| $1,2,4\text{-}Trimethylbenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $sec\text{-}Butylbenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $4\text{-}Isopropyltoluene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,3\text{-}Dichlorobenzene_A$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,4\text{-}Dichlorobenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $n\text{-}Butylbenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,2\text{-}Dichlorobenzene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,2\text{-}Dibromo\text{-}3\text{-}chloropropane (DCBP)_A$ | <2 | - | - | - | - | - | - | µg/kg | 2 | A-T-006s |
| $1,2,4\text{-}Trichlorobenzene_A$ | <3 | - | - | - | - | - | - | µg/kg | 3 | A-T-006s |
| $Hexachlorobutadiene_A^{\#}$ | <1 | - | - | - | - | - | - | µg/kg | 1 | A-T-006s |
| $1,2,3\text{-}Trichlorobenzene_A$ | <3 | - | - | - | - | - | - | µg/kg | 3 | A-T-006s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/15 | 22/00840/16 | 22/00840/17 | 22/00840/18 | 22/00840/19 | 22/00840/20 | 22/00840/21 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC01 | SKIP | MW101 | MW101 | MW103 | MW103 | MW103 | | | |
| Depth to Top | | | 2.5 | 6 | 0.5 | 2.5 | 3.8 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 27-Jan-22 | 25-Jan-22 | 25-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 6A | 6A | | | | | | | | |
| **TPH CWG with Clean Up *C1** | | | | | | | | | | |
| Ali >C5-C6$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| Ali >C6-C8$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| Ali >C8-C10$_A$ | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Ali >C10-C12$_A$M# | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Ali >C12-C16$_A$M# | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Ali >C16-C21$_A$M# | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Ali >C21-C35$_A$M# | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Total Aliphatics$_A$ | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Aro >C5-C7$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| Aro >C7-C8$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| Aro >C8-C10$_A$ | <5 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Aro >C10-C12$_A$ | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Aro >C12-C16$_A$ | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Aro >C16-C21$_A$M# | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Aro >C21-C35$_A$ | <1 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| Total Aromatics$_A$ | <5 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| TPH (Ali & Aro >C5-C35)$_A$ | <5 | - | - | - | - | - | - | mg/kg | 1 | A-T-055s |
| BTEX - Benzene$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| BTEX - Toluene$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| BTEX - Ethyl Benzene$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| BTEX - m & p Xylene$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| BTEX - o Xylene$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |
| MTBE$_A$# | <0.01 | - | - | - | - | - | - | mg/kg | 0.01 | A-T-022s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/22 | 22/00840/23 | 22/00840/24 | 22/00840/25 | 22/00840/26 | 22/00840/27 | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW103 | MW104 | MW105 | MW105 | MW105 | QAQC7 | | | | |
| Depth to Top | 6 | 2 | 2 | 4 | 6 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 27-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | | |
| Sample Matrix Code | | | | | 5A | | | | | |
| % Stones >10mm$_{A}$ | - | - | - | - | <0.1 | - | | % w/w | 0.1 | A-T-044 |
| Arsenic$_{D}^{M\#}$ | - | - | - | - | 2 | - | | mg/kg | 1 | A-T-024s |
| Boron (water soluble)$_{D}$ | - | - | - | - | <1.0 | - | | mg/kg | 1 | A-T-027s |
| Cadmium$_{D}^{M\#}$ | - | - | - | - | 0.5 | - | | mg/kg | 0.5 | A-T-024s |
| Cobalt$_{D}^{M\#}$ | - | - | - | - | 12 | - | | mg/kg | 1 | A-T-024s |
| Copper$_{D}^{M\#}$ | - | - | - | - | 7 | - | | mg/kg | 1 | A-T-024s |
| Chromium$_{D}^{M\#}$ | - | - | - | - | 12 | - | | mg/kg | 1 | A-T-024s |
| Lead$_{D}^{M\#}$ | - | - | - | - | 8 | - | | mg/kg | 1 | A-T-024s |
| Mercury$_{D}$ | - | - | - | - | <0.17 | - | | mg/kg | 0.17 | A-T-024s |
| Nickel$_{D}^{M\#}$ | - | - | - | - | 14 | - | | mg/kg | 1 | A-T-024s |
| Selenium$_{D}^{M\#}$ | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-024s |
| Tin$_{D}$ | - | - | - | - | <5 | - | | mg/kg | 5 | A-T-024s |
| Zinc$_{D}^{M\#}$ | - | - | - | - | 29 | - | | mg/kg | 5 | A-T-024s |
| TAME$_{A}$ | - | - | - | - | <0.1 | - | | mg/kg | 0.1 | A-T-022s |
| DIPE$_{A}$ | - | - | - | - | <0.1 | - | | mg/kg | 0.1 | A-T-022s |
| ETBE$_{A}$ | - | - | - | - | <0.1 | - | | mg/kg | 0.1 | A-T-022s |
| TBA$_{A}$ | - | - | - | - | <0.5 | - | | mg/kg | 0.5 | A-T-022s |
| Hexane (n-Hexane)$_{A}^{\#}$ | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| Ethanol$_{A}$ | - | - | - | - | <100 | - | | µg/kg | 100 | Subcon ALS Haw |
| 1,2-Dichloroethane$_{A}^{\#}$ | - | - | - | - | <2 | - | | µg/kg | 2 | A-T-006s |
| 1,2-Dibromoethane$_{A}^{\#}$ | - | - | - | - | <1 | - | | µg/kg | 1 | A-T-006s |
| 2-Methylnaphthalene$_{A}$ | - | - | - | - | <100 | - | | µg/kg | 100 | A-T-052s |

| Lab Sample ID | 22/00840/22 | 22/00840/23 | 22/00840/24 | 22/00840/25 | 22/00840/26 | 22/00840/27 | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW103 | MW104 | MW105 | MW105 | MW105 | QAQC7 | | | | |
| Depth to Top | 6 | 2 | 2 | 4 | 6 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 27-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | | |
| Sample Matrix Code | | | | | 5A | | | | | |
| **PAH-16MS** | | | | | | | | | | |
| Acenaphthene$_A$ M# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-019s |
| Acenaphthylene$_A$ M# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-019s |
| Anthracene$_A$ M# | - | - | - | - | <0.02 | - | | mg/kg | 0.02 | A-T-019s |
| Benzo(a)anthracene$_A$ M# | - | - | - | - | <0.04 | - | | mg/kg | 0.04 | A-T-019s |
| Benzo(a)pyrene$_A$ M# | - | - | - | - | <0.04 | - | | mg/kg | 0.04 | A-T-019s |
| Benzo(b)fluoranthene$_A$ M# | - | - | - | - | <0.05 | - | | mg/kg | 0.05 | A-T-019s |
| Benzo(ghi)perylene$_A$ M# | - | - | - | - | <0.05 | - | | mg/kg | 0.05 | A-T-019s |
| Benzo(k)fluoranthene$_A$ M# | - | - | - | - | <0.07 | - | | mg/kg | 0.07 | A-T-019s |
| Chrysene$_A$ M# | - | - | - | - | <0.06 | - | | mg/kg | 0.06 | A-T-019s |
| Dibenzo(ah)anthracene$_A$ M# | - | - | - | - | <0.04 | - | | mg/kg | 0.04 | A-T-019s |
| Fluoranthene$_A$ M# | - | - | - | - | <0.08 | - | | mg/kg | 0.08 | A-T-019s |
| Fluorene$_A$ M# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-019s |
| Indeno(123-cd)pyrene$_A$ M# | - | - | - | - | <0.03 | - | | mg/kg | 0.03 | A-T-019s |
| Naphthalene $_A$ M# | - | - | - | - | <0.03 | - | | mg/kg | 0.03 | A-T-019s |
| Phenanthrene$_A$ M# | - | - | - | - | <0.03 | - | | mg/kg | 0.03 | A-T-019s |
| Pyrene$_A$ M# | - | - | - | - | <0.07 | - | | mg/kg | 0.07 | A-T-019s |
| Total PAH-16MS$_A$ M# | - | - | - | - | <0.08 | - | | mg/kg | 0.01 | A-T-019s |

**Envirolab Job Number: 22/00840**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00840/22 | 22/00840/23 | 22/00840/24 | 22/00840/25 | 22/00840/26 | 22/00840/27 | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | MW103 | MW104 | MW105 | MW105 | MW105 | QAQC7 | | | | |
| Depth to Top | 6 | 2 | 2 | 4 | 6 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 27-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | Soil - ES | | | | |
| Sample Matrix Code | | | | | 5A | | | | | |
| **TPH CWG with Clean Up *C1** | | | | | | | | | | |
| Ali >C5-C6$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| Ali >C6-C8$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| Ali >C8-C10$_A$ | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Ali >C10-C12$_A$M# | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Ali >C12-C16$_A$M# | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Ali >C16-C21$_A$M# | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Ali >C21-C35$_A$M# | - | - | - | - | 2 | - | | mg/kg | 1 | A-T-055s |
| Total Aliphatics$_A$ | - | - | - | - | 2 | - | | mg/kg | 1 | A-T-055s |
| Aro >C5-C7$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| Aro >C7-C8$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| Aro >C8-C10$_A$ | - | - | - | - | <5 | - | | mg/kg | 1 | A-T-055s |
| Aro >C10-C12$_A$ | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Aro >C12-C16$_A$ | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Aro >C16-C21$_A$M# | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Aro >C21-C35$_A$ | - | - | - | - | <1 | - | | mg/kg | 1 | A-T-055s |
| Total Aromatics$_A$ | - | - | - | - | <5 | - | | mg/kg | 1 | A-T-055s |
| TPH (Ali & Aro >C5-C35)$_A$ | - | - | - | - | <5 | - | | mg/kg | 1 | A-T-055s |
| BTEX - Benzene$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| BTEX - Toluene$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| BTEX - Ethyl Benzene$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| BTEX - m & p Xylene$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| BTEX - o Xylene$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |
| MTBE$_A$# | - | - | - | - | <0.01 | - | | mg/kg | 0.01 | A-T-022s |

## REPORT NOTES

**General**
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

**Soil chemical analysis:**
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

**TPH analysis of water by method A-T-007:**
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

**Electrical Conductivity of water by Method A-T-037:**
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

**Asbestos:**
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

**Predominant Matrix Codes:**
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
**Secondary Matrix Codes:**
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

**Key:**
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

**EPH CWG GCxGC ID from TPH CWG**

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

# Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

**Client:** RSK Environment Ltd Hemel, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, UK, HP3 9RT
**Project:** Shell Welwyn Garden
**Clients Project No:** 1922098

**Project No:** 22/00840
**Date Received:** 01/02/2022 (am)
**Cool Box Temperatures (°C):** 6.1

| **Lab Sample ID** | 22/00840/4 | 22/00840/13 | 22/00840/14 |
|---|---|---|---|
| **Client Sample No** | | | |
| **Client Sample ID/Depth** | MW102 1.00m | VP01 0.3m | VP01 1.7m |
| **Date Sampled** | 19/01/22 | 19/01/22 | 19/01/22 |
| **Deviation Code** | | | |
| F | ✓ | ✓ | ✓ |

*Key*
*F* *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

## HOLDING TIME EXCEEDANCES

| **Lab Sample ID** | 22/00840/4 | 22/00840/13 | 22/00840/14 |
|---|---|---|---|
| **Client Sample No** | | | |
| **Client Sample ID/Depth** | MW102 1.00m | VP01 0.3m | VP01 1.7m |
| **Date Sampled** | 19/01/22 | 19/01/22 | 19/01/22 |
| VPHCWG | ✓ | ✓ | ✓ |
| PAH-16MS | ✓ | ✓ | ✓ |
| Hexane (n-Hexane) | ✓ | ✓ | ✓ |
| 2-Methylnaphthalene | ✓ | ✓ | ✓ |
| VOC | ✓ | ✓ | ✓ |

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples 5 ± 3°C), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

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# Envirolab Analysis Dates

| Lab Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | | | |
| Client Sample ID/Depth | MW101 1.6m | MW101 3.8m | MW101 4.9m | MW102 1.00m | MW103 1.50m | MW103 3.00m | MW103 5.00m | MW104 0.70m | MW104 3.00m | MW105 1m | MW105 3m | MW105 5m |
| Date Sampled | 25/01/22 | 25/01/22 | 25/01/22 | 19/01/22 | 20/01/22 | 27/01/22 | 27/01/22 | 26/01/22 | 26/01/22 | 26/01/22 | 26/01/22 | 26/01/22 |
| A-T-004s | | | | | | 09/02/2022 | | | | 11/02/2022 | 09/02/2022 | |
| A-T-006s | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 |
| A-T-007s | | 08/02/2022 | | | | 09/02/2022 | | | | | 09/02/2022 | |
| A-T-019s | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 | 08/02/2022 |
| A-T-022s | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 |
| A-T-024s | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 |
| A-T-025w | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| A-T-026w | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| A-T-027s | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 |
| A-T-030s | | | | | | 15/02/2022 | | | | | 15/02/2022 | |
| A-T-031s | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| A-T-031w | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| A-T-032 FOC | | 15/02/2022 | | | | | | | | | | |
| A-T-032s | | | | | | 15/02/2022 | | | | | 15/02/2022 | |
| A-T-032w | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| A-T-037w | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| A-T-044 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 |
| A-T-045 | 02/02/2022 | | | 02/02/2022 | 02/02/2022 | 02/02/2022 | | 02/02/2022 | | 03/02/2022 | 03/02/2022 | |
| A-T-050w | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| A-T-052s | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 |
| A-T-054 | | | | 08/02/2022 | | | | | | | | |
| A-T-055s | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 |
| A-T-ANCs | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| Calc | | | | | | 02/02/2022 | | | | | 02/02/2022 | |
| Calc-no stones | | | | | | 16/02/2022 | | | | | 16/02/2022 | |
| Probe (w) | | | | | | 16/02/2022 | | | | | 16/02/2022 | |

| Lab Sample ID | 22/00840/13 | 22/00840/14 | 22/00840/15 | 22/00840/16 | 22/00840/17 | 22/00840/18 | 22/00840/19 | 22/00840/20 | 22/00840/21 | 22/00840/22 | 22/00840/23 | 22/00840/24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | | | |
| Client Sample ID/Depth | VP01 0.3m | VP01 1.7m | QAQC01 | SKIP | MW101 2.5m | MW101 6m | MW103 0.5m | MW103 2.5m | MW103 3.8m | MW103 6m | MW104 2m | MW105 2m |
| Date Sampled | 19/01/22 | 19/01/22 | 25/01/22 | 27/01/22 | 25/01/22 | 25/01/22 | 20/01/22 | 27/01/22 | 27/01/22 | 27/01/22 | 26/01/22 | 26/01/22 |
| A-T-004s | | | | 09/02/2022 | | | | | | | | |
| A-T-006s | 07/02/2022 | 07/02/2022 | 07/02/2022 | | | | | | | | | |
| A-T-007s | | | | 09/02/2022 | | | | | | | | |
| A-T-019s | 08/02/2022 | 09/02/2022 | 08/02/2022 | 08/02/2022 | | | | | | | | |
| A-T-022s | 16/02/2022 | 16/02/2022 | 16/02/2022 | 07/02/2022 | | | | | | | | |
| A-T-024s | 16/02/2022 | 16/02/2022 | 16/02/2022 | | | | | | | | | |
| A-T-025w | | | | 16/02/2022 | | | | | | | | |
| A-T-026w | | | | 16/02/2022 | | | | | | | | |
| A-T-027s | 16/02/2022 | 16/02/2022 | 16/02/2022 | | | | | | | | | |
| A-T-030s | | | | 15/02/2022 | | | | | | | | |
| A-T-031s | | | | 16/02/2022 | | | | | | | | |
| A-T-031w | | | | 16/02/2022 | | | | | | | | |
| A-T-032 FOC | | | | | | | | | | | | |
| A-T-032s | | | | 15/02/2022 | | | | | | | | |
| A-T-032w | | | | 16/02/2022 | | | | | | | | |
| A-T-037w | | | | 16/02/2022 | | | | | | | | |
| A-T-044 | 16/02/2022 | 16/02/2022 | 16/02/2022 | 16/02/2022 | | | | | | | | |
| A-T-045 | 03/02/2022 | 03/02/2022 | 03/02/2022 | 03/02/2022 | | | | | | | | |
| A-T-050w | | | | 16/02/2022 | | | | | | | | |
| A-T-052s | 07/02/2022 | 08/02/2022 | 07/02/2022 | | | | | | | | | |
| A-T-054 | | | | | | | | | | | | |
| A-T-055s | 07/02/2022 | 09/02/2022 | 07/02/2022 | | | | | | | | | |
| A-T-ANCs | | | | 16/02/2022 | | | | | | | | |
| Calc | | | | 02/02/2022 | | | | | | | | |
| Calc-no stones | | | | 16/02/2022 | | | | | | | | |
| Probe (w) | | | | 16/02/2022 | | | | | | | | |

| Lab Sample ID | 22/00840/25 | 22/00840/26 | 22/00840/27 |
|---|---|---|---|
| Client Sample No | | | |
| Client Sample ID/Depth | MW105 4m | MW105 6m | QAQC7 |
| Date Sampled | 26/01/22 | 26/01/22 | 26/01/22 |
| A-T-004s | | | |
| A-T-006s | | 07/02/2022 | |
| A-T-007s | | | |
| A-T-019s | | 08/02/2022 | |
| A-T-022s | | 16/02/2022 | |
| A-T-024s | | 16/02/2022 | |
| A-T-025w | | | |
| A-T-026w | | | |
| A-T-027s | | 16/02/2022 | |
| A-T-030s | | | |
| A-T-031s | | | |
| A-T-031w | | | |
| A-T-032 FOC | | | |
| A-T-032s | | | |
| A-T-032w | | | |
| A-T-037w | | | |
| A-T-044 | | 16/02/2022 | |
| A-T-045 | | | |
| A-T-050w | | | |
| A-T-052s | | 07/02/2022 | |
| A-T-054 | | | |
| A-T-055s | | 07/02/2022 | |
| A-T-ANCs | | | |
| Calc | | | |
| Calc-no stones | | | |
| Probe (w) | | | |

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

**End of Report**

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Units 7 & 8, Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

# Final Test Report

**SUPPLEMENT TO TEST REPORT 22/00840/1**

| | | | |
|---|---|---|---|
| Envirolab Job Number: | 22/00840 | | |
| Issue Number: | 2 | Date: | 22-Mar-22 |

Client: RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

| | |
|---|---|
| Project Manager: | Johanna Houlahan/Rhys Jones/William Cook |
| Project Name: | Shell Welwyn Garden |
| Project Ref: | 1922098 |
| Order No: | N/A |

| | |
|---|---|
| Date Samples Received: | 31-Jan-22 |
| Date Instructions Received: | 1-Feb-22 |
| Date Analysis Completed: | 17-Feb-22 |

**Notes - Soil analysis**

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

**Notes - General**

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid

**Predominant Matrix Codes:** 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample

**Secondary Matrix Codes:** A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

**HWOL TPH Code:** EH_CU_1D_AL: Extractable hydrocarbons - i.e. everything extracted by the solvent(s), Clean-up - e.g. by florisil, silica gel, GC - Single coil gas chromatography, Aliphatics only

Approved by:

France

Sophie France
Client Service Manager

envirolab

***Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.***

| Sample Details | | | | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | **Method** | **ISO17025** | **MCERTS** | **22/00840/6** | | | | | | |
| Client Sample Number | | | | | | | | **Inert Waste Landfill** | **Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill** | **Hazardous Waste Landfill** |
| Client Sample ID | | | | MW103 | | | | | | |
| Depth to Top | | | | 3 | | | | | | |
| Depth to Bottom | | | | | | | | | | |
| Date Sampled | | | | 27/01/2022 | | | | | | |
| Sample Type | | | | Soil - ES | | | | | | |
| Sample Matrix Code | | | | 5A | | | | | | |
| **Solid Waste Analysis** | | | | | | | | | | |
| pH (pH Units)$_D$ | A-T-031 | **N** | **N** | **7.24** | | | | - | >6 | - |
| ANC to pH 4 (mol/kg)$_D$ | A-T-ANC | **N** | **N** | **<0.01** | | | | - | to be evaluated | to be evaluated |
| ANC to pH 6 (mol/kg)$_D$ | A-T-ANC | **N** | **N** | **<0.01** | | | | - | to be evaluated | to be evaluated |
| Loss on Ignition (%)$_D$ | A-T-030 | **N** | **N** | **2.9** | | | | - | - | 10 |
| Total Organic Carbon (%)$_D$ | A-T-032 | **N** | **N** | **0.07** | | | | 3 | 5 | 6 |
| PAH Sum of 17 (mg/kg)$_A$ | A-T-019 | **N** | **N** | **<0.08** | | | | 100 | - | - |
| Mineral Oil (mg/kg)$_{A\ EH\_CU\_1D\_AL}$ | A-T-007 | **N** | **N** | **<10** | | | | 500 | - | - |
| Sum of 7 PCBs (mg/kg)$_A$ | A-T-004 | **N** | **N** | **<0.007** | | | | 1 | - | - |
| Sum of BTEX (mg/kg)$_A$ | A-T-022 | **N** | **N** | **<0.01** | | | | 6 | - | - |
| **Eluate Analysis** | | | | **2:1** | **8:1** | **2:1** | **Cumulative 10:1** | **Limit values for compliance leaching test using** | | |
| | | | | **mg/l** | | **mg/kg** | | **BS EN 12457-3 at L/S 10 l/kg (mg/kg)** | | |
| Arsenic | A-T-025 | **N** | **N** | <0.001 | <0.001 | <0.002 | **<0.01** | 0.5 | 2 | 25 |
| Barium | A-T-025 | **N** | **N** | 0.018 | 0.013 | 0.039 | **0.140** | 20 | 100 | 300 |
| Cadmium | A-T-025 | **N** | **N** | <0.001 | <0.001 | <0.002 | **<0.01** | 0.04 | 1 | 5 |
| Chromium | A-T-025 | **N** | **N** | 0.002 | <0.001 | 0.004 | **<0.01** | 0.5 | 10 | 70 |
| Copper | A-T-025 | **N** | **N** | 0.002 | 0.001 | 0.004 | **0.010** | 2 | 50 | 100 |
| Mercury | A-T-025 | **N** | **N** | <0.0005 | <0.0005 | <0.001 | **<0.005** | 0.01 | 0.2 | 2 |
| Molybdenum | A-T-025 | **N** | **N** | <0.001 | <0.001 | <0.002 | **<0.01** | 0.5 | 10 | 30 |
| Nickel | A-T-025 | **N** | **N** | 0.002 | <0.001 | 0.004 | **<0.01** | 0.4 | 10 | 40 |
| Lead | A-T-025 | **N** | **N** | 0.005 | 0.004 | 0.011 | **0.040** | 0.5 | 10 | 50 |
| Antimony | A-T-025 | **N** | **N** | <0.001 | 0.002 | <0.002 | **<0.01** | 0.06 | 0.7 | 5 |
| Selenium | A-T-025 | **N** | **N** | <0.001 | <0.001 | <0.002 | **<0.01** | 0.1 | 0.5 | 7 |
| Zinc | A-T-025 | **N** | **N** | 0.017 | 0.012 | 0.037 | **0.130** | 4 | 50 | 200 |
| Chloride | A-T-026 | **N** | **N** | 4 | 14 | 10 | **129** | 800 | 15000 | 25000 |
| Fluoride | A-T-026 | **N** | **N** | <0.10 | 0.1 | <0.2 | **<1** | 10 | 150 | 500 |
| Sulphate as $SO_4$ | A-T-026 | **N** | **N** | 2 | 11 | 3 | **101** | 1000 | 20000 | 50000 |
| Total Dissolved Solids | A-T-035 | **N** | **N** | <20 | 66 | <40 | **<200** | 4000 | 60000 | 100000 |
| Phenol Index | A-T-050 | **N** | **N** | <0.01 | <0.01 | <0.02 | **<0.1** | 1 | - | - |
| Dissolved Organic Carbon | A-T-032 | **N** | **N** | <20.0 | 104.00 | <40 | **<200** | 500 | 800 | 1000 |
| **Leach Test Information** | | | | | | | | | | |
| pH (pH Units) | A-T-031 | **N** | **N** | 8.8 | 8.1 | | | | | |
| Conductivity (µS/cm) | A-T-037 | **N** | **N** | 38 | 131 | | | | | |
| | | | | | | | | | | |
| Mass Sample (kg) | | | | 0.208 | | | | | | |
| Dry Matter (%) | A-T-044 | **N** | **N** | 84.2 | | | | | | |
| **Stage 1** | | | | | | | | | | |
| Volume Leachant, $L_2$ (l) | A-T-046 | | | 0.350 | | | | | | |
| Filtered Eluate Volume, $VE_1$ (l) | A-T-046 | | | 0.200 | | | | | | |
| **Stage 2** | | | | | | | | | | |
| Volume Leachant, $L_8$ (l) | A-T-046 | | | 1.400 | | | | | | |

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

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***Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.***

| Sample Details | | | | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | **Method** | **ISO17025** | **MCERTS** | **22/00840/11** | | | | | | |
| Client Sample Number | | | | | | | | **Inert Waste Landfill** | **Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill** | **Hazardous Waste Landfill** |
| Client Sample ID | | | | MW105 | | | | | | |
| Depth to Top | | | | 3 | | | | | | |
| Depth to Bottom | | | | | | | | | | |
| Date Sampled | | | | 26/01/2022 | | | | | | |
| Sample Type | | | | Soil - ES | | | | | | |
| Sample Matrix Code | | | | 4A | | | | | | |
| **Solid Waste Analysis** | | | | | | | | | | |
| pH (pH Units)$_D$ | A-T-031 | N | N | **7.81** | | | | - | >6 | - |
| ANC to pH 4 (mol/kg)$_D$ | A-T-ANC | N | N | **<0.01** | | | | - | to be evaluated | to be evaluated |
| ANC to pH 6 (mol/kg)$_D$ | A-T-ANC | N | N | **<0.01** | | | | - | to be evaluated | to be evaluated |
| Loss on Ignition (%)$_D$ | A-T-030 | N | N | **1.3** | | | | - | - | 10 |
| Total Organic Carbon (%)$_D$ | A-T-032 | N | N | **<0.03** | | | | 3 | 5 | 6 |
| PAH Sum of 17 (mg/kg) $_A$ | A-T-019 | N | N | **<0.08** | | | | 100 | - | - |
| Mineral Oil (mg/kg)$_{A\ EH\_CU\_1D\_AL}$ | A-T-007 | N | N | **<10** | | | | 500 | - | - |
| Sum of 7 PCBs (mg/kg)$_A$ | A-T-004 | N | N | **<0.007** | | | | 1 | - | - |
| Sum of BTEX (mg/kg)$_A$ | A-T-022 | N | N | **<0.01** | | | | 6 | - | - |
| **Eluate Analysis** | | | | **2:1** | **8:1** | **2:1** | **Cumulative 10:1** | **Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)** | | |
| | | | | **mg/l** | | **mg/kg** | | | | |
| Arsenic | A-T-025 | N | N | <0.001 | <0.001 | <0.002 | **<0.01** | 0.5 | 2 | 25 |
| Barium | A-T-025 | N | N | 0.018 | 0.017 | 0.038 | **0.170** | 20 | 100 | 300 |
| Cadmium | A-T-025 | N | N | <0.001 | <0.001 | <0.002 | **<0.01** | 0.04 | 1 | 5 |
| Chromium | A-T-025 | N | N | <0.001 | 0.001 | <0.002 | **<0.01** | 0.5 | 10 | 70 |
| Copper | A-T-025 | N | N | 0.003 | 0.002 | 0.006 | **0.020** | 2 | 50 | 100 |
| Mercury | A-T-025 | N | N | <0.0005 | <0.0005 | <0.001 | **<0.005** | 0.01 | 0.2 | 2 |
| Molybdenum | A-T-025 | N | N | 0.001 | 0.004 | 0.002 | **0.040** | 0.5 | 10 | 30 |
| Nickel | A-T-025 | N | N | <0.001 | <0.001 | <0.002 | **<0.01** | 0.4 | 10 | 40 |
| Lead | A-T-025 | N | N | 0.010 | 0.003 | 0.021 | **0.040** | 0.5 | 10 | 50 |
| Antimony | A-T-025 | N | N | <0.001 | 0.002 | <0.002 | **<0.01** | 0.06 | 0.7 | 5 |
| Selenium | A-T-025 | N | N | <0.001 | <0.001 | <0.002 | **<0.01** | 0.1 | 0.5 | 7 |
| Zinc | A-T-025 | N | N | 0.016 | 0.007 | 0.034 | **0.080** | 4 | 50 | 200 |
| Chloride | A-T-026 | N | N | 4 | 3 | 8 | **35** | 800 | 15000 | 25000 |
| Fluoride | A-T-026 | N | N | <0.10 | 1.0 | <0.2 | **<1** | 10 | 150 | 500 |
| Sulphate as $SO_4$ | A-T-026 | N | N | 2 | 14 | 4 | **131** | 1000 | 20000 | 50000 |
| Total Dissolved Solids | A-T-035 | N | N | <20 | 53 | <40 | **<200** | 4000 | 60000 | 100000 |
| Phenol Index | A-T-050 | N | N | <0.01 | <0.01 | <0.02 | **<0.1** | 1 | - | - |
| Dissolved Organic Carbon | A-T-032 | N | N | <20.0 | <20.0 | <40 | **<200** | 500 | 800 | 1000 |
| **Leach Test Information** | | | | | | | | | | |
| pH (pH Units) | A-T-031 | N | N | 8.7 | 8.0 | | | | | |
| Conductivity (µS/cm) | A-T-037 | N | N | 33 | 107 | | | | | |
| | | | | | | | | | | |
| Mass Sample (kg) | | | | 0.195 | | | | | | |
| Dry Matter (%) | A-T-044 | N | N | 89.5 | | | | | | |
| **Stage 1** | | | | | | | | | | |
| Volume Leachant, $L_2$ (l) | A-T-046 | | | 0.350 | | | | | | |
| Filtered Eluate Volume, $VE_1$ (l) | A-T-046 | | | 0.200 | | | | | | |
| **Stage 2** | | | | | | | | | | |
| Volume Leachant, $L_8$ (l) | A-T-046 | | | 1.400 | | | | | | |

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

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***Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.***

| Sample Details | | | | | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | Method | ISO17025 | MCERTS | 22/00840/16 | | | | | | | |
| Client Sample Number | | | | | | | | | Inert Waste Landfill | Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill | Hazardous Waste Landfill |
| Client Sample ID | | | | SKIP | | | | | | | |
| Depth to Top | | | | | | | | | | | |
| Depth to Bottom | | | | | | | | | | | |
| Date Sampled | | | | 27/01/2022 | | | | | | | |
| Sample Type | | | | Soil - ES | | | | | | | |
| Sample Matrix Code | | | | 6A | | | | | | | |
| **Solid Waste Analysis** | | | | | | | | | | | |
| pH (pH Units)$_D$ | A-T-031 | N | N | **8.05** | | | | | - | >6 | - |
| ANC to pH 4 (mol/kg)$_D$ | A-T-ANC | N | N | **0.02** | | | | | - | to be evaluated | to be evaluated |
| ANC to pH 6 (mol/kg)$_D$ | A-T-ANC | N | N | **0.02** | | | | | - | to be evaluated | to be evaluated |
| Loss on Ignition (%)$_D$ | A-T-030 | N | N | **2.3** | | | | | - | - | 10 |
| Total Organic Carbon (%)$_D$ | A-T-032 | N | N | **0.04** | | | | | 3 | 5 | 6 |
| PAH Sum of 17 (mg/kg) $_A$ | A-T-019 | N | N | **<0.08** | | | | | 100 | - | - |
| Mineral Oil (mg/kg)$_{A\ EH\_CU\_1D\_AL}$ | A-T-007 | N | N | **<10** | | | | | 500 | - | - |
| Sum of 7 PCBs (mg/kg)$_A$ | A-T-004 | N | N | **<0.007** | | | | | 1 | - | - |
| Sum of BTEX (mg/kg)$_A$ | A-T-022 | N | N | **<0.01** | | | | | 6 | - | - |
| **Eluate Analysis** | | | | 2:1 | 8:1 | 2:1 | Cumulative 10:1 | | Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg) | | |
| | | | | mg/l | | mg/kg | | | | | |
| Arsenic | A-T-025 | N | N | 0.001 | <0.001 | 0.002 | **<0.01** | | 0.5 | 2 | 25 |
| Barium | A-T-025 | N | N | 0.019 | 0.025 | 0.041 | **0.250** | | 20 | 100 | 300 |
| Cadmium | A-T-025 | N | N | <0.001 | <0.001 | <0.002 | **<0.01** | | 0.04 | 1 | 5 |
| Chromium | A-T-025 | N | N | 0.002 | 0.003 | 0.004 | **0.030** | | 0.5 | 10 | 70 |
| Copper | A-T-025 | N | N | 0.003 | 0.001 | 0.006 | **0.010** | | 2 | 50 | 100 |
| Mercury | A-T-025 | N | N | <0.0005 | <0.0005 | <0.001 | **<0.005** | | 0.01 | 0.2 | 2 |
| Molybdenum | A-T-025 | N | N | <0.001 | 0.001 | <0.002 | **<0.01** | | 0.5 | 10 | 30 |
| Nickel | A-T-025 | N | N | 0.001 | 0.001 | 0.002 | **0.010** | | 0.4 | 10 | 40 |
| Lead | A-T-025 | N | N | 0.012 | 0.002 | 0.026 | **0.030** | | 0.5 | 10 | 50 |
| Antimony | A-T-025 | N | N | <0.001 | 0.002 | <0.002 | **<0.01** | | 0.06 | 0.7 | 5 |
| Selenium | A-T-025 | N | N | <0.001 | <0.001 | <0.002 | **<0.01** | | 0.1 | 0.5 | 7 |
| Zinc | A-T-025 | N | N | 0.014 | 0.010 | 0.030 | **0.110** | | 4 | 50 | 200 |
| Chloride | A-T-026 | N | N | 4 | 4 | 8 | **41** | | 800 | 15000 | 25000 |
| Fluoride | A-T-026 | N | N | 0.8 | 0.6 | 1.7 | **6.0** | | 10 | 150 | 500 |
| Sulphate as $SO_4$ | A-T-026 | N | N | 3 | 14 | 6 | **127** | | 1000 | 20000 | 50000 |
| Total Dissolved Solids | A-T-035 | N | N | <20 | 63 | <40 | **<200** | | 4000 | 60000 | 100000 |
| Phenol Index | A-T-050 | N | N | <0.01 | <0.01 | <0.02 | **<0.1** | | 1 | - | - |
| Dissolved Organic Carbon | A-T-032 | N | N | <20.0 | 24.80 | <40 | **<200** | | 500 | 800 | 1000 |
| **Leach Test Information** | | | | | | | | | | | |
| pH (pH Units) | A-T-031 | N | N | 8.5 | 7.9 | | | | | | |
| Conductivity (µS/cm) | A-T-037 | N | N | 38 | 126 | | | | | | |
| | | | | | | | | | | | |
| Mass Sample (kg) | | | | 0.199 | | | | | | | |
| Dry Matter (%) | A-T-044 | N | N | 88.1 | | | | | | | |
| **Stage 1** | | | | | | | | | | | |
| Volume Leachant, $L_2$ (l) | A-T-046 | | | 0.350 | | | | | | | |
| Filtered Eluate Volume, $VE_1$ (l) | A-T-046 | | | 0.200 | | | | | | | |
| **Stage 2** | | | | | | | | | | | |
| Volume Leachant, $L_8$ (l) | A-T-046 | | | 1.400 | | | | | | | |

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

# FINAL ANALYTICAL TEST REPORT

| | | |
|---|---|---|
| **Envirolab Job Number:** | 22/00826 | |
| **Issue Number:** | 1 | **Date:** 07 February, 2022 |

**Client:** RSK Environment Ltd Hemel
18 Frogmore Road
Hemel Hempstead
Hertfordshire
UK
HP3 9RT

| | |
|---|---|
| **Project Manager:** | Johanna Houlahan |
| **Project Name:** | Shell Welwyn Garden |
| **Project Ref:** | 1922098 |
| **Order No:** | N/A |
| **Date Samples Received:** | 27/01/22 |
| **Date Instructions Received:** | 31/01/22 |
| **Date Analysis Completed:** | 07/02/22 |

**Approved by:**

Sophie France
Client Service Manager

UKAS TESTING 1247

**Envirolab Job Number: 22/00826**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00826/1 | 22/00826/2 | 22/00826/3 | 22/00826/4 | 22/00826/5 | 22/00826/6 | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC03 | QAQC04 | QAQC05 | QAQC06 | QAQC08 | QAQC02 | | | | |
| Depth to Top | | | | | | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 24-Jan-22 | 25-Jan-22 | 26-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | | |
| Sample Type | Water - EW | Water - EW | Water - EW | Water - EW | Water - EW | Water - EW | | | | |
| Sample Matrix Code | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| Ali >C5-C6 (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| Ali >C6-C8 (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| Aro >C5-C7 (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| Aro >C7-C8 (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| BTEX - Benzene (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| BTEX - Toluene (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| BTEX - Ethyl Benzene (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| BTEX - m & p Xylene (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| BTEX - o Xylene (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |
| MTBE (w)$_{A}^{\#}$ | <1 | <1 | <1 | <1 | <1 | <1 | | µg/l | 1 | A-T-022w |

**Envirolab Job Number: 22/00826**

**Client Project Name: Shell Welwyn Garden**

**Client Project Ref: 1922098**

| Lab Sample ID | 22/00826/1 | 22/00826/2 | 22/00826/3 | 22/00826/4 | 22/00826/5 | 22/00826/6 | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | QAQC03 | QAQC04 | QAQC05 | QAQC06 | QAQC08 | QAQC02 | | | | |
| Depth to Top | | | | | | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 25-Jan-22 | 24-Jan-22 | 25-Jan-22 | 26-Jan-22 | 27-Jan-22 | 27-Jan-22 | | | | |
| Sample Type | Water - EW | Water - EW | Water - EW | Water - EW | Water - EW | Water - EW | | | | |
| Sample Matrix Code | N/A | N/A | N/A | N/A | N/A | N/A | | | | |
| **TPH CWG (w) with Clean Up *C1** | | | | | | | | | | |
| Ali >C8-C10 (w)$_{A}^{\#}$ | <5 | <5 | <5 | <5 | <5 | - | | µg/l | 5 | A-T-055w |
| Ali >C10-C12 (w)$_{A}^{\#}$ | <5 | <5 | <5 | <5 | <5 | - | | µg/l | 5 | A-T-055w |
| Ali >C12-C16 (w)$_{A}^{\#}$ | <5 | <5 | <5 | 26 | <5 | - | | µg/l | 5 | A-T-055w |
| Ali >C16-C21 (w)$_{A}^{\#}$ | <5 | 6 | <5 | <5 | <5 | - | | µg/l | 5 | A-T-055w |
| Ali >C21-C35 (w)$_{A}^{\#}$ | <5 | <5 | <5 | 27 | <5 | - | | µg/l | 5 | A-T-055w |
| Total Aliphatics (w)$_{A}^{\#}$ | <5 | 6 | <5 | 53 | <5 | - | | µg/l | 5 | A-T-055w |
| Aro >C8-C10 (w)$_{A}$ | <10 | <10 | <10 | 14 | <10 | - | | µg/l | 5 | A-T-055w |
| Aro >C10-C12 (w)$_{A}^{\#}$ | <5 | <5 | <5 | 10 | <5 | - | | µg/l | 5 | A-T-055w |
| Aro >C12-C16 (w)$_{A}^{\#}$ | <5 | <5 | 5 | 76 | <5 | - | | µg/l | 5 | A-T-055w |
| Aro >C16-C21 (w)$_{A}^{\#}$ | <5 | <5 | 8 | 71 | <5 | - | | µg/l | 5 | A-T-055w |
| Aro >C21-C35 (w)$_{A}$ | <10 | <10 | <10 | <10 | <10 | - | | µg/l | 10 | A-T-055w |
| Total Aromatics (w)$_{A}$ | <10 | <10 | 13 | 171 | <10 | - | | µg/l | 10 | A-T-055w |
| TPH (Ali & Aro >C5-C35) (w)$_{A}$ | <10 | <10 | 13 | 224 | <10 | - | | µg/l | 10 | A-T-055w |

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## REPORT NOTES

**General**

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

**Soil chemical analysis:**

All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

**TPH analysis of water by method A-T-007:**

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

**Electrical Conductivity of water by Method A-T-037:**

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

**Asbestos:**

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

**Predominant Matrix Codes:**

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

**Secondary Matrix Codes:**

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

**Key:**

IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
TPH CWG *C1 indicates results with humics mathematically subtracted through instrument calculation
TPH CWG *C2 indicates results cleaned up with Silica during extraction

**EPH CWG GCxGC ID from TPH CWG with Clean Up** $_{C1}$

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

# Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

**Client:** RSK Environment Ltd Hemel, 18 Frogmore Road, Hemel Hempstead, Hertfordshire, UK, HP3 9RT
**Project:** Shell Welwyn Garden
**Clients Project No:** 1922098

**Project No:** 22/00826
**Date Received:** 31/01/2022 (am)
**Cool Box Temperatures (°C):** 6.1 & 6.7

NO DEVIATIONS IDENTIFIED
If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

# Envirolab Analysis Dates

| Lab Sample ID | 22/00826/1 | 22/00826/2 | 22/00826/3 | 22/00826/4 | 22/00826/5 | 22/00826/6 |
|---|---|---|---|---|---|---|
| Client Sample No | | | | | | |
| Client Sample ID/Depth | QAQC03 | QAQC04 | QAQC05 | QAQC06 | QAQC08 | QAQC02 |
| Date Sampled | 25/01/22 | 24/01/22 | 25/01/22 | 26/01/22 | 27/01/22 | 27/01/22 |
| A-T-022w | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 |
| A-T-055w | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | 07/02/2022 | |

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

**End of Report**

# APPENDIX K
# GEOTECHNICAL SPT RESULTS

**Table K1: SPT results**

| Monitoring well | Depth (m bgl) | Strata | SPT 'n' value |
|---|---|---|---|
| MW101 | 1.5 | Made Ground | 1, 1, 1, 1, 1, 1 = 4 |
| | 3.0 | Slightly Sandy Silt | 3, 3, 4, 4, 3, 3 = 14 |
| | 4.5 | Gravelly Sandy Clay | 3, 5, 5, 4, 5, 6 = 20 |
| | 6.0 | Slightly Sandy Gravelly Clay | 2, 3, 4, 5, 4, 6 = 19 |
| MW105 | 1.5 | Made Ground | 6, 8, 11, 10, 10, 9 = 40 |
| | 3.0 | Slightly Clayey Gravelly Sand | 1, 2, 4, 5, 4, 4 = 17 |
| | 4.5 | Gravelly Sandy Silt | 2, 2, 4, 6, 6, 5 = 21 |
| | 6.0 | Slightly Clayey Sand | 1, 3, 5, 5, 4, 6 = 20 |

# APPENDIX L
# ANALYTICAL RESULTS SUMMARIES

RSK GEOSCIENCES

**Table L1: Soil analytical results summary – selected retail petroleum COPC**

| COPC mg/kg unless stated | Location | MW101 | MW101 | MW101 | MW102 | MW103 | MW103 | MW103 | MW104 | MW104 | MW105 | MW105 | MW105 | MW105 | VP01 | VP01 | GAC * mg/kg unless stated |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depth (m) | 1.6 | 3.8 | 4.9 | 1.00 | 1.50 | 3.00 | 5.00 | 0.70 | 3.00 | 1.0 | 3.0 | 5.0 | 6.0 | 0.3 | 1.7 | |
| Aliphatic >C5-C6 | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *600* |
| Aliphatic >C6-C8 | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *1500* |
| Aliphatic >C8-C10 | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | *400* |
| Aliphatic >C10-C12 | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | *1900* |
| Aliphatic >C12-C16 | | <1 | <1 | <1 | 2 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | *15000* |
| Aliphatic >C16-C21 | | <1 | <1 | <1 | 11 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - |
| Aliphatic >C21-C35 | | 1 | <1 | <1 | 129 | <1 | <1 | <1 | 3 | <1 | 24 | <1 | 4 | 2 | 5 | 2 | - |
| Aromatic >C5-C7 | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | - |
| Aromatic >C7-C8 | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | - |
| Aromatic >C8-C10 | | <5 | <5 | <5 | 7 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 63 | *700* |
| Aromatic >C10-C12 | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | *4000* |
| Aromatic >C12-C16 | | <1 | <1 | <1 | 4 | <1 | <1 | <1 | <1 | <1 | 5 | <1 | <1 | <1 | <1 | <1 | *26000* |
| Aromatic >C16-C21 | | <1 | <1 | <1 | 37 | <1 | <1 | <1 | <1 | <1 | 4 | <1 | <1 | <1 | <1 | <1 | *27000* |
| Aromatic >C21-C35 | | <1 | <1 | <1 | 173 | <1 | <1 | <1 | 3 | <1 | 28 | <1 | <1 | <1 | 4 | 1 | *28000* |
| TPH (C5-C35) | | <5 | <5 | <5 | 363 | <5 | <5 | <5 | 5 | <5 | 60 | <5 | <5 | <5 | 9 | 66 | - |
| BTEX - Benzene | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *5* |
| BTEX - Toluene | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *13000* |
| BTEX - Ethyl Benzene | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *1000* |
| BTEX - o Xylene | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *1400* |
| BTEX - m & p Xylene | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *1300* |
| MTBE | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | *1500* |
| TAME | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - |
| DIPE | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - |
| ETBE | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - |
| TBA | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - |
| n-Hexane | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | - |
| Ethanol (µg/kg) | | <100 | <100 | <100 | 1030 | <100 | <100 | 131 | 177 | <100 | 148 | <100 | 137 | <100 | <100 | <100 | - |
| 1,2-Dichloroethane (µg/kg) | | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | *0.13* |
| 1,2-Dibromoethane (µg/kg) | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - |
| 2-methylnaphthalene (µg/kg) | | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | <100 | - |
| PAH – naphthalene | | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.09 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | *400* |
| Total PAH (16) | | <0.08 | <0.08 | <0.08 | 32.1 | <0.08 | <0.08 | <0.08 | 0.38 | <0.08 | 6.19 | <0.08 | <0.08 | <0.08 | <0.08 | 0.82 | - |

Notes: NA = Not Analysed
GAC* = Human health GACs for a continued oil scenario since at SOM 1% the GACs for certain COPC were generally lower than the LMDL.

**Table L2: Soil analytical results summary – selected non-retail petroleum COPC, including comparison with applicable GAC**

<table>
<tr><th rowspan="2">COPC<br>mg/kg unless stated</th><th>Location</th><th>MW101</th><th>MW101</th><th>MW102</th><th>VP01</th><th>VP01</th><th>MW105</th><th>GAC</th></tr>
<tr><th>Depth (m)</th><th>1.6</th><th>3.8</th><th>1.00</th><th>0.3</th><th>1.7</th><th>1.0</th><th>mg/kg unless stated</th></tr>
<tr><td colspan="2">Carbon tetrachloride</td><td><1</td><td><1</td><td><1</td><td><1</td><td><1</td><td>NA</td><td>0.6</td></tr>
<tr><td colspan="2">Dichloromethane</td><td><5</td><td><5</td><td><5</td><td><5</td><td><5</td><td>NA</td><td>-</td></tr>
<tr><td colspan="2">1,1,1-Trichloroethane</td><td><1</td><td><1</td><td><1</td><td><1</td><td><1</td><td>NA</td><td>100</td></tr>
<tr><td colspan="2">Trichloroethene</td><td><1</td><td><1</td><td><1</td><td><1</td><td><1</td><td>NA</td><td>0.15</td></tr>
<tr><td colspan="2">Tetrachloroethene</td><td><1</td><td><1</td><td><1</td><td><1</td><td><1</td><td>NA</td><td>5.2</td></tr>
<tr><td colspan="2">Vinyl chloride</td><td><1</td><td><1</td><td><1</td><td><1</td><td><1</td><td>NA</td><td>0.21</td></tr>
<tr><td colspan="2">PCBs</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td>NA</td><td><0.007</td><td>-</td></tr>
<tr><td colspan="9">Notes: NA = Not Analysed<br>Human health GACs for a continued oil scenario since at SOM 1% the GACs for certain COPC were generally lower than the LMDL.</td></tr>
</table>

**Table L3: Potable water analytical results summary (µg/l) – selected retail petroleum COPC, including comparison with applicable GAC**

<table>
<tr><th>COPC - µg/l unless stated</th><th>Potable water sample – TAP1</th><th>UK Drinking Water Standard (DWS)</th></tr>
<tr><td>Aliphatic >C5-C6</td><td><1</td><td>RBSL: 30,000</td></tr>
<tr><td>Aliphatic >C6-C8</td><td><1</td><td>WHO DWS: 15,000</td></tr>
<tr><td>Aliphatic >C8-C10</td><td><5</td><td>WHO DWS: 300</td></tr>
<tr><td>Aliphatic >C10-C12</td><td><5</td><td>WHO DWS: 300</td></tr>
<tr><td>Aliphatic >C12-C16</td><td><5</td><td>WHO DWS: 300</td></tr>
<tr><td>Aliphatic >C16-C21</td><td><5</td><td>WHO DWS: N/A</td></tr>
<tr><td>Aliphatic >C21-C35</td><td><5</td><td></td></tr>
<tr><td>Aromatic >C5-C7</td><td><1</td><td>Statutory DWS of 1 (refer to benzene)</td></tr>
<tr><td>Aromatic >C7-C8</td><td><1</td><td>LTOT: 42, RBSL: 480 (refer to toluene)</td></tr>
<tr><td>Aromatic >C8-C9</td><td><5</td><td rowspan="2">LTOT: 29, RBSL: 590 (refer to benzene) or RBSL: 1,200 (refer to xylene)</td></tr>
<tr><td>Aromatic >C9-C10</td><td><5</td></tr>
<tr><td>Aromatic >C10-C12</td><td><5</td><td>RBSL: 250</td></tr>
<tr><td>Aromatic >C12-C16</td><td><5</td><td>RBSL: 270</td></tr>
<tr><td>Aromatic >C16-C21</td><td><5</td><td>RBSL: 260</td></tr>
<tr><td>Aromatic >C21-C35</td><td><10</td><td rowspan="2">WHO DWS: 90</td></tr>
<tr><td>TPH (C5-C35)</td><td><10</td></tr>
<tr><td>BTEX - Benzene</td><td><1</td><td>1</td></tr>
</table>

| | | |
|---|---|---|
| BTEX - Toluene | <1 | LTOT: 42, RBSL: 480 |
| BTEX - Ethyl Benzene | <1 | LTOT: 29, RBSL: 590 |
| BTEX - m & p Xylene | <1 | LTOT: -, RBSL: 1,200 |
| BTEX - o Xylene | <1 | |
| MTBE | <1 | LTOT: 20, RBSL: 2,300 |
| TAME | <10 | LTOT: 128, RBSL: 800 |
| DIPE | <10 | LTOT: 0.8*, RBSL: 440 |
| ETBE | <10 | LTOT: 13, RBSL: 1,700 |
| TBA | <50 | LTOT: -, RBSL: 7,500 |
| Ethanol | <100 | |
| 1,2-Dichloroethane | <1 | 3 |
| 1,2-Dibromoethane | <1 | LTOT: -, RBSL: 1.9 |
| PAH – naphthalene | <0.1 | LTOT: 21, RBSL: 150 |
| Total PAH (16) | <0.1 | |
| 2-methylnaphthalene | <1 | LTOT: 10, RBSL: 28 |
| Carbon tetrachloride | <1 | Statutory DWS 3.0 |
| Dichloromethane | <5 | Statutory DWS 3.0 |
| 1,1,1-Trichloroethane | <1 | |
| Trichloroethene | <1 | Statutory DWS 10.0 sum of TCE and PCE |
| Tetrachloroethene | <1 | |
| Vinyl chloride | <1 | Statutory DWS 0.5 |
| ***Notes:*** *< denotes below the respective LMDL*<br>*LTOT: Lower Taste & Odour Thresholds, RBSL = Risk Based Screening Level*<br>** = LMDL is higher than the DWS* | | |

**Table L4: Vapour-phase analytical results summary (µg/m3) – selected retail petroleum and/or non-retail petroleum COPC, including comparison with applicable vGAC**

| COPC (µg/m3) | Location | VP01 | MW101 | MW105 | MW104 | TRIP BLANK | RSK vGAC - Residential (Small Terrace House) | RSK vGAC - Commercial (Office pre-1970) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | (µg/m3) | |
| MTBE | | <5.4 | <5.4 | <5.4 | <5.4 | <5.4 | *807,000* | *25679,000* |
| Benzene | | 7.7 | <4.8 | 15.7 | 7.3 | <4.8 | *1,590* | *49,990* |
| Toluene | | 33.2 | 25.2 | 88.9 | 185.8 | <5.7 | *1580,000* | *49945,000* |
| Ethylbenzene | | <6.5 | <6.5 | 8.7 | <6.5 | <6.5 | *83,100* | *2644,000* |
| m/p-Xylene | | 6.9 | <6.5 | 8.7 | <6.5 | <6.5 | *62,300 (Xylenes)* | *2089,000 (Xylenes)* |
| o-Xylene | | <6.5 | <6.5 | <6.5 | <6.5 | <6.5 | | |
| Aliphatic >C4-C6 | | <33 | 53 | <33 | 5539 | <33 | *2831,000* | *89271,000* |
| Aliphatic >C6-C8 | | <41 | 413 | 315 | 1247 | <41 | *2831,000* | *89271,000* |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Aliphatic >C8-C10 | <53 | <53 | 85 | <53 | <53 | *164,000* | *5178,000* |
| Aliphatic >C10-C12 | <65 | <65 | 589 | 1276 | <65 | *164,000* | *5178,000* |
| Aromatic >C5-EC7 (Benzene) | 7.7 | <4.8 | 15.7 | 7.3 | <4.8 | - | - |
| Aromatic >EC7-EC8 (Toluene) | 33.2 | 25.2 | 88.9 | 185.8 | <5.7 | - | - |
| Aromatic >EC8-EC10 | <49 | <49 | <49 | <49 | <49 | *34,000* | *1071,000* |
| Aromatic >EC10-EC12 | <53 | <53 | <53 | <53 | <53 | *34,000* | *1071,000* |

**Table L5: Results of waste soils characterisation assessment (HASWASTE)**

| Sample reference/location | Waste classification |
|---|---|
| MW103 at 3 m bgl | not hazardous |
| MW105 at 3m bgl | not hazardous |
| Composite sample from the skip 'SKIP' | not hazardous |

# APPENDIX M
# WASTE CHARACTERISATION ASSESSMENT OUTPUTS

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Haswaste, developed by Dr. Iain Haslock.

**Shell Welwyn Garden**

| **Sample ID** | | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | 22/00840/15 | 22/00840/16 | 22/00840/26 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Borehole ID / Depth** | | MW101 - 1.6m | MW101 - 3.8m | MW101 - 4.9m | MW102 - 1.0m | MW103 - 1.5m | MW103 - 3.0m | MW103 - 5.0m | MW104 - 0.7m | MW104 - 3.0m | MW105 - 1.0m | MW105 - 3.0m | MW105 - 5.0m | VP01 - 0.3m | VP01 - 1.7m | QAQC01 | SKIP | MW105 - 6.0m | |
| **Date** | | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | 24-Jan-22 | 27-Jan-22 | 26-Jan-22 | |
| % Moisture | % | | | | | | 10.7 | | | | | 9.7 | | | | | 9.7 | | |
| pH (soil) | | | | | | | 7.24 | | | | | 7.81 | | | | | 8.05 | | |
| pH (leachate) | | | | | | | 8.80 | | | | | 8.70 | | | | | 8.50 | | |
| Arsenic | mg/kg | 1 | 3 | 18 | 26 | 12 | 34 | 4 | 12 | 8 | 6 | 3 | 2 | 1 | 1 | 4 | | 2 | |
| Cadmium | mg/kg | 0.50 | 0.50 | 0.80 | 0.50 | 0.60 | 1.90 | 0.50 | 0.60 | 0.60 | 0.80 | 0.50 | 0.60 | 0.50 | 0.60 | 0.70 | | 0.50 | |
| Copper | mg/kg | 41.00 | 12.00 | 15.00 | 121.00 | 17.00 | 44.00 | 10.00 | 10.00 | 13.00 | 17.00 | 5.00 | 7.00 | 11.00 | 12.00 | 31.00 | | 7.00 | |
| CrVI or Chromium | mg/kg | 45.00 | 34.00 | 35.00 | 16.00 | 29.00 | 29.00 | 25.00 | 20.00 | 30.00 | 24.00 | 13.00 | 29.00 | 36.00 | 40.00 | 24.00 | | 12.00 | |
| Lead | mg/kg | 5.00 | 14.00 | 14.00 | 70.00 | 14.00 | 26.00 | 7.00 | 15.00 | 12.00 | 59.00 | 5.00 | 10.00 | 4.00 | 4.00 | 11.00 | | 8.00 | |
| Mercury | mg/kg | 0.17 | 0.17 | 0.17 | 0.57 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.59 | 0.17 | 0.17 | 0.17 | 0.81 | 0.17 | | 0.17 | |
| Nickel | mg/kg | 54.00 | 19.00 | 35.00 | 15.00 | 26.00 | 83.00 | 17.00 | 23.00 | 40.00 | 20.00 | 13.00 | 25.00 | 34.00 | 37.00 | 40.00 | | 14.00 | |
| Selenium | mg/kg | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | |
| Zinc | mg/kg | 29 | 61 | 89 | 64 | 72 | 199 | 24 | 54 | 61 | 79 | 30 | 29 | 27 | 24 | 42 | | 29 | |
| Barium | mg/kg | | | | | | | | | | | | | | | | | | |
| Beryllium | mg/kg | | | | | | | | | | | | | | | | | | |
| Vanadium | mg/kg | | | | | | | | | | | | | | | | | | |
| Cobalt | mg/kg | 377 | 12 | 13 | 6 | 11 | 13 | 7 | 9 | 11 | 5 | 3 | 8 | 9 | 6 | 12 | | 12 | |
| Manganese | mg/kg | | | | | | | | | | | | | | | | | | |
| Molybdenum | mg/kg | | | | | | | | | | | | | | | | | | |
| Antimony | mg/kg | | | | | | | | | | | | | | | | | | |
| Aluminium | mg/kg | | | | | | | | | | | | | | | | | | |
| Bismuth | mg/kg | | | | | | | | | | | | | | | | | | |
| CrIII | mg/kg | | | | | | | | | | | | | | | | | | |
| Iron | mg/kg | | | | | | | | | | | | | | | | | | |
| Strontium | mg/kg | | | | | | | | | | | | | | | | | | |
| Tellurium | mg/kg | | | | | | | | | | | | | | | | | | |
| Thallium | mg/kg | | | | | | | | | | | | | | | | | | |
| Titanium | mg/kg | | | | | | | | | | | | | | | | | | |
| Tungsten | mg/kg | | | | | | | | | | | | | | | | | | |
| Ammoniacal N | mg/kg | | | | | | | | | | | | | | | | | | |
| ws Boron | mg/kg | | | | | | | | | | | | | | | | | | |
| **PAH** (Input Total PAH **OR** individual PAH results) | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | mg/kg | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.18 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | | 0.01 | |
| Acenaphthylene | mg/kg | 0.01 | 0.01 | 0.01 | 0.04 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | 0.01 | |
| Anthracene | mg/kg | 0.02 | 0.02 | 0.02 | 0.89 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.26 | 0.02 | 0.02 | 0.02 | 0.07 | 0.02 | | 0.02 | |
| Benzo(a)anthracene | mg/kg | 0.04 | 0.04 | 0.04 | 2.86 | 0.04 | 0.04 | 0.04 | 0.05 | 0.04 | 0.28 | 0.04 | 0.04 | 0.04 | 0.07 | 0.04 | | 0.04 | |
| Benzo(a)pyrene | mg/kg | 0.04 | 0.04 | 0.04 | 2.31 | 0.04 | 0.04 | 0.04 | 0.05 | 0.04 | 0.54 | 0.04 | 0.04 | 0.04 | 0.05 | 0.04 | | 0.04 | |
| Benzo(b)fluoranthene | mg/kg | 0.05 | 0.05 | 0.05 | 2.67 | 0.05 | 0.05 | 0.05 | 0.07 | 0.05 | 0.41 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | |
| Benzo(ghi)perylene | mg/kg | 0.05 | 0.05 | 0.05 | 0.99 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.59 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | |
| Benzo(k)fluoranthene | mg/kg | 0.07 | 0.07 | 0.07 | 0.85 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.14 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | | 0.07 | |
| Chrysene | mg/kg | 0.06 | 0.06 | 0.06 | 2.66 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.33 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | | 0.06 | |
| Dibenzo(ah)anthracene | mg/kg | 0.04 | 0.04 | 0.04 | 0.22 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.06 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | | 0.04 | |
| Fluoranthene | mg/kg | 0.08 | 0.08 | 0.08 | 7.31 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.83 | 0.08 | 0.08 | 0.08 | 0.20 | 0.08 | | 0.08 | |
| Fluorene | mg/kg | 0.01 | 0.01 | 0.01 | 0.06 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.15 | 0.01 | 0.01 | 0.01 | 0.03 | 0.01 | | 0.01 | |
| Indeno(123cd)pyrene | mg/kg | 0.03 | 0.03 | 0.03 | 1.32 | 0.03 | 0.03 | 0.03 | 0.05 | 0.03 | 0.52 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | | 0.03 | |
| Naphthalene | mg/kg | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.09 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | | 0.03 | |
| Phenanthrene | mg/kg | 0.03 | 0.03 | 0.03 | 3.60 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 1.12 | 0.03 | 0.03 | 0.03 | 0.22 | 0.03 | | 0.03 | |
| Pyrene | mg/kg | 0.07 | 0.07 | 0.07 | 6.35 | 0.07 | 0.07 | 0.07 | 0.08 | 0.07 | 0.67 | 0.07 | 0.07 | 0.07 | 0.16 | 0.07 | | 0.07 | |
| Coronene | mg/kg | | | | | | | | | | | | | | | | | | |
| Total PAHs (16 or 17) | mg/kg | | | | | | | | | | | | | | | | | | |
| **TPH** | | | | | | | | | | | | | | | | | | | |
| Petrol | mg/kg | | | | | | | | | | | | | | | | | | |
| Diesel | mg/kg | | | | | | | | | | | | | | | | | | |
| Lube Oil | mg/kg | | | | | | | | | | | | | | | | | | |
| Crude Oil | mg/kg | | | | | | | | | | | | | | | | | | |
| White Spirit / Kerosene | mg/kg | | | | | | | | | | | | | | | | | | |
| Creosote | mg/kg | | | | | | | | | | | | | | | | | | |
| Unknown TPH with ID | mg/kg | | | | | | | | | | | | | | | | | | |
| Unknown TPHCWG | mg/kg | | | | | | | | | | | | | | | | | | |
| Total Sulphide | mg/kg | | | | | | | | | | | | | | | | | | |
| Complex Cyanide | mg/kg | | | | | | | | | | | | | | | | | | |
| Free (or Total) Cyanide | mg/kg | | | | | | | | | | | | | | | | | | |
| Thiocyanate | mg/kg | | | | | | | | | | | | | | | | | | |
| Elemental/Free Sulphur | mg/kg | | | | | | | | | | | | | | | | | | |
| **Phenols** Input Total Phenols HPLC **OR** individual Phenol results. | | | | | | | | | | | | | | | | | | | |
| Phenol | mg/kg | | | | | | | | | | | | | | | | | | |
| Cresols | mg/kg | | | | | | | | | | | | | | | | | | |
| Xylenols | mg/kg | | | | | | | | | | | | | | | | | | |
| Resourcinol | mg/kg | | | | | | | | | | | | | | | | | | |
| Phenols Total by HPLC | mg/kg | | | | | | | | | | | | | | | | | | |
| **BTEX** Input Total BTEX **OR** individual BTEX results. | | | | | | | | | | | | | | | | | | | |
| Benzene | mg/kg | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | 0.01 | |
| Toluene | mg/kg | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | 0.01 | |
| Ethylbenzene | mg/kg | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | 0.01 | |
| Xylenes | mg/kg | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | 0.01 | |
| Total BTEX | mg/kg | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | 0.01 | |
| **PCBs (POPs)** | | | | | | | | | | | | | | | | | | | |
| PCBs Total (eg EC7/WHO12) | mg/kg | | | | | | | | | | 0.007 | | | | | | | | |
| **PBBs (POPs)** | | | | | | | | | | | | | | | | | | | |
| Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available) | mg/kg | | | | | | | | | | | | | | | | | | |

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Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Haswaste, developed by Dr. Iain Haslock.

**Shell Welwyn Garden**

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | 22/00840/15 | 22/00840/16 | 22/00840/26 | |
| **Borehole ID / Depth** | | MW101 - 1.6m | MW101 - 3.8m | MW101 - 4.9m | MW102 - 1.0m | MW103 - 1.5m | MW103 - 3.0m | MW103 - 5.0m | MW104 - 0.7m | MW104 - 3.0m | MW105 - 1.0m | MW105 - 3.0m | MW105 - 5.0m | VP01 - 0.3m | VP01 - 1.7m | QAQC01 | SKIP | MW105 - 6.0m | |
| **Date** | | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | 24-Jan-22 | 27-Jan-22 | 26-Jan-22 | |
| **POPs Dioxins and Furans** Input Total Dioxins and Furans **OR** individual Dioxin and Furan results. | | | | | | | | | | | | | | | | | | | |
| 2,3,7,8-TeCDD | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,7,8-PeCDD | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,4,7,8-HxCDD | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,6,7,8-HxCDD | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,7,8,9-HxCDD | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,4,6,7,8-HpCDD | mg/kg | | | | | | | | | | | | | | | | | | |
| OCDD | mg/kg | | | | | | | | | | | | | | | | | | |
| 2,3,7,8-TeCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,7,8-PeCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 2,3,4,7,8-PeCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,4,7,8-HxCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,6,7,8-HxCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 2,3,4,6,7,8-HxCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,7,8,9-HxCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,4,6,7,8-HpCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| 1,2,3,4,7,8,9-HpCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| OCDF | mg/kg | | | | | | | | | | | | | | | | | | |
| Total Dioxins and Furans | mg/kg | | | | | | | | | | | | | | | | | | |
| **Some Pesticides (POPs unless otherwise stated)** | | | | | | | | | | | | | | | | | | | |
| Aldrin | mg/kg | | | | | | | | | | | | | | | | | | |
| α Hexachlorocyclohexane (alpha-HCH) *(leave empty if total HCH results used)* | mg/kg | | | | | | | | | | | | | | | | | | |
| β Hexachlorocyclohexane (beta-HCH) *(leave empty if total HCH results used)* | mg/kg | | | | | | | | | | | | | | | | | | |
| α Cis-Chlordane (alpha) ***OR*** *Total Chlordane* | mg/kg | | | | | | | | | | | | | | | | | | |
| δ Hexachlorocyclohexane (delta-HCH) *(leave empty if total HCH results used)* | mg/kg | | | | | | | | | | | | | | | | | | |
| Dieldrin | mg/kg | | | | | | | | | | | | | | | | | | |
| Endrin | mg/kg | | | | | | | | | | | | | | | | | | |
| χ Hexachlorocyclohexane (gamma-HCH) (lindane) ***OR*** *Total HCH* | mg/kg | | | | | | | | | | | | | | | | | | |
| Heptachlor | mg/kg | | | | | | | | | | | | | | | | | | |
| Hexachlorobenzene | mg/kg | | | | | | | | | | | | | | | | | | |
| o,p'-DDT *(leave empty if total DDT results used)* | mg/kg | | | | | | | | | | | | | | | | | | |
| p,p'-DDT ***OR*** *Total DDT* | mg/kg | | | | | | | | | | | | | | | | | | |
| χ Trans-Chlordane (gamma) *(leave empty if total Chlordane results used)* | mg/kg | | | | | | | | | | | | | | | | | | |
| Chlordecone (kepone) | mg/kg | | | | | | | | | | | | | | | | | | |
| Pentachlorobenzene | mg/kg | | | | | | | | | | | | | | | | | | |
| Mirex | mg/kg | | | | | | | | | | | | | | | | | | |
| Toxaphene (camphechlor) | mg/kg | | | | | | | | | | | | | | | | | | |
| **Tin** | | | | | | | | | | | | | | | | | | | |
| Tin *(leave empty if Organotin and Tin excl Organotin results used)* | mg/kg | | | | | | | | | | | | | | | | | | |
| **Organotin** | | | | | | | | | | | | | | | | | | | |
| Dibutyltin; DiBT | mg/kg | | | | | | | | | | | | | | | | | | |
| Tributyltin; TriBT | mg/kg | | | | | | | | | | | | | | | | | | |
| Triphenyltin; TriPT | mg/kg | | | | | | | | | | | | | | | | | | |
| Tetrabutyltin; TeBT | mg/kg | | | | | | | | | | | | | | | | | | |
| **Tin excluding Organotin** | | | | | | | | | | | | | | | | | | | |
| Tin excl Organotin | mg/kg | | | | | | | | | | | | | | | | | | |

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Haswaste, developed by Dr. Iain Haslock.

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

**Shell Welwyn Garden**

| Sample ID | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | 22/00840/15 | 22/00840/16 | 22/00840/26 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole ID / Depth | MW101 - 1.6m | MW101 - 3.8m | MW101 - 4.9m | MW102 - 1.0m | MW103 - 1.5m | MW103 - 3.0m | MW103 - 5.0m | MW104 - 0.7m | MW104 - 3.0m | MW105 - 1.0m | MW105 - 3.0m | MW105 - 5.0m | VP01 - 0.3m | VP01 - 1.7m | QAQC01 | SKIP | MW105 - 6.0m | |
| Date | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | 24-Jan-22 | 27-Jan-22 | 26-Jan-22 | |

**Asbestos in Soil**

| Asbestos in Soil | Thresholds | | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | 22/00840/15 | 22/00840/16 | 22/00840/26 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Asbestos detected in Soil (enter Y or N) | Y | | N | | | Y | N | N | | N | | N | N | | N | N | N | N | | |
| Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only) | see "Carc HP7 % Asbestos in Soil (Fibres)" below | % | | | | | | | | | | | | | | | | | | |
| Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)<br>*Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.* | ≥0.1% | | 0.00000 | 0.00000 | 0.00000 | 0.07200 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N) | N | | | | | N | | | | | | | | | | | | | | |

If Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7

If Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7

If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You cannot use Asbestos % results when visual identifiable pieces are present.

If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You cannot use Asbestos % results when visual identifiable pieces are present.

If visual identifiable pieces of asbestos are present, <u>you cannot use Asbestos % results</u> and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 05. Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.

If visual identifiable pieces of asbestos are present, <u>you cannot use Asbestos % results</u> and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 05. Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.
All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.
All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.

**If cells below turn yellow and the text turns red, the samples should be classified as Hazardous Waste.**

**If cells below turn yellow and the text turns red, the samples should be classified as Hazardous Waste.**

| Hazardous Property | Thresholds | Cut Off Value | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | 22/00840/15 | 22/00840/16 | 22/00840/26 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corrosive HP8 | ≥5% | <1% | 0.00877 | 0.00692 | 0.00910 | 0.00650 | 0.00715 | 0.00898 | 0.00533 | 0.00542 | 0.00682 | 0.00540 | 0.00261 | 0.00583 | 0.00704 | 0.00781 | 0.00514 | 0.00000 | 0.00257 | 0.00000 |
| Irritant HP4 | ≥10% | <1% | 0.00477 | 0.00175 | 0.00407 | 0.01711 | 0.00351 | 0.00845 | 0.00166 | 0.00271 | 0.00253 | 0.00271 | 0.00087 | 0.00106 | 0.00138 | 0.00149 | 0.00403 | 0.00000 | 0.00106 | 0.00000 |
| Irritant HP4 | ≥20% | <1% | 0.01556 | 0.00521 | 0.00878 | 0.01780 | 0.00719 | 0.01943 | 0.00458 | 0.00580 | 0.00957 | 0.00619 | 0.00290 | 0.00586 | 0.00813 | 0.00888 | 0.01160 | 0.00000 | 0.00364 | 0.00000 |
| Specifc Target Organ Toxicity HP5 | ≥1% | | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Specifc Target Organ Toxicity HP5 | ≥20% | | 0.00000 | 0.00000 | 0.00000 | 0.00036 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00011 | 0.00000 | 0.00000 | 0.00000 | 0.00002 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Specifc Target Organ Toxicity HP5 | ≥1% | | 0.01091 | 0.00653 | 0.00707 | 0.00307 | 0.00557 | 0.01497 | 0.00480 | 0.00465 | 0.00808 | 0.00461 | 0.00237 | 0.00557 | 0.00691 | 0.00768 | 0.00808 | 0.00000 | 0.00283 | 0.00000 |
| Specifc Target Organ Toxicity HP5 | ≥10% | | 0.03770 | 0.00140 | 0.00140 | 0.00700 | 0.00140 | 0.00232 | 0.00070 | 0.00150 | 0.00120 | 0.00590 | 0.00045 | 0.00100 | 0.00090 | 0.00060 | 0.00120 | 0.00000 | 0.00120 | 0.00000 |
| Aspiration Toxicity HP5 | ≥10% | | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00000 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00000 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00000 | 0.00001 | 0.00000 |
| Acute Toxicity HP6 | ≥0.1% | <0.1% | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Acute Toxicity HP6 | ≥0.25% | <0.1% | 0.00015 | 0.00041 | 0.00239 | 0.00349 | 0.00160 | 0.00402 | 0.00055 | 0.00160 | 0.00107 | 0.00085 | 0.00037 | 0.00028 | 0.00015 | 0.00021 | 0.00055 | 0.00000 | 0.00028 | 0.00000 |
| Acute Toxicity HP6 | ≥5% | <0.1% | 0.00892 | 0.00667 | 0.00686 | 0.00321 | 0.00571 | 0.00510 | 0.00494 | 0.00398 | 0.00590 | 0.00475 | 0.00238 | 0.00571 | 0.00705 | 0.00782 | 0.00475 | 0.00000 | 0.00245 | 0.00000 |
| Acute Toxicity HP6 | ≥25% | <1% | 0.05381 | 0.00786 | 0.01156 | 0.02545 | 0.00975 | 0.02308 | 0.00603 | 0.00825 | 0.01192 | 0.01265 | 0.00366 | 0.00772 | 0.00948 | 0.00994 | 0.01397 | 0.00000 | 0.00568 | 0.00000 |
| Acute Toxicity HP6 | ≥0.25% | <0.1% | 0.00002 | 0.00002 | 0.00002 | 0.00006 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | 0.00006 | 0.00002 | 0.00002 | 0.00002 | 0.00008 | 0.00002 | 0.00000 | 0.00002 | 0.00000 |
| Acute Toxicity HP6 | ≥2.5% | <0.1% | 0.00864 | 0.00653 | 0.00672 | 0.00307 | 0.00557 | 0.00497 | 0.00480 | 0.00384 | 0.00576 | 0.00461 | 0.00225 | 0.00557 | 0.00691 | 0.00768 | 0.00461 | 0.00000 | 0.00230 | 0.00000 |
| Acute Toxicity HP6 | ≥15% | <0.1% | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Acute Toxicity HP6 | ≥55% | <1% | 0.00005 | 0.00005 | 0.00008 | 0.00005 | 0.00006 | 0.00017 | 0.00005 | 0.00006 | 0.00006 | 0.00008 | 0.00005 | 0.00006 | 0.00005 | 0.00006 | 0.00007 | 0.00000 | 0.00005 | 0.00000 |
| Acute Toxicity HP6 | ≥0.1% | <0.1% | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Acute Toxicity HP6 | ≥0.5% | <0.1% | 0.00871 | 0.00660 | 0.00682 | 0.00318 | 0.00565 | 0.00516 | 0.00487 | 0.00392 | 0.00584 | 0.00475 | 0.00231 | 0.00565 | 0.00698 | 0.00782 | 0.00470 | 0.00000 | 0.00237 | 0.00000 |
| Acute Toxicity HP6 | ≥3.5% | <0.1% | 0.00028 | 0.00014 | 0.00014 | 0.00014 | 0.00014 | 0.00013 | 0.00014 | 0.00014 | 0.00014 | 0.00014 | 0.00013 | 0.00014 | 0.00014 | 0.00014 | 0.00014 | 0.00000 | 0.00014 | 0.00000 |
| Acute Toxicity HP6 | ≥22.5% | <1% | 0.01604 | 0.00660 | 0.01017 | 0.02371 | 0.00858 | 0.02174 | 0.00527 | 0.00728 | 0.01075 | 0.01186 | 0.00334 | 0.00684 | 0.00851 | 0.00923 | 0.01269 | 0.00000 | 0.00442 | 0.00000 |
| Carcinogenic HP7 | ≥0.1% | | 0.03770 | 0.00653 | 0.00707 | 0.00700 | 0.00557 | 0.01497 | 0.00480 | 0.00465 | 0.00808 | 0.00590 | 0.00237 | 0.00557 | 0.00691 | 0.00768 | 0.00808 | 0.00000 | 0.00283 | 0.00000 |
| Carcinogenic HP7 | ≥0.1% | | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 | 0.000000000 |
| Carcinogenic HP7 | ≥1% | | 0.00000 | 0.00000 | 0.00000 | 0.00013 | 0.00000 | 0.00000 | 0.00000 | 0.00001 | 0.00000 | 0.00005 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Carcinogenic HP7 Unknown TPH with ID | ≥1,000mg/kg | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg | ≥0.01% | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| pH Corrosive HP8 pH (soil or leachate) | H8 ≥11.5 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8.80 | 0.00 | 0.00 | 0.00 | 0.00 | 8.70 | 0.00 | 0.00 | 0.00 | 0.00 | 8.50 | 0.00 | 0.00 |
| pH Corrosive HP8 pH (soil or leachate) | H8 ≤2 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.24 | 0.00 | 0.00 | 0.00 | 0.00 | 7.81 | 0.00 | 0.00 | 0.00 | 0.00 | 8.05 | 0.00 | 0.00 |
| Toxic for Reproduction HP10 | ≥0.3% | | 0.03770 | 0.00384 | 0.00707 | 0.00700 | 0.00525 | 0.01497 | 0.00343 | 0.00465 | 0.00808 | 0.00590 | 0.00237 | 0.00505 | 0.00687 | 0.00747 | 0.00808 | 0.00000 | 0.00283 | 0.00000 |
| Toxic for Reproduction HP10 | ≥3% | | 0.00864 | 0.00653 | 0.00672 | 0.00307 | 0.00557 | 0.00497 | 0.00480 | 0.00384 | 0.00576 | 0.00461 | 0.00225 | 0.00557 | 0.00691 | 0.00768 | 0.00461 | 0.00000 | 0.00230 | 0.00000 |
| Mutagenic HP11 | ≥0.1% | | 0.00864 | 0.00653 | 0.00672 | 0.00307 | 0.00557 | 0.00497 | 0.00480 | 0.00384 | 0.00576 | 0.00461 | 0.00225 | 0.00557 | 0.00691 | 0.00768 | 0.00461 | 0.00000 | 0.00230 | 0.00000 |
| Mutagenic HP11 Unknown TPH with ID | ≥1,000mg/kg | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg | ≥0.01% | | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| Mutagenic HP11 | ≥1% | | 0.03770 | 0.00384 | 0.00707 | 0.00303 | 0.00525 | 0.01497 | 0.00343 | 0.00465 | 0.00808 | 0.00404 | 0.00237 | 0.00505 | 0.00687 | 0.00747 | 0.00808 | 0.00000 | 0.00283 | 0.00000 |
| Produces Toxic Gases HP12 Sulphide | ≥1,400mg/kg | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Produces Toxic Gases HP12 Cyanide | ≥1,200mg/kg | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Produces Toxic Gases HP12 Thiocyanate | ≥2,600mg/kg | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HP13 Sensitising | ≥10% | | 0.03770 | 0.00653 | 0.00707 | 0.00307 | 0.00557 | 0.01497 | 0.00480 | 0.00465 | 0.00808 | 0.00461 | 0.00237 | 0.00557 | 0.00691 | 0.00768 | 0.00808 | 0.00000 | 0.00283 | 0.00000 |
| Ecotoxic HP14<br>amended v6 | ≥25% | <0.1% | 0.06655 | 0.02261 | 0.03198 | 0.04214 | 0.02610 | 0.05445 | 0.01456 | 0.02063 | 0.02657 | 0.02848 | 0.00984 | 0.01738 | 0.02010 | 0.02104 | 0.02456 | 0.00000 | 0.01208 | 0.00000 |

Table 3 of the CLP, CL Inventory, ATPs, IARC, Concawe, MSDSs, REACH + Pesticide Properties databases. Worst case REACH + MSDS's used for "*" STOT + Acute Toxicity.

Please enter available data in the rows associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
If any calculation cells below state "0.00000", testing has NOT been undertaken that contributes to that Hazardous Property.

Haswaste, developed by Dr. Iain Haslock.

**Shell Welwyn Garden**

| **Sample ID** | | | 22/00840/1 | 22/00840/2 | 22/00840/3 | 22/00840/4 | 22/00840/5 | 22/00840/6 | 22/00840/7 | 22/00840/8 | 22/00840/9 | 22/00840/10 | 22/00840/11 | 22/00840/12 | 22/00840/13 | 22/00840/14 | 22/00840/15 | 22/00840/16 | 22/00840/26 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Borehole ID / Depth** | | | MW101 - 1.6m | MW101 - 3.8m | MW101 - 4.9m | MW102 - 1.0m | MW103 - 1.5m | MW103 - 3.0m | MW103 - 5.0m | MW104 - 0.7m | MW104 - 3.0m | MW105 - 1.0m | MW105 - 3.0m | MW105 - 5.0m | VP01 - 0.3m | VP01 - 1.7m | QAQC01 | SKIP | MW105 - 6.0m | |
| **Date** | | | 25-Jan-22 | 25-Jan-22 | 25-Jan-22 | 19-Jan-22 | 20-Jan-22 | 27-Jan-22 | 27-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 26-Jan-22 | 19-Jan-22 | 19-Jan-22 | 24-Jan-22 | 27-Jan-22 | 26-Jan-22 | |
| Ecotoxic HP14<br>amended v6 | ≥25% | <0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T-Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene, Xylene + BTEX 1%). | 0.06655 | 0.02262 | 0.03199 | 0.04214 | 0.02611 | 0.05446 | 0.01456 | 0.02064 | 0.02657 | 0.02849 | 0.00985 | 0.01738 | 0.02010 | 0.02104 | 0.02456 | 0.00000 | 0.01208 | 0.00000 |
| Ecotoxic HP14<br>amended v6 | ≥25% | <0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T-Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene, Xylene + BTEX 1%). | 6.65470 | 2.26110 | 3.19840 | 4.21370 | 2.61030 | 5.44525 | 1.45600 | 2.06330 | 2.65680 | 2.84817 | 0.98436 | 1.73760 | 2.00980 | 2.10360 | 2.45570 | 0.00000 | 1.20800 | 0.00000 |
| Persistent Organic Pollutant (PCB, PBB or POP Pesticides) | >0.005% | | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000070 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| Persistent Organic Pollutant (Total Dioxins+Furans) | >0.0000015% | | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 |
| Persistent Organic Pollutant (Individual Dioxins+Furans) | >0.0000015% | | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 | 0.0000000000 |

If other contaminants need adding to Haswaste, please contact Envirolab.

# Registration CBDU116673 – O'Donovan (Waste Disposal) Ltd.

| | |
|---|---|
| **Registration number** | CBDU116673 |
| **Business name** | O'Donovan (Waste Disposal) Ltd. |
| **Company number** | 02216657 (http://business.data.gov.uk/id/company/02216657) |
| **Registered as** | Carrier Dealer - Upper Tier<br>▶ Help with tier types |
| **Applicant type** | Company |
| **Registration date:** | 06/06/2019 |
| **Expiry date:** | 10/07/2022 |

## Business address

| | |
|---|---|
| **Address** | O'DONOVAN WASTE DISPOSAL LTD, MARKFIELD ROAD, LONDON, N15 4QF |
| **Postcode** | N15 4QF (http://data.ordnancesurvey.co.uk/id/postcodeunit/N154QF) |

**Is this your registration? Click here to embed a widget on your website.**

Back

## CONTAINER DELIVERY AND CONTROLLED WASTE TRANSFER NOTE

**O'DONOVAN (WASTE DISPOSAL) LTD.**

MARKFIELD HOUSE, 82 MARKFIELD ROAD,
TOTTENHAM, LONDON N15 4QF
TEL: 020-8801 9561 FAX: 020-8808 1043

CWTN No. 447360

| | |
|---|---|
| CUSTOMER DETAILS: REECONOMY LTD | DATE 08.03.22 |
| | SIZE 5 |
| DELIVERY / COLLECTION POINT SHELL. STANBOROUGH RD AL86XA | DELIVERY — |
| | COLLECTION ✓ |
| WASTE TIPPED AT 82 MARKFIELD ROAD, TOTTENHAM N15 LICENCE NUMBER: WP3391NT/A001 | EXCHANGE — |
| WASTE TIPPED AT ALPERTON LANE, HA0 1DX LICENCE NUMBER: EPR/LP3037WG | DRIVERS INITIALS M |
| OTHER ADDRESS: LICENCE NUMBER: | |

**PLEASE NOTE**

CONTAINERS LOADED LEVEL ONLY.

NO FIRES IN OR BESIDES CONTAINER.

THE HIRER SHALL OBTAIN ALL PERMITS FROM LOCAL AUTHORITIES AS REQUIRED.

THE HIRER SHALL ADEQUATELY LIGHT CONTAINER DURING HOURS OF DARKNESS.

THE HIRER IS RESPONSIBLE FOR SITING CONTAINERS.

THE CONTAINER IS HIRED FOR 7 DAYS ONLY.

THE HIRER IS LIABLE FOR ALL LOSSES AND DAMAGES TO OR ACCIDENTS INVOLVING CONTAINERS WHILST ON HIRE TO THEM.

WE ARE WASTE CARRIERS REG No. CBDU116673

I THE CLIENT CONFIRM THAT WE HAVE CONSIDERED THE WASTE HIERARCHY.

SIGNED ON BEHALF OF THE PRODUCER OF WASTE. [signature]

SIGNED ON BEHALF OF THE CARRIER. [signature]

NAME IN BLOCK CAPITALS

| | |
|---|---|
| EWC | 200301 |
| SIC CODE | 39000 |
| VEHICLE REG | EY69MHA |
| MATERIAL WEIGHT | |
| DESCRIPTION OF MATERIALS | HOUSEHOLD WASTE |
| TIME ON SITE | 07 05 |
| TIME OFF SITE | 7 25 |
| TOTAL | £ ACC |

**THIS IS NOT A VAT INVOICE**

CUSTOMERS ORDERING VEHICLES OFF THE PUBLIC ROAD DO SO ENTIRELY ON THEIR OWN RESPONSIBILITY. WE CANNOT ACCEPT RESPONSIBILITY FOR DAMAGE CAUSED BY OUR VEHICLES WHILE DELIVERING TO YOUR SITE.

---

## O'DONOVAN (WASTE DISPOSAL) LIMIT

Markfield House
82 Markfield Road ✓
London N15 4QF
WP3391NT/A001

Tel: 020-8801 9561
Fax 020-8808 1043

No. 584092

### TIP TICKET

WASTE IN ✓ OUT

| | |
|---|---|
| CUSTOMER/SUPPLIER | O DONOWAN |
| COLLECTION POINT | |
| DESCRIPTION OF GOODS | STANBOROUGH RD SHELL AL86XA |
| DATE | 08.03.22 |
| SIZE | 5 |
| HAULIER | MARIUSZ |
| VEHICLE REG' No. | EY69MHA |

Second Weigh
08/03/22 08:38
re-entered Weight 6100kg
Registration
Second Weight 8600kg

Net Weight 2500kg

I THE CLIENT CONFIRM THAT WE HAVE CONSIDERED THE WASTE HIERARCHY.

| | |
|---|---|
| SIC CODE 39000 | EWC 200301 |
| DRIVER'S SIGNATURE [signature] | WEIGHMAN'S SIGNATURE |

DEPOTS AT:

ALPERTON LANE
LONDON
HA0 1DX
EPR/LP3037WG

100a MARKFIELD ROAD
LONDON N15
WML80413

TERMS AND CONDITIONS: ALL VEHICLES TIP AND LOAD AT THEIR OWN RISK. NO VEHICLES CARRYING DIFFICULT ...

# APPENDIX N
# GENERIC ASSESSMENT CRITERIA

# Generic assessment criteria for human health: continued oil (filling station kiosk)

## Background

RSK's generic assessment criteria (GAC) were initially prepared following the publication by the Environment Agency (EA) of soil guideline value (SGV) and toxicological (TOX) reports, and associated publications in 2009[1]. RSK GAC were updated following the publication of GAC by LQM/CIEH in 2009[2]. RSK GAC are periodically revised when updated information on toxicological, land use or receptor parameters is published.

## Updates to the RSK GAC

In 2014, the publication of Category 4 Screening Levels (C4SL)[3,4], as part of the Defra funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3)[5] used in the generation of SGVs. The sole modification applicable to the RSK continued oil (filling station) land use scenario is the updated daily inhalation rates.

C4SL were initially published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern (LLTC; see Section 2.3 of research project report SP1010[3]). Further C4SL were published in 2021 for vinyl chloride, tetrachloroethene (PCE) and trichloroethene (TCE). Where a C4SL has been published, the RSK GAC duplicates the C4SL using all input parameters within the SP1010 final project report[3] and associated chemical specific reports[6], and adopts them as GAC for these six substances. Due to the use of decimal places rather than significant figures applied to the Contaminated Land Exposure Assessment (CLEA) tool outputs, the GAC presented may be marginally differently to the C4SL values, however any differences between the values are minimal and would not equate to an unacceptable risk. The current RSK GAC have also been revised with updated toxicology published by LQM/CIEH in 2015[7], where a LLTC has not been published as part of the C4SL.

RSK GAC for the continued oil land use scenario has used the toxicology published within the SP1010 final project report[3] and associated appendices[6], where available, or the toxicology published by LQM/CIEH in 2015[7] or by the USEPA[14].

This GAC appendix therefore presents RSK GAC that may be used in the GQRA stage for a continued oil land use scenario.

## RSK GAC derivation for metals and organic compounds

### *Model selection*

Soil assessment criteria (SAC) were calculated using the CLEA tool v1.071 and supporting EA guidance[5,8,9]. The SAC are also termed GAC.

### *Pathway selection*

The RSK continued oil scenario is most similar to that of a commercial scenario set out in SR3[5], which considers risks to a female worker who works from the age of 16 to 65 years (age class

17). In accordance with Box 3.5 of SR3[5], the pathways considered for production of the SAC in the commercial scenario (continued oil use) are

- direct soil and dust ingestion
- dermal contact with soil both indoors and outdoors
- indoor air inhalation from soil and vapour and outdoor inhalation of soil and vapour.

Figure 1 is a conceptual model illustrating these linkages. It should be noted that the predominant pathway for the continued oil scenario is associated with vapour inhalation owing to hardstanding being present over the majority of filling stations.

With respect to volatilisation, the CLEA model assumes a simple linear partitioning of a chemical in the soil between the sorbed, dissolved and vapour phase[9]. The upper boundaries of this partitioning are represented by the maximum aqueous solubility and pure saturated vapour concentration of the chemical. The CLEA model estimates saturated soil concentrations where these limits are reached[9]. The CLEA software uses a traffic light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous- or vapour-based soil saturation limits. Model output cells are flagged red where the saturated soil concentration has been exceeded and the contribution of the indoor and outdoor vapour pathway to total exposure is greater than 10%. In this case, further consideration of the following is required[9]:

- Free phase contamination may be present.
- Exposure from the vapour pathways will be over predicted by the model, as in reality the vapour phase concentration will not increase at concentrations above saturation limits.
- Where the vapour pathway contribution is greater than 90%, it is unlikely the relevant health criteria value (HCV) will be exceeded at soil concentrations at least a factor of ten higher than the relevant HCV.

Where the vapour pathway is the predominant pathway (contributes greater than 90% of exposure) or the only exposure route considered and the cell is highlighted red (SAC exceeds saturation limit), the risk based on the assumed conceptual model is likely to be negligible as the vapour risk is assumed to be tolerable at maximum possible soil concentrations. In such circumstances the vapour pathway exposure should be considered based on the presence of free phase or non-aqueous phase liquid sources and the measured concentrations of volatile organic compounds (VOC) in the vapour phase. Screening could be considered based on setting the SAC as the modelled soil saturation limits. However, as stated within the CLEA handbook[9], this is likely to not be practical in many cases because of the very low saturation limits and, in any case, is highly conservative.

It should also be noted that for mixtures of compounds, free phase may be present where soil (or groundwater) concentrations are well below saturation limits for individual compounds.

Where the vapour pathway is only one of the exposure pathways considered, an additional approach can then be utilised as detailed within Section 4.12 of the CLEA model handbook[9], which explains how to calculate an effective assessment criterion manually.

SR3[5] states that, as a general rule of thumb, it is recognised that estimating vapour phase concentrations from dissolved and sorbed phase contamination by petroleum hydrocarbons are at least a factor of ten higher than those likely to be measured on site. RSK has therefore applied an empirical subsurface to indoor air correction factor of 10 into the CLEA chemical database and to outputs for all petroleum hydrocarbons (including BTEX, trimethylbenzenes, and the polycyclic aromatic hydrocarbons (PAH) naphthalene, acenaphthene and acenaphthylene) to reduce this conservatism.

*Input selection*

The most up-to-date published chemical and toxicological data was obtained from EA Report SC050021/SR7[10], the EA TOX[1] reports, the C4SL SP1010 project report and associated chemical specific reports[3,6], the 2015 LQM/CIEH report[7] or the USEPA IRIS database[14]. Where a LLTC[3,6] has been published for a substance, RSK has used these input parameters to derive the RSK GAC.

Toxicological and specific chemical parameters for 1,2,4-trimethylbenzene, barium and methyl tertiary-butyl ether (MTBE) were obtained from the CL:AIRE Soil GAC report[11]. For TPH, aromatic hydrocarbons $C_5$–$C_8$ were not modelled, as this range comprises benzene (>EC5-EC7) and toluene (>EC7-EC8), which are modelled separately.

*Physical parameters*

A typical kiosk on a filling station is smaller than a CLEA office (24.5m x 24.5m x 9.6m) or warehouse (45m x 45m x 4.6m). Therefore, the SAC have been produced with a smaller building size considered more representative of a kiosk. The building size taken was 10m x 8m x 3m. No basement was assumed present in line with typical service stations. The building parameters are outlined in Table 3.

The parameters for a sandy loam soil type were used in line with SR3[5]. This includes a value of 6% for the percentage of soil organic matter (SOM) within the soil. In RSK's experience, this is rather high for many sites. To avoid undertaking site-specific risk assessments for this parameter, RSK has produced an additional set of SAC for an SOM of 1% and 2.5%.

*Summary of modifications to the default SR3 input parameters*

In summary, the RSK continued oil GAC were produced using the default input parameters for soil properties, the air dispersion model and the vapour model detailed in SR3[5]. The building size has been modified to reflect a small on-site kiosk. Modifications to the default SR3[5] commercial exposure scenario based on the C4SL commercial exposure scenarios[3] are presented in Table 2 below. The sole modification is the updated inhalation rate for the inhalation of vapours from soil only.

The SAC were produced using the input parameters in Tables 1 and 2 below, and the GrAC using the input parameters in Table 3. The pathway specific GAC are presented in Table 3 and the combined GAC are presented in Table 4.

**Figure 1: Conceptual model for continued oil scenario**

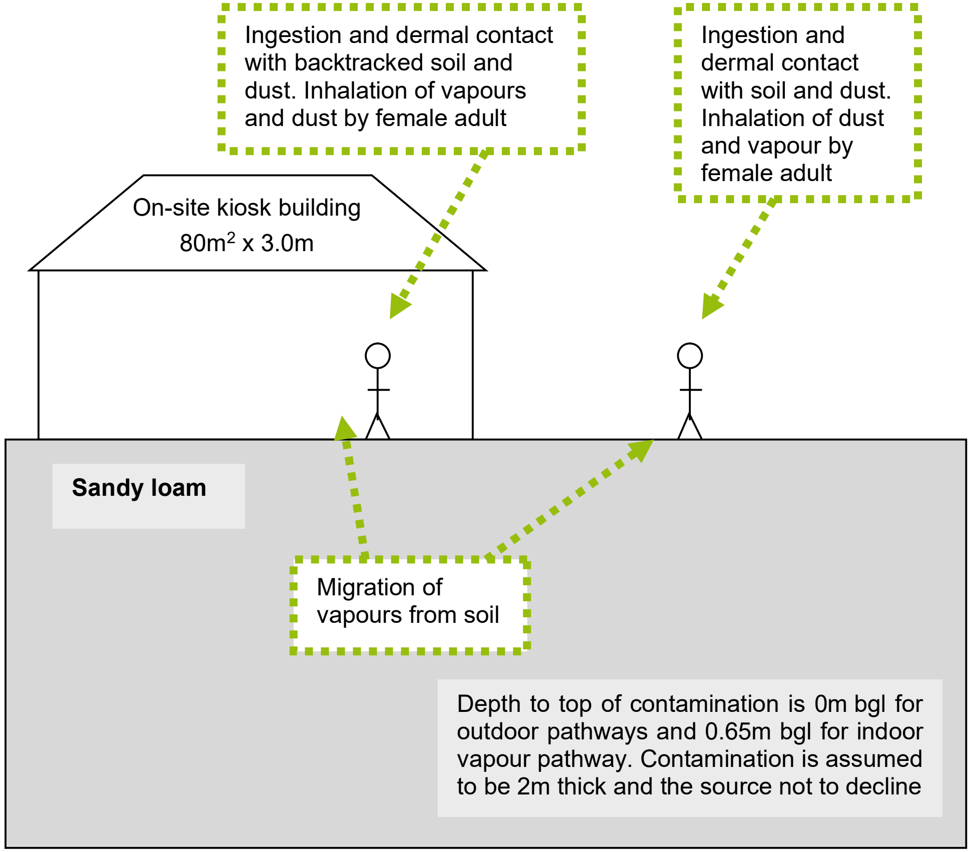


**Table 1: Exposure assessment parameters for continued oil scenario – inputs for CLEA model**

| Parameter | Value | Justification |
|---|---|---|
| Land use | Commercial | Chosen land use |
| Receptor | Female worker | Taken as female adult exposed over 49 years from age 16 to 65 years, Box 3.5, SR3[(5)] |
| Building | Kiosk | Taken as a building measuring 8m x 10m, which is 3.0m high based on RSK experience of typical filling stations |
| Soil type | Sandy loam | Most common UK soil type (Section 4.3.1, Table 4.4, SR3[(5)]). |
| Start age class (AC) | 17 | AC corresponding to key generic assumption that the critical receptor is a working female adult exposed over a 49-year period from age 16 to 65 years. Assumption given in Box 3.5, SR3[(5)]. |
| End AC | 17 | |
| SOM (%) | 6 | Representative of sandy loam according to EA guidance note dated January 2009 entitled 'Changes We Have Made to the CLEA Framework Documents'[(13)] |
| | 1 | To provide SAC for sites where SOM < 6% as often observed by RSK |
| | 2.5 | |
| pH | 7 | Model default |

**Table 2: Continued oil – modified receptor inputs**

| Parameter | Unit | Value | Justification |
|---|---|---|---|
| Inhalation rate (AC17) | $m^3\ day^{-1}$ | 15.7 | Mean value USEPA, 2011[(12)]; Table 3.2, SP1010[(3)] |

## References


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12. USEPA (2011), *Exposure factors handbook*, EPA/600/R-090/052F (Washington DC: Office of Research and Development).

13. Environment Agency (2009), 'Changes made to the CLEA framework documents after the three-month evaluation period in 2008', released January 2009.

14. USEPA (2010). Hydrogen cyanide and cyanide salts. Integrated Risk Information Systems (IRIS) Chemical Assessment Summary. September 2010. https://www.epa.gov/iris (accessed 9 December 2015)

**GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - CONTINUED OIL SCENARIO**

**Table 3**

**Human health generic assessment criteria by pathway for continued oil scenario**

| Compound | Notes | SAC appropriate to pathway SOM 1% (mg/kg) | | | Soil saturation limit (mg/kg) | SAC appropriate to pathway SOM 2.5% (mg/kg) | | | Soil saturation limit (mg/kg) | SAC appropriate to pathway SOM 6% (mg/kg) | | | Soil saturation limit (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Oral | Inhalation | Combined | | Oral | Inhalation | Combined | | Oral | Inhalation | Combined | |
| **Metals** | | | | | | | | | | | | | |
| Arsenic | (a,b) | 6.35E+02 | 1.25E+03 | NR | NR | 6.35E+02 | 1.25E+03 | NR | NR | 6.35E+02 | 1.25E+03 | NR | NR |
| Barium | (b) | 2.21E+04 | NR | NR | NR | 2.21E+04 | NR | NR | NR | 2.21E+04 | NR | NR | NR |
| Beryllium | | 3.97E+03 | 1.17E+01 | NR | NR | 3.97E+03 | 1.17E+01 | NR | NR | 3.97E+03 | 1.17E+01 | NR | NR |
| Boron | | 2.38E+05 | 2.82E+07 | NR | NR | 2.38E+05 | 2.82E+07 | NR | NR | 2.38E+05 | 2.82E+07 | NR | NR |
| Cadmium | (a) | 7.73E+02 | 8.57E+02 | 4.10E+02 | NR | 7.73E+02 | 8.57E+02 | 4.10E+02 | NR | 7.73E+02 | 8.57E+02 | 4.10E+02 | NR |
| Chromium (III) - trivalent | (c) | 3.31E+05 | 8.57E+03 | NR | NR | 3.31E+05 | 8.57E+03 | NR | NR | 3.31E+05 | 8.57E+03 | NR | NR |
| Chromium (VI) - hexavalent | (a,d) | 9.62E+02 | 4.91E+01 | NR | NR | 9.62E+02 | 4.91E+01 | NR | NR | 9.62E+02 | 4.91E+01 | NR | NR |
| Copper | | 1.89E+05 | 8.96E+04 | 6.83E+04 | NR | 1.89E+05 | 8.96E+04 | 6.83E+04 | NR | 1.89E+05 | 8.96E+04 | 6.83E+04 | NR |
| Lead | (a) | 2.32E+03 | NR | NR | NR | 2.32E+03 | NR | NR | NR | 2.32E+03 | NR | NR | NR |
| Elemental Mercury ($Hg^0$) | (d) | NR | 3.68E+00 | NR | 4.31E+00 | NR | 8.80E+00 | NR | 1.07E+01 | NR | 1.93E+01 | NR | 2.58E+01 |
| Inorganic Mercury ($Hg^{2+}$) | | 1.18E+03 | 1.97E+04 | 1.12E+03 | NR | 1.18E+03 | 1.97E+04 | 1.12E+03 | NR | 1.18E+03 | 1.97E+04 | 1.12E+03 | NR |
| Methyl Mercury ($Hg^{4+}$) | | 3.38E+02 | 1.55E+02 | 1.06E+02 | 7.33E+01 | 3.38E+02 | 2.99E+02 | 1.59E+02 | 1.42E+02 | 3.38E+02 | 6.31E+02 | 2.20E+02 | 3.04E+02 |
| Nickel | (d) | 3.06E+03 | 9.83E+02 | NR | NR | 3.06E+03 | 9.83E+02 | NR | NR | 3.06E+03 | 9.83E+02 | NR | NR |
| Selenium | (b) | 1.23E+04 | NR | NR | NR | 1.23E+04 | NR | NR | NR | 1.23E+04 | NR | NR | NR |
| Vanadium | | 2.15E+04 | 9.03E+03 | NR | NR | 2.15E+04 | 9.03E+03 | NR | NR | 2.15E+04 | 9.03E+03 | NR | NR |
| Zinc | (b) | 7.35E+05 | 1.97E+08 | NR | NR | 7.35E+05 | 1.97E+08 | NR | NR | 7.35E+05 | 1.97E+08 | NR | NR |
| Cyanide (free) | | 6.56E+02 | 7.51E+04 | 6.53E+02 | NR | 6.56E+02 | 7.51E+04 | 6.53E+02 | NR | 6.56E+02 | 7.51E+04 | 6.53E+02 | NR |
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| Benzene | (a) | 1.09E+03 | 5.52E+00 | 5.50E+00 | 1.22E+03 | 1.09E+03 | 1.03E+01 | 1.02E+01 | 2.26E+03 | 1.09E+03 | 2.13E+01 | 2.09E+01 | 4.71E+03 |
| Toluene | | 4.24E+05 | 1.33E+04 | 1.29E+04 | 8.69E+02 | 4.24E+05 | 2.94E+04 | 2.75E+04 | 1.92E+03 | 4.24E+05 | 6.67E+04 | 5.77E+04 | 4.36E+03 |
| Ethylbenzene | | 1.91E+05 | 1.25E+03 | 1.24E+03 | 5.18E+02 | 1.91E+05 | 2.92E+03 | 2.88E+03 | 1.22E+03 | 1.91E+05 | 6.83E+03 | 6.60E+03 | 2.84E+03 |
| Xylene - m | | 3.43E+05 | 1.33E+03 | 1.32E+03 | 6.25E+02 | 3.43E+05 | 3.13E+03 | 3.10E+03 | 1.47E+03 | 3.43E+05 | 7.34E+03 | 7.18E+03 | 3.46E+03 |
| Xylene - o | | 3.43E+05 | 1.43E+03 | 1.42E+03 | 4.78E+02 | 3.43E+05 | 3.34E+03 | 3.31E+03 | 1.12E+03 | 3.43E+05 | 7.81E+03 | 7.64E+03 | 2.62E+03 |
| Xylene - p | | 3.43E+05 | 1.28E+03 | 1.27E+03 | 5.76E+02 | 3.43E+05 | 3.00E+03 | 2.97E+03 | 1.35E+03 | 3.43E+05 | 7.00E+03 | 6.86E+03 | 3.17E+03 |
| Total xylene | | 3.43E+05 | 1.28E+03 | 1.27E+03 | 5.76E+02 | 3.43E+05 | 3.00E+03 | 2.97E+03 | 1.35E+03 | 3.43E+05 | 7.00E+03 | 6.86E+03 | 3.17E+03 |
| Methyl tertiary-Butyl ether (MTBE) | | 5.72E+05 | 1.54E+03 | 1.54E+03 | 2.04E+04 | 5.72E+05 | 2.50E+03 | 2.49E+03 | 3.31E+04 | 5.72E+05 | 4.75E+03 | 4.71E+03 | 6.27E+04 |
| Trichloroethene (TCE) | | 1.49E-01 | 5.28E-01 | NR | 1.54E+03 | 3.12E-01 | 1.11E+00 | NR | 3.22E+03 | 6.91E-01 | 2.46E+00 | NR | 7.14E+03 |
| Tetrachloroethene (PCE) | | 2.67E+04 | 5.16E+00 | 5.16E+00 | 4.24E+02 | 2.67E+04 | 1.16E+01 | 1.16E+01 | 9.51E+02 | 2.67E+04 | 2.65E+01 | 2.65E+01 | 2.18E+03 |
| 1,1,1-Trichloroethane | | 1.14E+06 | 1.35E+02 | 1.35E+02 | 1.43E+03 | 1.14E+06 | 2.77E+02 | 2.77E+02 | 2.92E+03 | 1.14E+06 | 6.08E+02 | 6.07E+02 | 6.39E+03 |
| 1,1,1,2 Tetrachloroethane | | 1.10E+04 | 2.31E+01 | 2.31E+01 | 2.60E+03 | 1.10E+04 | 5.36E+01 | 5.34E+01 | 6.02E+03 | 1.10E+04 | 1.25E+02 | 1.23E+02 | 1.40E+04 |
| 1,1,2,2-Tetrachloroethane | | 1.10E+04 | 5.88E+01 | 5.85E+01 | 2.67E+03 | 1.10E+04 | 1.21E+02 | 1.19E+02 | 5.46E+03 | 1.10E+04 | 2.64E+02 | 2.58E+02 | 1.20E+04 |
| Carbon Tetrachloride | | 7.62E+03 | 5.90E-01 | 5.90E-01 | 1.52E+03 | 7.62E+03 | 1.29E+00 | 1.29E+00 | 3.32E+03 | 7.62E+03 | 2.93E+00 | 2.93E+00 | 7.54E+03 |
| 1,2-Dichloroethane | | 2.29E+02 | 1.33E-01 | 1.33E-01 | 3.41E+03 | 2.29E+02 | 1.92E-01 | 1.92E-01 | 4.91E+03 | 2.29E+02 | 3.29E-01 | 3.29E-01 | 8.43E+03 |
| Vinyl Chloride (chloroethene) | | 1.19E+02 | 2.07E-01 | 2.06E-01 | 1.36E+03 | 1.19E+02 | 2.67E-01 | 2.67E-01 | 1.76E+03 | 1.19E+02 | 4.09E-01 | 4.07E-01 | 2.69E+03 |
| 1,2,4-Trimethylbenzene | | NR | 8.30E+01 | NR | 4.74E+02 | NR | 1.91E+02 | NR | 1.16E+03 | NR | 3.98E+02 | NR | 2.76E+03 |
| 1,3,5-Trimethylbenzene | (e) | NR | NR | NR | 2.30E+02 | NR | NR | NR | 5.52E+02 | NR | NR | NR | 1.30E+03 |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | |
| Acenaphthene | | 1.10E+05 | 6.68E+05 | 9.42E+04 | 5.70E+01 | 1.10E+05 | 1.55E+06 | 1.02E+05 | 1.41E+02 | 1.10E+05 | 3.28E+06 | 1.06E+05 | 3.36E+02 |
| Acenaphthylene | | 1.10E+05 | 6.23E+05 | 9.33E+04 | 8.61E+01 | 1.10E+05 | 1.45E+06 | 1.02E+05 | 2.12E+02 | 1.10E+05 | 3.07E+06 | 1.06E+05 | 5.06E+02 |
| Anthracene | | 5.49E+05 | 1.97E+06 | 4.29E+05 | 1.17E+00 | 5.49E+05 | 4.75E+06 | 4.92E+05 | 2.91E+00 | 5.49E+05 | 1.06E+07 | 5.22E+05 | 6.96E+00 |
| Benzo(a)anthracene | | 2.84E+02 | 1.99E+02 | 1.17E+02 | 1.71E+00 | 2.84E+02 | 3.07E+02 | 1.47E+02 | 4.28E+00 | 2.84E+02 | 3.89E+02 | 1.64E+02 | 1.03E+01 |
| Benzo(a)pyrene | (a) | 7.63E+01 | 8.66E+01 | NR | 9.11E-01 | 7.64E+01 | 9.21E+01 | NR | 2.28E+00 | 7.64E+01 | 9.49E+01 | NR | 5.46E+00 |
| Benzo(b)fluoranthene | | 7.13E+01 | 1.06E+02 | 4.26E+01 | 1.22E+00 | 7.13E+01 | 1.15E+02 | 4.40E+01 | 3.04E+00 | 7.13E+01 | 1.19E+02 | 4.46E+01 | 7.29E+00 |
| Benzo(g,h,i)perylene | | 6.29E+03 | 1.01E+04 | 3.88E+03 | 1.54E-02 | 6.29E+03 | 1.04E+04 | 3.93E+03 | 3.85E-02 | 6.29E+03 | 1.06E+04 | 3.95E+03 | 9.23E-02 |
| Benzo(k)fluoranthene | | 1.88E+03 | 2.92E+03 | 1.15E+03 | 6.87E-01 | 1.88E+03 | 3.09E+03 | 1.17E+03 | 1.72E+00 | 1.88E+03 | 3.17E+03 | 1.18E+03 | 4.12E+00 |
| Chrysene | | 5.67E+02 | 6.95E+02 | 3.12E+02 | 4.40E-01 | 5.67E+02 | 8.29E+02 | 3.37E+02 | 1.10E+00 | 5.67E+02 | 9.02E+02 | 3.48E+02 | 2.64E+00 |
| Dibenzo(a,h)anthracene | | 5.67E+00 | 8.20E+00 | 3.35E+00 | 3.93E-03 | 5.67E+00 | 9.02E+00 | 3.48E+00 | 9.82E-03 | 5.67E+00 | 9.42E+00 | 3.54E+00 | 2.36E-02 |
| Fluoranthene | | 2.29E+04 | 4.08E+05 | 2.16E+04 | 1.89E+01 | 2.29E+04 | 8.79E+05 | 2.23E+04 | 4.73E+01 | 2.29E+04 | 1.61E+06 | 2.25E+04 | 1.13E+02 |
| Fluorene | | 7.31E+04 | 8.63E+04 | 3.96E+04 | 3.09E+01 | 7.31E+04 | 2.11E+05 | 5.43E+04 | 7.65E+01 | 7.31E+04 | 4.92E+05 | 6.37E+04 | 1.83E+02 |

**GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - CONTINUED OIL SCENARIO**

**Table 3**

**Human health generic assessment criteria by pathway for continued oil scenario**

| Compound | Notes | SAC appropriate to pathway SOM 1% (mg/kg) | | | Soil saturation limit (mg/kg) | SAC appropriate to pathway SOM 2.5% (mg/kg) | | | Soil saturation limit (mg/kg) | SAC appropriate to pathway SOM 6% (mg/kg) | | | Soil saturation limit (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Oral | Inhalation | Combined | | Oral | Inhalation | Combined | | Oral | Inhalation | Combined | |
| Indeno(1,2,3-cd)pyrene | | 8.10E+02 | 1.17E+03 | 4.79E+02 | 6.13E-02 | 8.10E+02 | 1.28E+03 | 4.97E+02 | 1.53E-01 | 8.10E+02 | 1.34E+03 | 5.05E+02 | 3.68E-01 |
| Naphthalene | | 3.64E+04 | 4.08E+02 | 4.03E+02 | 7.64E+01 | 3.64E+04 | 9.73E+02 | 9.48E+02 | 1.83E+02 | 3.64E+04 | 2.28E+03 | 2.14E+03 | 4.32E+02 |
| Phenanthrene | | 2.28E+04 | 8.98E+04 | 1.82E+04 | 3.60E+01 | 2.28E+04 | 2.15E+05 | 2.06E+04 | 8.96E+01 | 2.28E+04 | 4.78E+05 | 2.18E+04 | 2.14E+02 |
| Pyrene | | 5.49E+04 | 9.23E+05 | 5.18E+04 | 2.20E+00 | 5.49E+04 | 2.00E+06 | 5.34E+04 | 5.49E+00 | 5.49E+04 | 3.70E+06 | 5.41E+04 | 1.32E+01 |
| Phenol | | 1.10E+06 | 4.55E+03 | 4.53E+03 | 2.42E+04 | 1.10E+06 | 6.72E+03 | 6.68E+03 | 3.81E+04 | 1.10E+06 | 1.09E+04 | 1.08E+04 | 7.03E+04 |
| **Total petroleum hydrocarbons** | | | | | | | | | | | | | |
| Aliphatic hydrocarbons $EC_5$-$EC_6$ | | 4.77E+06 | 6.04E+02 | 6.04E+02 | 3.04E+02 | 4.77E+06 | 1.11E+03 | 1.11E+03 | 5.58E+02 | 4.77E+06 | 2.29E+03 | 2.29E+03 | 1.15E+03 |
| Aliphatic hydrocarbons $>EC_6$-$EC_8$ | | 4.77E+06 | 1.47E+03 | 1.47E+03 | 1.44E+02 | 4.77E+06 | 3.29E+03 | 3.29E+03 | 3.22E+02 | 4.77E+06 | 7.53E+03 | 7.52E+03 | 7.36E+02 |
| Aliphatic hydrocarbons $>EC_8$-$EC_{10}$ | | 9.53E+04 | 3.82E+02 | 3.82E+02 | 7.77E+01 | 9.53E+04 | 9.32E+02 | 9.30E+02 | 1.90E+02 | 9.53E+04 | 2.22E+03 | 2.20E+03 | 4.51E+02 |
| Aliphatic hydrocarbons $>EC_{10}$-$EC_{12}$ | | 9.53E+04 | 1.89E+03 | 1.88E+03 | 4.75E+01 | 9.53E+04 | 4.71E+03 | 4.65E+03 | 1.18E+02 | 9.53E+04 | 1.13E+04 | 1.09E+04 | 2.83E+02 |
| Aliphatic hydrocarbons $>EC_{12}$-$EC_{16}$ | | 9.53E+04 | 1.58E+04 | 1.51E+04 | 2.37E+01 | 9.53E+04 | 3.94E+04 | 3.45E+04 | 5.91E+01 | 9.53E+04 | 9.43E+04 | 6.32E+04 | 1.42E+02 |
| Aliphatic hydrocarbons $>EC_{16}$-$EC_{35}$ | (b) | 9.37E+05 | NR | NR | 8.48E+00 | 1.34E+06 | NR | NR | 2.12E+01 | 1.62E+06 | NR | NR | 5.09E+01 |
| Aliphatic hydrocarbons $>EC_{35}$-$EC_{44}$ | (b) | 9.37E+05 | NR | NR | 8.48E+00 | 1.34E+06 | NR | NR | 2.12E+01 | 1.62E+06 | NR | NR | 5.09E+01 |
| Aromatic hydrocarbons $>EC_8$-$EC_{10}$ | | 3.81E+04 | 6.74E+02 | 6.71E+02 | 6.13E+02 | 3.81E+04 | 1.65E+03 | 1.63E+03 | 1.50E+03 | 3.81E+04 | 3.93E+03 | 3.82E+03 | 3.58E+03 |
| Aromatic hydrocarbons $>EC_{10}$-$EC_{12}$ | | 3.81E+04 | 3.67E+03 | 3.57E+03 | 3.64E+02 | 3.81E+04 | 9.05E+03 | 8.44E+03 | 8.99E+02 | 3.81E+04 | 2.15E+04 | 1.77E+04 | 2.15E+03 |
| Aromatic hydrocarbons $>EC_{12}$-$EC_{16}$ | | 3.81E+04 | 4.00E+04 | 2.60E+04 | 1.69E+02 | 3.81E+04 | 9.82E+04 | 3.37E+04 | 4.19E+02 | 3.81E+04 | 2.30E+05 | 3.64E+04 | 1.00E+03 |
| Aromatic hydrocarbons $>EC_{16}$-$EC_{21}$ | (b) | 2.72E+04 | NR | NR | 5.37E+01 | 2.79E+04 | NR | NR | 1.34E+02 | 2.82E+04 | NR | NR | 3.21E+02 |
| Aromatic hydrocarbons $>EC_{21}$-$EC_{35}$ | (b) | 2.84E+04 | NR | NR | 4.83E+00 | 2.84E+04 | NR | NR | 1.21E+01 | 2.84E+04 | NR | NR | 2.90E+01 |
| Aromatic hydrocarbons $>EC_{35}$-$EC_{44}$ | (b) | 2.84E+04 | NR | NR | 4.83E+00 | 2.84E+04 | NR | NR | 1.21E+01 | 2.84E+04 | NR | NR | 2.90E+01 |

**Notes:**

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway or an absence of toxicological data.

The CLEA model output is colour coded depending upon whether the soil saturation limit has been exceeded.

| Colour | Meaning |
|---|---|
| (pink) | Calculated SAC exceeds soil saturation limit and may significantly affect the interpretation of any exceedances as the contribution of the indoor and outdoor vapour pathway to total exposure is >10%. |
| (yellow) | Calculated SAC exceeds soil saturation limit but the exceedance will not affect the SAC significantly as the contribution of the indoor and outdoor vapour pathway to total exposure is <10%. |
| (green) | Calculated SAC does not exceed the soil saturation limit. |

The SAC for organic compounds are dependant upon soil organic matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC for TPH fractions, PAHs napthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway (Section 10.1.1, SR3)

(a) SAC for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead are derived using the C4SL toxicology data.

(b) SAC for barium and selenium should not include the inhalation pathway as no expert group HCV has been derived; aliphatic and aromatic hydrocarbons >EC16 should not include inhalation pathway due to their non-volatile nature and inhalation exposure being minimal (oral, dermal and inhalation exposure is compared to the oral HCV); arsenic should only be based on oral contribution (rather than combined) owing to the relative small contribution from inhalation in accordance with the SGV report. The Oral SAC should be adopted for zinc and benzo(a)pyrene.

(c) SAC for CrIII should be based on the lower of the oral and inhalation SAC (see LQM/CIEH 2015 Section 6.8)

(d) SAC for elemental mercury, chromium VI and nickel should be based on the inhalation pathway only.

(e) SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used.

**GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH - CONTINUED OIL**

**Table 4**
**Human health generic assessment criteria for continued oil scenario**

| Compound | SAC for Soil SOM 1% (mg/kg) | SAC for Soil SOM 2.5% (mg/kg) | SAC for Soil SOM 6% (mg/kg) |
|---|---|---|---|
| **Metals** | | | |
| Arsenic | 640 | 640 | 640 |
| Barium | 22,000 | 22,000 | 22,000 |
| Beryllium | 12 | 12 | 12 |
| Boron | 238,000 | 238,000 | 238,000 |
| Cadmium | 410 | 410 | 410 |
| Chromium (III) - trivalent | 8,600 | 8,600 | 8,600 |
| Chromium (VI) - hexavalent | 49 | 49 | 49 |
| Copper | 68,000 | 68,000 | 68,000 |
| Lead | 2,320 | 2,320 | 2,320 |
| Elemental Mercury ($Hg^0$) | 4 (4) | 9 (11) | 19 |
| Inorganic Mercury ($Hg^{2+}$) | 1,120 | 1,120 | 1,120 |
| Methyl Mercury ($Hg^{4+}$) | 110 (73) | 160 | 220 |
| Nickel | 980 | 980 | 980 |
| Selenium | 12,000 | 12,000 | 12,000 |
| Vanadium | 9,000 | 9,000 | 9,000 |
| Zinc | 740,000 | 740,000 | 740,000 |
| Cyanide (free) | 650 | 650 | 650 |
| **Volatile Organic Compounds** | | | |
| Benzene | 5 | 10 | 21 |
| Toluene | 13,000 (870) | 27,000 (1,920) | 58,000 (4,360) |
| Ethylbenzene | 1,000 (520) | 3,000 (1,220) | 7,000 (2,840) |
| Xylene - m | 1,300 (620) | 3,100 (1,470) | 7,200 (3,460) |
| Xylene - o | 1,400 (480) | 3,300 (1,120) | 7,600 (2,620) |
| Xylene - p | 1,300 (580) | 3,000 (1,350) | 6,900 (3,170) |
| Total xylene | 1,300 (580) | 3,000 (1,350) | 6,900 (3,170) |
| Methyl tertiary-Butyl ether (MTBE) | 1,500 | 2,500 | 4,700 |
| Trichloroethene (TCE) | 0.15 | 0.31 | 0.69 |
| Tetrachloroethene (PCE) | 5.2 | 11.6 | 26.5 |
| 1,1,1-Trichloroethane | 100 | 300 | 600 |
| 1,1,1,2 Tetrachloroethane | 20 | 50 | 120 |
| 1,1,2,2-Tetrachloroethane | 60 | 120 | 260 |
| Carbon Tetrachloride | 0.6 | 1.3 | 2.9 |
| 1,2-Dichloroethane | 0.13 | 0.19 | 0.33 |
| Vinyl Chloride (chloroethene) | 0.21 | 0.27 | 0.41 |
| 1,2,4-Trimethylbenzene | 80 | 190 | 400 |
| 1,3,5-Trimethylbenzene | NR | NR | NR |
| **Semi-Volatile Organic Compounds** | | | |
| Acenaphthene | 90,000 (57) | 100,000 | 110,000 |
| Acenaphthylene | 90,000 (86) | 100,000 | 110,000 |
| Anthracene | 430,000 | 490,000 | 520,000 |
| Benzo(a)anthracene | 120 | 150 | 160 |
| Benzo(a)pyrene | 76 | 76 | 76 |
| Benzo(b)fluoranthene | 43 | 44 | 45 |
| Benzo(g,h,i)perylene | 3,900 | 3,900 | 4,000 |
| Benzo(k)fluoranthene | 1,100 | 1,200 | 1,200 |
| Chrysene | 310 | 340 | 350 |
| Dibenzo(a,h)anthracene | 3.4 | 3.5 | 3.5 |
| Fluoranthene | 22,000 | 22,000 | 23,000 |
| Fluorene | 40,000 (31) | 54,000 (77) | 64,000 (183) |
| Indeno(1,2,3-cd)pyrene | 480 | 500 | 510 |
| Naphthalene | 400 (76) | 950 (183) | 2,140 (432) |
| Phenanthrene | 18,000 | 21,000 | 22,000 |
| Pyrene | 52,000 | 53,000 | 54,000 |
| Phenol | 440* | 690* | 1,300* |
| **Total Petroleum Hydrocarbons** | | | |
| Aliphatic hydrocarbons $EC_5$-$EC_6$ | 600 (304) | 1,100 (558) | 2,300 (1,150) |
| Aliphatic hydrocarbons >$EC_6$-$EC_8$ | 1,500 (144) | 3,300 (322) | 7,500 (736) |
| Aliphatic hydrocarbons >$EC_8$-$EC_{10}$ | 400 (78) | 900 (190) | 2,200 (451) |
| Aliphatic hydrocarbons >$EC_{10}$-$EC_{12}$ | 1,900 (48) | 4,600 (118) | 10,900 (283) |
| Aliphatic hydrocarbons >$EC_{12}$-$EC_{16}$ | 15,000 (24) | 35,000 (59) | 63,000 (142) |
| Aliphatic hydrocarbons >$EC_{16}$-$EC_{35}$ | 900,000 | 1,000,000** | 1,000,000** |
| Aliphatic hydrocarbons >$EC_{35}$-$EC_{44}$ | 900,000 | 1,000,000** | 1,000,000** |
| Aromatic hydrocarbons >$EC_8$-$EC_{10}$ | 700 (613) | 1,600 (1,503) | 3,800 (3,578) |
| Aromatic hydrocarbons >$EC_{10}$-$EC_{12}$ | 4,000 (364) | 8,000 (899) | 18,000 (2,149) |
| Aromatic hydrocarbons >$EC_{12}$-$EC_{16}$ | 26,000 (169) | 34,000 | 36,000 |
| Aromatic hydrocarbons >$EC_{16}$-$EC_{21}$ | 27,000 | 28,000 | 28,000 |
| Aromatic hydrocarbons >$EC_{21}$-$EC_{35}$ | 28,000 | 28,000 | 28,000 |
| Aromatic hydrocarbons >$EC_{35}$-$EC_{44}$ | 28,000 | 28,000 | 28,000 |
| **Minerals** | | | |
| Asbestos | Stage 1 test – No asbestos detected with ID; Stage 2 test - <0.001% dry weight (exceedance of either equates to an exceedance of the GAC)[1] | | |

**Notes:**

'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway, or an absence of toxicological data.
NR - SAC for 1,3,5-trimethylbenzene is not recorded owing to the lack of toxicological data, SAC for 1,2,4 trimethylbenzene may be used
EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.
* The GAC for Phenol is based on a threshold which is protective of direct contact (SC050021/Phenol SGV report)
** Denoted SAC calculated exceeds 100% contaminant, hence 100% (1,000,000mg/kg) has been taken as SAC

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.

SAC and GrAC for TPH fractions, PAHs napthalene, acenaphthene and acenaphthylene, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

(VALUE IN BRACKETS)
RSK has adopted an approach for petroleum hydrocarbons in accordance with LQM/CIEH whereby the concentration modelled for each petroleum hydrocarbon fraction has been tabulated as the SAC with the corresponding solubility or vapour saturation limits given in brackets.

# Generic assessment criteria (vGAC) for indoor human health exposure

## Background

RSK's vapour generic assessment criteria (vGAC) were initially prepared in 2012. The RSK vGAC are periodically revised when updated information on toxicological, land use or receptor parameters is published.

The potential for volatile organic compounds (VOC) present in the ground to cause significant human health risks *via* inhalation exposure is well documented and UK guidance on investigating, assessing and managing risks of inhalation of VOC on land affected by contamination has been published in CIRIA C682(1). CIRIA C682(1) is consistent with existing UK regulatory guidance on land contamination (e.g. the CLEA model and supporting documents(2,3,4) and complements BS8576(5) - Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs).

A detailed framework for the assessment of VOC is provided in CIRIA C682(1), which describes the development and use of screening criteria for VOC present in soil, groundwater and soil gas (vapour).

For soil it is recognised that for VOC, published Soil Guideline Values (SGV) or calculated generic assessment criteria (GAC) that include, or are specific to, indoor inhalation exposure pathways may be used as conservative screening criteria(1). RSK has calculated GAC for VOC in soils for a variety of end-uses using CLEA v1.06, where SGV are not available. RSK also uses data from the Suitable for Use Levels published in 2015 by Nathanial et al.,(6) and CL:AIRE(7). For groundwater, RSK has calculated GAC using the RBCA model (version 1.3b) updated to reflect UK guidance.

It is recognised within CIRIA C682(1) that SGV/GAC for VOC in soil and groundwater calculated using published coefficients to estimate the partitioning from the sorbed or dissolved phase into the gas phase (e.g. Henry's constant) may be conservative by up to several orders of magnitude. Additional conservatism of inhalation exposure may also occur through estimation of soil gas intrusion into building *via* the foundation using models such as Johnson & Ettinger (J&E)(8), although there are recognisable differences between chlorinated and non-chlorinated compounds. The J&E model is known to typically overestimate the intrusion of non-chlorinated VOC into buildings, whilst chlorinated VOC may be underestimated, with the consequence that the J&E model is no longer recommended for predicting vapour intrusion of chlorinated VOC in many of the states in the USA(1). This difference is in part due to the often rapid biodegradation of non-chlorinated VOC and very slow degradation of chlorinated in aerobic environments such as those typically found in shallow soils and beneath buildings.

Notwithstanding the above, it should be recognised that comparison of laboratory data for VOC in soils with SGV/GAC may also underestimate inhalation risk, due to the potential loss of VOC during soil sampling, which may be significant. Many states in the USA disregard reliance on soil results for vapour intrusion assessment for this reason.

The conservatism associated with estimating the indoor intrusion of VOC in soils has been recognised in guidance for the use of the CLEA model(3), where calculated indoor VOC concentrations may be amended using a sub-surface soil to indoor air correction factor for petroleum hydrocarbons.

In general, multiple lines of evidence are recommended for vapour intrusion risk assessment[1]. However, **it is not necessary to undertake soil gas VOC monitoring at all sites**, particularly those where VOC are not anticipated or identified in soil and groundwater. In deciding when it is appropriate to undertake soil gas VOC monitoring the following situations should be considered, based on a detailed understanding of the conceptual model and possible limitations in your data:

- Reliance on VOC in soil data alone - acceptable only where shallow groundwater is absent and where:
  - VOC sources are not anticipated;
  - VOC are not identified during drilling/sampling (i.e. no olfactory evidence); and
  - VOC concentrations in soil samples are representative and well below SGV/GAC; potential significant losses of VOC during soil sampling must be recognised.

- Reliance on VOC in soil and groundwater data alone (i.e. no soil gas VOC data) - acceptable only where:
  - VOC sources are not anticipated;
  - VOC are not identified during drilling/sampling (i.e. no olfactory evidence); and
  - VOC concentrations in soil and groundwater samples are representative and below SGV/GAC; potential significant losses of VOC during soil sampling must be recognised.

Where VOC are either anticipated or present in soil and/or groundwater in concentrations near to or exceeding SGV/GAC then direct measurement of VOC in soil gas is recommended to assess potential inhalation exposure. Soil gas VOC data should initially be compared with generic soil gas VOC assessment criteria (vGAC).

Remediation measures should not be recommended, or remediation criteria calculated, to mitigate inhalation exposure risks in the absence of soil gas VOC data, except in specific circumstances, e.g. where acute risk is possible or emergency response work is being undertaken.

## Generic Soil Gas VOC Assessment Criteria (vGAC)

As part of a multiple lines of evidence approach, recommended in CIRIA C682, RSK details herein the calculation of vGAC to be used for screening soil gas VOC concentrations for the protection of human health inhalation exposure within residential and commercial buildings. vGAC are relevant to soil gas VOC concentrations measured in the following scenarios:

- Open spaces, with planned future development;
- Near slab – i.e. close to, but outside, the building footprint; and
- Sub slab – i.e. directly beneath the building footprint.

It is important to note that vGAC relate to soil gas concentrations only and are not for use when assessing the results of indoor air sampling. Indoor air sampling data must be compared directly with relevant published or adjusted inhalation health criteria value (HCV) such as those in Table 3 or with occupational exposure limits depending upon the purpose of the assessment.

*Model Selection*

In line with recommendations[(9)] and the approach taken within the CLEA model, RSK has used the J&E model[(10)] as the basis to estimate the vGAC. Limitations of the J&E model for chlorinated compounds are noted. The following components of vapour intrusion are incorporated within the model:

1. Partitioning of contaminants between groundwater, soil and vapour-phase.
2. Movement of contaminants in the soil vapour-phase through the unsaturated zone – **diffusion** controlled.
3. Movement of contaminants in the soil vapour-phase through the unsaturated zone – **advection** controlled for shallow soils beneath a building.
4. Movement of contaminants through the building foundation (dust-filled joints and cracks) - **advection** controlled.
5. Dilution of soil gas vapours within indoor air.

Movement of soil gas vapours through advection forces (pressure differential) is recognised to be more rapid than *via* diffusion, particularly in close proximity to building foundations.

The following components of vapour intrusion are not included in the model:

1. Preferential flow paths through foundations (e.g. *via* large cracks or service entries);
2. Biodegradation/bioattenuation during unsaturated zone transport, during intrusion via the foundation or whilst in indoor air.

The output of the J&E model is the calculation of an attenuation factor ($\alpha$) by the following equation (Equation 10.4 in SR3[(3)]):

$$\alpha = \frac{\left[\left(\frac{D_{eff} A_B}{Q_b L_T}\right) \exp\left(\frac{Q_s L_{crack}}{D_{crack} A_{crack}}\right)\right]}{\left[\exp\left(\frac{Q_s L_{crack}}{D_{crack} A_{crack}}\right) + \left(\frac{D_{eff} A_B}{Q_b L_T}\right) + \left(\frac{D_{eff} A_B}{Q_s L_T}\right)\left[\exp\left(\frac{Q_s L_{crack}}{D_{crack} A_{crack}}\right) - 1\right]\right]}$$

Where: $\alpha$ is the steady-state attenuation coefficient between soil and indoor air, dimensionless
$D_{eff}$ is the effective diffusion coefficient for unsaturated soils, $cm^2\ s^{-1}$
$A_B$ is the area of enclosed floor and walls below ground, $cm^2$
$Q_b$ is the building ventilation rate, $cm^3\ s^{-1}$
$L_T$ is the source-building separation, cm
$Q_s$ is the volumetric flow rate of soil gas into the enclosed space, $cm^3\ s^{-1}$ [25 to 150]
$L_{crack}$ is the foundation slab thickness, cm
$A_{crack}$ is the floor crack area, $cm^2$
$D_{crack}$ is the effective diffusion coefficient through the cracks, $cm^2\ s^{-1}$ [= $D_{eff}$]
Note: Appendix 1, Equation A10 where the Peclet number approaches infinity

The attenuation factor ($\alpha$) is the ratio of the indoor concentration to the concentration in the soil gas for a particular chemical (Equation 10.6 in SR3[(3)]) and is a measure of the degree of **reduction** in concentration as VOC migrate into buildings:

$$A = \left[\frac{D_T^{eff}}{E_B \left(\frac{V_B}{A_B}\right) L_T}\right], \quad B = \left[\frac{\left(\frac{Q_{soil}}{Q_B}\right) E_B \left(\frac{V_B}{A_B}\right) L_{crack}}{D_{crack}^{eff}\ \eta}\right], \quad C = \left[\frac{Q_{soil}}{Q_B}\right]$$

Identification of critical parameters for the J&E model (1991) was undertaken by Johnson in 2002[(11)]. Johnson[(11)] identified three multi-component parameters (termed A, B and C), required to achieve the required J&E model output:

$$C_{air} = \alpha\, C_{vap} \quad \times \quad 1000000\, cm^3 m^{-3}$$

Where: $C_{air}$ is the indoor air concentration, mg $m^{-3}$
$\alpha$ is steady-state attenuation coefficient between soil and indoor air, dimensionless
$C_{vap}$ is the soil vapour concentration, mg $cm^{-3}$

Where additional parameters:

$E_B$ is the enclosed space air exchange rate ($d^{-1}$)

$V_B$ is the enclosed space volume ($m^3$)

(Note – subscript B is not related to multi-component parameter B)

Depending on a variety of situations where movement of soil gas is controlled by either diffusion (slow) or advection (fast), Johnson identified solutions to the J&E model for the calculation of $\alpha$ based solely on the three multi-component parameters *A, B and C*.

The most **conservative** assumption is where movement of soil gas across the building foundation *via* advection is rate limiting, then:

$$\alpha \approx C \approx Q_{soil}/Q_B$$

Where: $\alpha$ = attenuation factor

$Q_{soil}$ = soil gas flow into building

$Q_B$ = building ventilation rate ($cm^3\ s^{-1}$)

For other situations where diffusion is assumed to be either dominant, or occurs in addition to advection (e.g. for a deeper source), then the solutions for $\alpha$ *via* parameters A and B are less conservative.

Assuming that the contaminant source in the soil gas is directly beneath the building foundation and that movement is controlled by advection (i.e. the most conservative assumption), then the attenuation factor $\alpha$ is the ratio of the flux of soil gas migration into the building ($Q_{soil}$) and the flux of air out of the building (building ventilation rate $Q_B$).

Guidance in SR3(3) provides recommendations for the calculation of the ventilation rate $Q_B$ as follows:

$$C = (H \times A_{foot} \times E_x) \times 1{,}000{,}000\ cm^3\ m^{-3} \times 1/3600\ s\ hr^{-1}$$

Where: $H$ = height of living space (m)

$A_{foot}$ = building footprint ($m^2$)

$E_x$ = building air exchange rate ($hr^{-1}$)

*Approach to Calculation of vGAC*

The building ventilation rate $Q_B$ can be calculated for various building types (residential and commercial) using building parameters provided in Tables 3.3 and 4.21 in SR3(3), and based on building air exchange rates ($E_X$) recommended in SR3(3) for residential properties (0.5 $h^{-1}$) and commercial properties (1.0 $h^{-1}$).

Values for the volumetric flow rate into the building ($Q_{soil}$) are stated in SR3(3), based on a combination of worst-case building parameters and soil type (crack/joint infill), and calculations provided in Appendix 1 of SR3[3], as 25 $cm^3\ s^{-1}$ and 150 $cm^3\ s^{-1}$ for the residential and commercial land uses, respectively.

The approach to calculating vGAC taken by RSK therefore bypasses direct use of the full J&E model algorithm and uses a simple dilution relationship ($Q_{soil}$/ $Q_B$), which is more conservative and suitable for screening purposes. This approach also negates the requirement to measure (or assume) a variety of soil and other physical characteristics (e.g. soil volumetric moisture content, total porosity, molecular diffusion in air).

Attenuation factors ($\alpha$) have been calculated on the basis of the above and are presented in Table 2.

This method of calculating attenuation factors from reasonably conservative vapour entry rates and indoor air exchange rates has been suggested in a recent (2014) paper[11] to offer a more technically defensible approach for the development of site specific attenuation factors, compared with a method that uses a comparison between paired, indoor air and sub-slab soil gas data in empirical databases.

As expected, attenuation is typically greater ($\alpha$ is a smaller value) for commercial properties than for residential properties. Calculation of vGAC, specific to both chemical and building type, has been undertaken through division of the HCV, specific to the critical receptor for a given end-use (e.g. residential or commercial), and the corresponding building-specific attenuation factor.

$$\mathbf{vGAC = HCV / \alpha}$$

*Health Criteria Values (HCV)*

The HCV and background inhalation has been taken from the relevant SGV report[12], published by Nathanial et al.,[6] or the CL:AIRE report[7], as appropriate. The HCV have been amended for commercial, petrol (retail) and residential scenarios as follows:

- Commercial
  - An adult weighing 70kg and breathing 15.7$m^3$ air per day in accordance with the revised exposure parameters used in the SP1010 final project report for the Category 4 Screening Levels (C4SL) (Table 3.2[13]) and USEPA data[14]
  - Background inhalation (mean daily intake(MDI)) for an adult (Age Class 17).

  - Background inhalation (mean daily intake (MDI)) for an adult (Age Class 17).

- Residential
  - A child weighing 13.3kg (average of 0-6 year old female in accordance with Table 4.6 of SR3[3]) and breathing 8.77$m^3$ (average daily inhalation rate for a 0-6yr old female in accordance with SP1010 final project report for the C4SL (Table 3.2[13]) and USEPA data[14]
  - Background inhalation (mean daily intake (MDI)) for a child (Age Classes 1-6)

- Residential amendments to the MDI for younger age groups following Table 3.4 and Section 3.4.1 of SR2[(2)],; amended to reflect average daily inhalation rates in accordance with SP1010 final project report for the C4SL (Table 3.2[(13)]) and USEPA data[(15)]. Correction factors are presented in Table 1.

Amended HCV are shown in Table 3.

*Note on Trimethylbenzenes*

For trimethylbenzenes the CL:AIRE report[(7)] based background inhalation from non-soil sources (MDI) on a Dutch study from 1985, which is reported to have identified an average daily dose of 1,2,4-trimethylbenzene of 86 ug $d^{-1}$ (1,3,5-trimethylbenzene was 20.5 ug $d^{-1}$). This dose value was based on the upper end of the identified concentration range of 1,2,4-trimethylbenzene (2.46 – 5.66 ug $m^{-3}$) and was used to calculate an a MDI of 1.23 ug $kg^{-1}$ bw $d^{-1}$ for a 70 kg adult breathing 20 $m^3$ of air daily.

The approach recommended in SR2[(2)], and also adopted for the C4SLs[(13)], for non-carcinogenic (threshold) compounds such as trimethylbenzenes is to subtract the MDI from the tolerable daily intake (TDI) to obtain a tolerable daily intake from soil (TDSI) in units of ug $kg^{-1}$ bw $d^{-1}$. For 1,2,4-trimethylbenzene, the adult MDI from the Dutch study used in the CL:AIRE report[(7)] (1.23 ug $kg^{-1}$ bw $d^{-1}$) is a significant proportion of the TDI (2.0 ug $kg^{-1}$ bw $d^{-1}$), resulting in a low TDSI (1.0 ug $kg^{-1}$ bw $d^{-1}$) when the 50% rule is applied (i.e. TDSI = TDI * 0.5 when MDI is high relative to TDI). This TDSI equates to an Inhalation Reference Concentration (or modified Health Criteria Value) for adults of 3.4 ug $m^{-3}$ (70 kg adult breathing 15.7 $m^3$ $d^{-1}$).

By comparison the adult inhalation modified HCV for benzene is 6.2 ug $m^{-3}$, which is proven human carcinogen (non-threshold compound).

The MDI for 1,2,4-trimethylbenzene is considered by RSK to be overly conservative for the following reasons:

- The Dutch 1985 study is dated and air quality has improved since this time
- The maximum value in the range (5.66 ug $m^{-3}$) was used in calculating the MDI
- Experience has shown that trimethylbenzenes often appear to drive inhalation risks to a greater extent than benzene, even though the latter is carcinogenic and more volatile.

As an alternative to the 1985 Dutch study, RSK have obtained automated roadside air quality monitoring data for the UK from www.uk-air.defra.gov.uk/. The average concentration of 1,2,4-trimethylbenzene measured during 2015 at Eltham, south-east London (urban) was 0.309 ug $m^{-3}$, significantly lower than that identified in the Dutch study and used by CL:AIRE[(7)] for calculation of a MDI. Whilst an average concentration of 1,2,4-trimethylbenzene in UK urban and rural areas is likely to be significantly below 0.0.309 ug $m^{-3}$, this value is considered to be suitably conservative for the calculation of a modified HCV for trimethylbenzenes in the UK.

On this basis, the HCV for 1,2,4-trimethylbenzene for adults and children was calculated as 8.5 ug $m^{-3}$ (0.0085 mg $m^{-3}$) and 2.6 ug $m^{-3}$ (0.0026 mg $m^{-3}$), respectively (see Table 3). Due to the paucity of toxicological data for 1,2,3-trimethylbenzene and 1,3,5-trimethylbenzene the modified HCV for 1,2,4-trimethylbenzene is considered suitable for assessing total trimethylbenzenes.

## RSK vGAC

RSK vGAC are presented in Table 4 for residential and commercial end-uses for common VOC and have also been calculated for common semi-volatile organic chemicals (sVOC), which may also have the potential to pose inhalation exposure risks.

RSK vGAC are simple screening criteria, in line with the principles of the CLEA model and the derivation of GAC, and are considered to be suitably conservative for use in a GQRA for the following reasons:

- Calculation of attenuation factors is based on the conservation assumption that the source lies directly beneath the foundation and that no additional depletion *via* diffusion occurs, i.e. attenuation is attributed solely to the dilution of soil gas as it moves through the foundation into indoor air
- The vGAC are applicable to the most conservative soil type
- Volumetric flow rate into buildings ($Q_{soil}$) is based on a combination of a sandy loam soil and parameters for a worst-case building type
- Biodegradation of VOC is not taken into account. Biodegradation of petroleum hydrocarbons can potentially attenuate soil gas concentrations and vapour intrusion by several orders of magnitude[(15)].

RSK vGAC listed in Table 4 have been calculated for the most conservative residential (small terraced house) and commercial buildings (pre-1970 office). vGAC may be calculated for other residential and commercial buildings *via* attenuation factors listed in Table 1 and modified HCV listed in Table 3.

## Uncertainties/Limitations

The use of the J&E model[(10)] is considered to be inappropriate for site conditions where NAPL is present and potentially for use with modelling chlorinated hydrocarbons. The simplified RSK approach described negates these limitations provided representative soil gas concentrations are measured.

Use of the vGAC should only be undertaken with **detailed knowledge of the conceptual model and an understanding of the potential limitations in data** for the site and should be used as part of a multiple lines of evidence approach to assessing vapour intrusion. Note that the compounds listed in tables are not exhaustive and VOC not listed may have the potential to pose an indoor inhalation risk.

vGAC listed in Table 4 may not be relevant or suitably protective where VOC migration is dominated by ground gas (carbon dioxide and methane) pressure driven flow or where other mechanisms leading to VOC exposure from soils (e.g. ingestion, dermal, dust inhalation) are active. vGAC may also not be relevant where the direct impact of foundation structures with impacted groundwater or NAPL occurs.

vGAC are not to be used for screening indoor or outdoor air quality results, where direct inhalation exposure is possible. In this scenario relevant inhalation HCV are suitable for use as screening criteria (for acceptable exposure) such as those in Table 3.

The conceptual model associated with the vGAC does not consider vapour intrusion along drainage pipes/backfill and migration into a building.

**Table 1: Correction factors used to adjust adult MDI to younger age groups**

| Age Class | Body weight (kg)[1] | Inhalation rate ($m^3$/day)[2] | Correction factor for inhalation MDI[3] |
|---|---|---|---|
| 1 | 5.6 | 5.4 | 0.34 |
| 2 | 9.8 | 8 | 0.51 |
| 3 | 12.7 | 8.9 | 0.57 |
| 4 | 15.1 | 10.1 | 0.64 |
| 5 | 16.9 | 10.1 | 0.64 |
| 6 | 19.7 | 10.1 | 0.64 |
| 17 | 70 | 15.7 | - |
| **Mean (AC1-6)** | **13.3** | **8.8** | **0.56** |

Notes

[1] Body weight from CLEA v1.06

[2] Inhalation rate from Table 3.2 of the SP1010 final project report for the C4SL(13)

[3] Inhalation correction factors are the ratio of the average male and female inhalation rates for each age class to the adult rate at age class 17 (age 16–59 years) and are based on the rates used by the Category 4 Screening Levels to derive the C4SLs(13),following the methodology in SR2(2).

**Table 2: α Attenuation Factors for a Variety of Residential and Commercial Buildings.**

| Receptor | Building Living Space Height - H (m) [a] | Building Footprint $A_{foot}$ ($m^2$) [a] | Building Air Exchange Rate ($hr^{-1}$) [a] | Building Ventilation Rate $Q_B$ ($cm^3 s^{-1}$) [b] | Soil Gas Flow Rate into Building $Q_{soil}$ ($cm^3 s^{-1}$) [c] | Attenuation Factor - Alpha = $Q_{soil}/Q_B$ [d] | Degree of Attenuation |
|---|---|---|---|---|---|---|---|
| Residential - Bungalow | 2.4 | 78 | 0.5 | 22472 | 25 | 0.00096 | 1040 |
| **Residential - Small Terrace House** | **4.8** | **28** | **0.5** | **9250** | **25** | **0.00134** | **747** |
| Residential - Medium/Large Terrace House | 4.8 | 44 | 0.5 | 13694 | 25 | 0.00085 | 1173 |
| Residential - Semi-Detached House | 4.8 | 43 | 0.5 | 13417 | 25 | 0.00087 | 1147 |
| Residential - Detached House | 4.8 | 68 | 0.5 | 20361 | 25 | 0.00055 | 1813 |
| **Commercial - Warehouse (pre-1970)** | **5.2** | **1089** | **1** | **304222** | **150** | **0.00008** | **12584** |
| Commercial - Warehouse (post-1970) | 5.9 | 1914 | 1 | 533583 | 150 | 0.00004 | 25095 |
| Commercial - Office (pre-1970) | 10.2 | 424 | 1 | 120889 | 150 | 0.00010 | 9611 |
| Commercial - Office (post-1970) | 13 | 610 | 1 | 173333 | 150 | 0.00006 | 17622 |

**Notes:**

[a] From Table 3.3 and 4.21, SR3(3)

[b] Equation 10.5, SR3(3)

[c] Generic flow rate, Section 10.3, SR3(3)

[d] Most conservative assumption where advection across foundation is rate limiting(8)

Table 3: Amended Health Criteria Values

| | Modified HCV (mg/m³)[1] | |
|---|---|---|
| **VOC / SVOC** | **Child (Residential)** | **Adult (Commercial)** |
| **MTBE** | 1.0803 | 3.2064 |
| **Benzene** | 0.0021 | 0.0062 |
| **Toluene** | 2.1164 | 6.2362 |
| **Ethylbenzene** | 0.1113 | 0.3301 |
| **Xylenes** | 0.0808 | 0.2586 |
| **Trimethybenzenes** | 0.0026 | 0.0085 |
| **TPH_Aliph EC5-EC6** | 3.7913 | 11.1465 |
| **TPH_Aliph >EC6-EC8** | 3.7913 | 11.1465 |
| **TPH_Aliph >EC8-EC10** | 0.2199 | 0.6465 |
| **TPH_Aliph >EC10-EC12** | 0.2199 | 0.6465 |
| **TPH_Aliph >EC12-EC16** | 0.2199 | 0.6465 |
| **TPH_Arom >EC8-EC10** | 0.0455 | 0.1338 |
| **TPH_Arom >EC10-EC12** | 0.0455 | 0.1338 |
| **TPH_Arom >EC12-EC16** | 0.0455 | 0.1338 |
| **Acenaphthene** | 0.0910 | 0.2675 |
| **Acenaphthylene** | 0.0910 | 0.2675 |
| **Naphthalene** | 0.0011 | 0.0037 |
| **Vinyl chloride** | 0.0005 | 0.0013 |
| **Dichloroethane-1,2** | 0.0002 | 0.0005 |
| **Tetrachloroethene** | 0.0083 | 0.0363 |
| **Carbon tetrachloride** | 0.0025 | 0.0114 |
| **Trichloroethane-1,1,1** | 0.9099 | 2.6752 |
| **Trichloroethene** | 0.0009 | 0.0025 |
| **Tetrachloroethane 1,1,2,2 & 1,1,1,2** | 0.0086 | 0.0257 |
| **1,1,2-Trichloroethane** | 0.0073 | 0.0216 |
| **1,1-dichloroethane** | 0.3030 | 0.8915 |
| **1,1-dichloroethene** | 0.0864 | 0.2541 |
| **Chloroethane** | 4.3318 | 12.7374 |
| **Chloromethane** | 0.0039 | 0.0115 |
| **cis-1,2-dichloroethene** | 0.0087 | 0.0264 |
| **Dichloromethane** | 0.1781 | 0.5765 |
| **trans-1,2-dichloroethene** | 0.0253 | 0.0754 |
| **Trichloromethane (chloroform)** | 0.0570 | 0.1752 |

[1] Inhalation HCV has taken account of background inhalation for threshold compounds only

Table 4: RSK vGAC – Single Exposure Route

| | vGAC ($mg/m^3$) | |
|---|---|---|
| **Volatile Organic Compound** | **Residential (Small Terrace House)** | **Commercial (Office pre-1970)** |
| Attenuation factor ($\alpha$) | **0.00134** | **0.00010** |
| **MTBE** | 807 | 25679 |
| **Benzene** | 1.59 | 49.99 |
| **Toluene** | 1580 | 49945 |
| **Ethylbenzene** | 83.1 | 2644 |
| **Xylenes** | 62.3 | 2089 |
| **Trimethybenzenes** | 1.9 | 68.3 |
| **TPH_Aliph EC5-EC6** | 2831 | 89271 |
| **TPH_Aliph >EC6-EC8** | 2831 | 89271 |
| **TPH_Aliph >EC8-EC10** | 164 | 5178 |
| **TPH_Aliph >EC10-EC12** | 164 | 5178 |
| **TPH_Aliph >EC12-EC16** | 164 | 5178 |
| **TPH_Arom >EC8-EC10** | 34 | 1071 |
| **TPH_Arom >EC10-EC12** | 34 | 1071 |
| **TPH_Arom >EC12-EC16** | 34 | 1071 |
| **Acenaphthene** | 68 | 2142 |
| **Acenaphthylene** | 68 | 2142 |
| **Naphthalene** | 0.82 | 29.3 |
| **Vinyl chloride** | 0.34 | 10.7 |
| **Dichloroethane-1,2** | 0.14 | 4.3 |
| **Tetrachloroethene** | 6.23 | 291 |
| **Carbon tetrachloride** | 1.8457 | 91 |
| **Trichloroethane-1,1,1** | 679 | 21425 |
| **Trichloroethene** | 0.6 | 20 |
| **Tetrachloroethane 1,1,2,2 & 1,1,1,2** | 6.5 | 206 |
| **1,1,2-Trichloroethane** | 5.4 | 173 |
| **1,1-dichloroethane** | 226 | 7140 |
| **1,1-dichloroethene** | 65 | 2035 |
| **Chloroethane** | 3234 | 102012 |
| **Chloromethane** | 2.9 | 91.8 |
| **cis-1,2-dichloroethene** | 6.5 | 211 |
| **Dichloromethane** | 133 | 4617 |
| **trans-1,2-dichloroethene** | 18.9 | 604 |
| **Trichloromethane (chloroform)** | 42.6 | 1403 |

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# SELECTION OF GENERIC ASSESSMENT CRITERIA FOR CONTROLLED WATERS

## Protection of the water environment

The water environment in the United Kingdom is protected under a number of regulatory regimes. The relevant environmental regulator is consulted where there may be a risk that pollution of ‘controlled waters’ may occur or may have occurred in the past.

The term ’controlled waters’ refers to coastal waters, inland freshwaters and groundwater. The EU Water Framework Directive (WFD) (2000/60/EC) is implemented via domestic regulations and guidance, covering aspects of groundwater and surface water protection as well as drinking water supply policy. Domestic legislation and guidance will vary across the United Kingdom. Therefore, the relevant legislation for England, Wales, Northern Ireland and Scotland should be reviewed, alongside guidance provided by the Environment Agency (EA), Natural Resource Wales (NRW), the Scottish Environmental Protection Agency (SEPA) or the Northern Ireland Environment Agency (NIEA), as appropriate.

The main objectives of the protection and remediation of groundwater under threat from land contamination are set out within “The Environment Agency’s approach to groundwater protection”, version 1.0 (March 2017)[(1)] and the associated guidance “Land contamination groundwater compliance points: quantitative risk assessments (March 2017)[(1a)] that have replaced the previous guidance document “Groundwater Principles and Practice (GP3)”. When assessing risks to groundwater, the following need to be considered:

- Where pollutants have not yet entered groundwater, all necessary and reasonable measures must be taken to:
  - ***prevent*** *the input of* ***hazardous*** *substances into groundwater (see description of hazardous substances below)*
  - ***limit*** *the entry of other (non-hazardous) pollutants into groundwater to avoid pollution, deterioration in the status of groundwater bodies and to prevent sustained, upward trends in pollutant concentrations in groundwater.*
- Where pollutants have already entered groundwater, the priority is to take all necessary and reasonable measures to:
  - ***minimise*** *further entry of “contaminants” where there is a defined source*
  - ***limit the pollution*** *of groundwater or any effect on the status of the groundwater body from the future expansion of the ‘plume’, if necessary, by actively reducing its extent.*

Within the context of groundwater risk assessments on sites affected by land contamination, “reasonable” means feasible without involving disproportionate costs. What costs are “disproportionate” depends on site-specific circumstances, which may include:

- Considerations of technical feasibility such as identified by the remedial options appraisal, this may be due to the distribution or nature of the contamination and the available remedial methods to treat the identified contamination;
- Sustainability considerations.

## Selecting the appropriate assessment criteria

When assessing the risks to controlled waters, various assessment criteria apply, depending on the nature of the assessment and the conceptual site model.

**A simple flow chart is included on the next page to inform selection of the appropriate target concentrations when considering potential risks to controlled waters, in keeping with the principles of "prevent / limit".**

Where a surface water body is considered as the primary receptor, then Environmental Quality Standards (EQS) defined within The Water Framework Directive (Standards and Classification) Directions (England and Wales)(2) are the relevant assessment criteria as they are designed to be protective of surface water ecology.

Where a public water supply or a Principal aquifer is considered the primary receptor, then the standards defined in The Water Supply (Water Quality) Regulations(3) are the main source of assessment criteria. The Private Water Supplies Regulations(4) may also be applicable in some cases.

For instances where there are **no statutory** UK assessment criteria, then other available, non-statutory assessment criteria may be used where necessary, and where justified by the conceptual site model. Available non-statutory assessment criteria for the purposes of this contract include GAC based on aquatic toxicity factors (ATF) for fresh and marine waters(5), Risk Based-Screening Levels (RBSLs) derived by GSI Environmental for Shell Downstream Sites which are applicable to water intended or used for ingestion and other domestic uses within a residential setting(6) and the World Health Organisation (WHO) drinking water guidelines(7).

This appendix presents the generic assessment criteria (GAC) that RSK considers suitable for assessing risks to controlled waters for our most commonly encountered determinants.

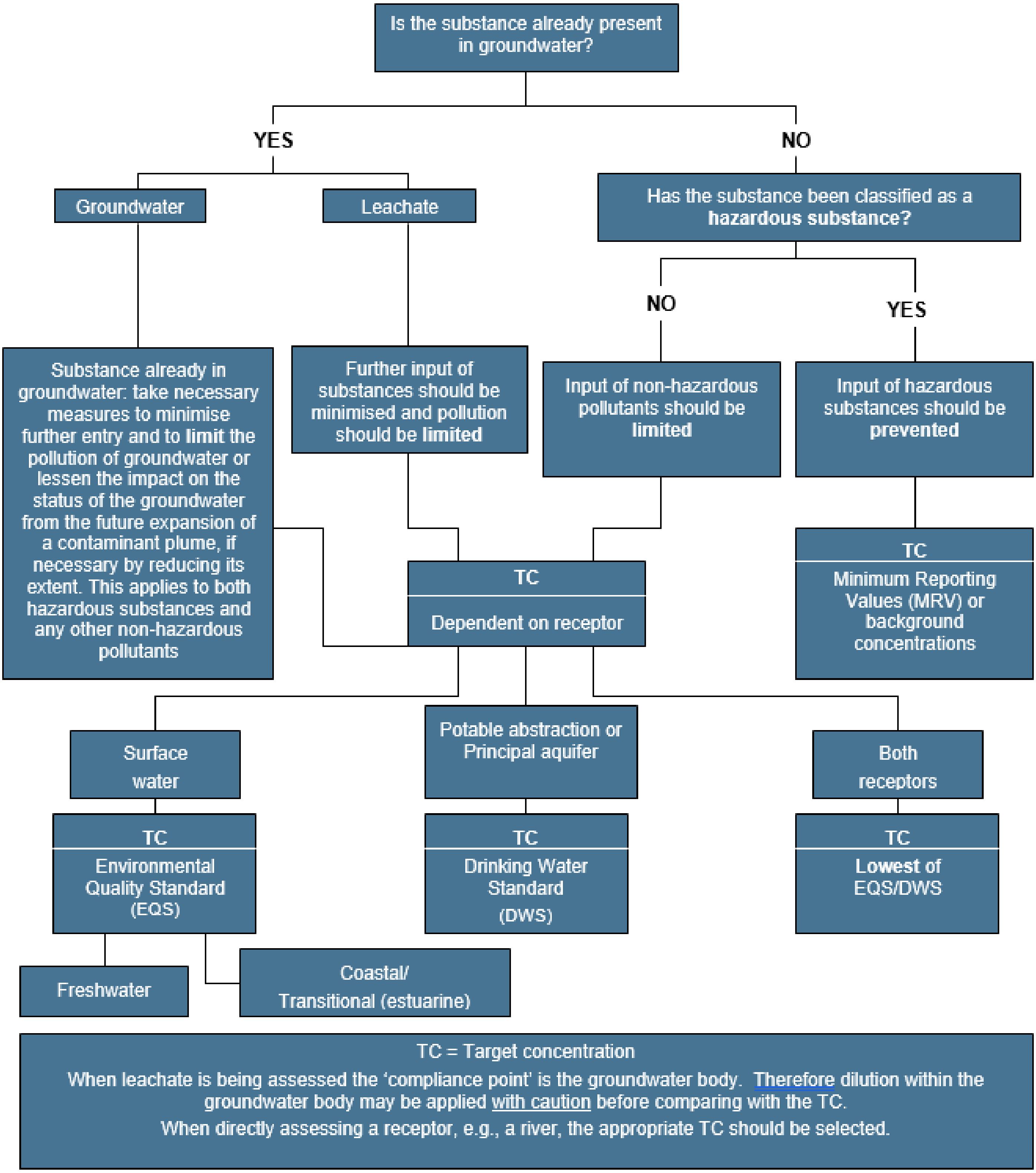
The RSK GAC for controlled waters are presented in **Table 1** and **Table 2**. In line with the Environment Agency's Remedial Targets Methodology(8), the GAC for controlled waters are termed 'target concentrations'.

The appropriate target concentrations should be selected with consideration to:

- The site conceptual model (i.e. the receptor at potential risk);
- Whether the substance is already present in groundwater at the site;
- Whether or not the substance is classified as a priority hazardous substance under the Priority Substances Directive (2013/39/EC) (see above), or as a hazardous substance according to the current list of JAGDAG determinations(9); and
- Background concentrations in the aquifer (if applicable).

It is important to remember that the WFD and Environment Agency guidance(1 & 1a) advocate for a sustainable, risk-based approach be applied to groundwater contamination. Exceedance of any target concentration does not necessarily imply that an unacceptable risk exists or that remediation is inevitably required.

# FLOW CHART TO ASSIST WITH SELECTION OF TARGET CONCENTRATIONS



# TARGET CONCENTRATIONS FOR CONTROLLED WATERS

| | | | |
|---|---|---|---|
| Target concentrations shaded in green are **statutory values** | Target concentrations shaded in orange are **non-statutory values** | **LTOT:** Target concentration based on the lowest of available taste and odour thresholds | |
| | | **RBSL:** Target concentration based on a risk based screening level (derived to be protective of groundwater ingestion in a domestic setting) | |

**Note:** Units µg/l throughout

**Table 1: Target concentrations for controlled waters (excluding TPH CWG fractions)**

| Substance classification | | Determinant | Target concentrations (µg/l) | | | |
|---|---|---|---|---|---|---|
| | | | | | EQS or best equivalent | |
| Groundwater receptors[9] | Surface water receptors[2] | | Minimum reporting value | UK drinking water standard (or best equivalent) | Freshwater | Transitional (estuaries) and coastal waters |
| **Lead scavengers** | | | | | | |
| Non-hazardous pollutant | Priority substance | 1,2-Dichloroethane (EDC) | 1.0[10] | 3.0[3] | 10[2a] | 10[2a] |
| **Hazardous substance** | - | 1,2-Dibromoethane (EDB) | - | LTOT: -<br>RBSL: 1.90[6] | - | - |
| **Semi-volatile organic compounds (SVOC)** | | | | | | |
| Non-hazardous pollutant | Priority substance | Naphthalene (C10-C12) | - | LTOT: 21[11]<br>RBSL: 150[6] | 2[2a] | 2[2a] |

| Substance classification | | Determinant | Target concentrations (µg/l) | | | |
|---|---|---|---|---|---|---|
| | | | Minimum reporting value | UK drinking water standard (or best equivalent) | EQS or best equivalent | |
| Groundwater receptors[9] | Surface water receptors[2] | | | | Freshwater | Transitional (estuaries) and coastal waters |
| **Hazardous substance** | **Priority hazardous substance(s)** | Benzo(a)pyrene (C16-C35) | - | 0.01[3] | 0.00017[2a] | 0.00017[2a] |
| **Petroleum hydrocarbons** | | | | | | |
| **Hazardous substance** | - | Total petroleum hydrocarbons* | - | See Table 2 for individual (non-statutory) TPH CWG fractions with respect to drinking water receptors | See individual risk driving compounds (i.e. BTEX and PAH) for specific EQS | |
| **Hazardous substance** | Priority substance | Benzene (Aro EC5-EC7) | 1[10] | 1[3] | 10[2a] | 8[2a] |
| **Hazardous substance** | Specific pollutant | Toluene (Aro EC7-EC8) | 4[10] | LTOT: 42[12]<br>RBSL: 480[6] | 74[2a] | 74[2a] |
| **Hazardous substance** | - | Ethylbenzene (Aro EC8-EC10) | - | LTOT: 29[13]<br>RBSL: 590[6] | 118[5a] | 118[5a] |
| **Hazardous substance** | - | Xylenes (Aro EC8-EC10) | 3[10] | LTOT: -<br>RBSL: 1,200[6] | EA operational target: 30[2g]<br>ATF: 290[5a] | ATF: 290[5a] |
| **Ether oxygenates** | | | | | | |
| Non-hazardous pollutant | - | Methyl tertiary butyl ether (MTBE) | - | LTOT: 20[14]<br>RBSL: 2,300[6] | 51,000[5b] | 18,000[5b] |
| *(Not determined)* | - | Ethyl tert-butyl ether (ETBE) | - | LTOT: 13[15]<br>RBSL: 1,700[6] | 11,100[5b] | 3,400[5b] |

| Substance classification | | Determinant | Target concentrations (µg/l) | | | |
|---|---|---|---|---|---|---|
| | | | | | EQS or best equivalent | |
| Groundwater receptors[9] | Surface water receptors[2] | | Minimum reporting value | UK drinking water standard (or best equivalent) | Freshwater | Transitional (estuaries) and coastal waters |
| **Ether oxygenates (continued)** | | | | | | |
| *(Not determined)* | - | Tert-amyl methyl ether (TAME) | - | LTOT: 128[15]<br>RBSL: 800[6] | 9,500[5b] | 3,400[5b] |
| *(Not determined)* | - | Diisopropyl ether (DIPE) | - | LTOT: 0.8[15]<br>RBSL: 440[6] | 9,500[5b] | 7,600[5b] |
| *(Not determined)* | - | Tert-butyl alcohol (TBA) | - | LTOT: -<br>RBSL: 7,500[6] | - | - |
| **Miscellaneous** | | | | | | |
| *(Not determined)* | - | 2-Methyl naphthalene | - | LTOT:10[11]<br>RBSL: 28[6] | 20[5c] | 20 [5c] |
| *(Not determined)* | - | Hexane | - | LTOT: -<br>RBSL: 310[6] | 50[5c] | 50 [5c] |

Note "-" indicates no target concentration available.

* "Total petroleum hydrocarbons" is used for consistency, but is an analytical method-defined measurement for a mixture of hydrocarbons subject to environmental analysis[11].

**Table 2: Non-statutory target concentrations available for TPH CWG fractions in groundwater with potential drinking water use**

| TPH CWG fraction | Overall relative mobility in groundwater (as ranked in CL:AIRE, 2017[16]) | Non-statutory target concentrations for drinking water receptors (µg/l) |
|---|---|---|
| **Aliphatic fractions:** | | |
| Aliphatic EC5-EC6 | High | RBSL: 30,000[6] |
| Aliphatic >EC6-EC8 | Moderate | RBSL[6] exceeds the aqueous solubility limit for this fraction<br>WHO DWS: 15,000[7] |
| Aliphatic >EC8-EC10 | Low | RBSL[6] exceeds the aqueous solubility limit for this fraction<br>WHO DWS: 300[7] |
| Aliphatic >EC10-EC12 | Low | RBSL[6] exceeds the aqueous solubility limit for this fraction<br>WHO DWS: 300[7] |
| Aliphatic >EC12-EC16 | Very low | RBSL[6] exceeds the aqueous solubility limit for this fraction<br>WHO DWS: 300[7] |
| Aliphatic >EC16-EC21 | Very low | RBSL[6] exceeds the aqueous solubility limit for this fraction<br>WHO DWS: N/A[7] |
| Aliphatic >EC21-EC35 | - | - |
| **Aromatic fractions:** | | |
| Aromatic EC5-EC6 | High | Refer to benzene:<br>Statutory DWS of 1 [3] |
| Aromatic >EC6-EC8 | High | Refer to toluene:<br>LTOT: 42[12] or RBSL: 480[6] |
| Aromatic >EC8-EC10 | High | Refer to ethyl benzene:<br>LTOT: 29[13] or RBSL: 590[6]<br>**OR**<br>Refer to xylene:<br>RBSL: 1,200[6] |
| Aromatic >EC10-EC12 | Moderate | RBSL: 250[6] |
| Aromatic >EC12-EC16 | Moderate | RBSL: 270[6] |
| Aromatic >EC16-EC21 | Low | RBSL: 260[6] |
| Aromatic >EC21-EC35 | Very low | RBSL[6] exceeds the aqueous solubility limit for this fraction<br>WHO DWS: 90[7] |

## References


1. Environment Agency (2017), 'The Environment Agency's approach to groundwater protection', version 1.0, March 2017 (formerly contained within GP3).

1a. Environment Agency (2017), 'Land contamination groundwater compliance points: quantitative risk assessments', March 2017 (formerly contained within GP3).

2. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

    2a. The EQS for these substances are based on a "long term mean" or an "annual average (AA)" EQS.

    2b. For cadmium and its compounds the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg CaCO3/l, Class 2: 40 to < 50 mg CaCO3/l, Class 3: 50 to < 100 mg CaCO3/l, Class 4: 100 to < 200 mg CaCO3/l and Class 5: ≥ 200 mg CaCO3/l).

    2c. The EQS for Mercury and hexachlorobutadiene are based on a "maximum acceptable concentration (MAC)" EQS in absence of an "annual average (AA)" EQS.

    2d. The EQS for chlorine in saltwater is based on the 95$^{th}$ percentile concentration of total residual oxidant, which refers to the sum of all oxidising agents existing in water, expressed as available chlorine.

    2e. The recommended saltwater standard is derived using a safety factor of 100. Where the standard is failed, it is recommended that supporting evidence of ecological damage should be obtained before committing to expensive action.

    2f. EQS for total ammonia is as per Schedule 3, Part 1, Table 7 of of the above directions. EQS applies to river types 1, 2 and 4 and 6 (namely upland and low alkalinity). The EQS for a lowland and high alkalinity rivers (types 3, 5 and 7) is 600µg/l (0.6mg/l).

    2g. Note that the xylene EQS is an Environment Agency "operational" target and is not listed in the 2015 Directions:

    Additional information on the Metal Bioavailability Assessment Tool (M-BAT) is available at http://www.wfduk.org/resources/rivers-lakes-metal-bioavailability-assessment-tool-m-bat

3. The Water Supply (Water Quality) Regulations 2000 (SI 2000/3184), as amended by SI 2001/2885, SI 2002/2469, SI 2005/2035, SI 2007/2734 and SI 2010/991

    3a. Sum of chloroform, bromoform, dibromochloromethane and bromodichloromethane

    3b. Standard applies to individual pesticides except aldrin, dieldrin, heptachlor and heptachlor epoxide, for which a separate standard is defined.

4. The Private Water Supplies (England) Regulations 2016. SI 2016/618

5. GAC based on aquatic toxicity factors (ATF) for fresh and marine waters as determined within:

    5a: Review and Development of Shell Guideline Surface Water Ecology Criteria for BTEX (2013). Shell Health Report HE 13.044, Shell Global Solutions International BV. The Hague, Netherlands.

    5b: Review and Development of Shell Guideline Surface Water Ecology Criteria for Ether Oxygenates (2013). Shell Health Report HE 13.054, Shell Global Solutions International BV. The Hague, Netherlands.

    5c: Review and Development of Shell Guideline Surface Water Ecology Criteria for Naphthalene, 2-Methylnaphthalene and n-hexane (2013). Shell Health Report HE 13.064. November 11, 2013, Shell Global Solutions.

6. GSI Environmental, Universal Human Health Risk-Based Screening Level (RBSL) Tables for Shell Downstream Sites, October 2014. Target concentrations applicable to water intended or used for ingestion and other domestic uses within a residential setting – "Standard" residential exposure selected as best analogy for UK housing exposure.
7. World Health Organisation (WHO), 2008. Petroleum products in drinking-water. Background document for development of WHO guidelines for drinking water quality. WHO/SDE/WSH/05.08/123. World Health Organisation, Geneva.
8. Environment Agency, 2014. Land Contamination: Remedial Targets Methodology (RTM). Hydrogeological risk assessment guidance and tool to set targets to remediate (clean up) contaminated land or groundwater.
9. JAGDAG hazard substance determinations (January 2019): This list contains substances that are determined to be hazardous substances or non-hazardous pollutants for the purposes of the groundwater directive 2006/118/EC. https://www.wfduk.org/stakeholders/jagdag [accessed 1 February 2021]
The absence of an assessment or substance from the list means an assessment has not been completed and is therefore presented as 'Not determined'. For further details on how substances are assessed, see the Joint Agencies Groundwater Directive Advisory Group (JAGDAG) 'Methodology for the determination of hazardous substances in groundwater for the purposes of the groundwater directive 2006/118/EC' which is available from the JAGDAG website. The methodology is a UK –wide framework that sets criteria for how to assess whether a substance is a hazardous substance in groundwater.
10. Minimum reporting values listed in Annex (J) of Horizontal Guidance Note H1 (H1 Environmental Risk Assessment Framework, Environment Agency, April 2010 v2.0). Note target concentration for xylenes is 0.003mg/l each for o-xylene and m/p xylene)
11. ATSDR 2005. Toxicological Profile for Naphthalene, 1-Methylnaphthalene and 2-Methylnaphthalene. Agency for Toxic Substances and Disease Registry, US Department of Health and Human Services.
12. ATSDR 2000. Toxicological Profile for Toluene. Agency for Toxic Substances and Disease Registry, US Department of Health and Human Services. September 2000.
13. ATSDR 2010. Toxicological Profile for Ethyl benzene. Agency for Toxic Substances and Disease Registry, US Department of Health and Human Services. November 2010.
14. Vetrano, 1993. Final report to ARCO Chemical Company in the odor and taste threshold studies performed with methyltertuary-butyl ether (MTBE) and ethyl tertiary-butyl ether (ETBE), Environ. Toxicol. Chem., 20, 1125-1132.
15. Shell, 2004. Toxicity Factors and Risk-Based Screening Levels for DIPE, ETBE, TAME and TBA. OG.04.50728, Shell Global Solutions, Houston, TX.
16. CL:AIRE, 2017. Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies. (Version 1.1, 29 March 2017).

**DEFINITIONS AND SUBSTANCE CLASSIFICATIONS**

**Risks to surface waters:**

**When assessing risks to surface waters, the following list of definitions should be understood:**

**Priority substances (PS)** are harmful substances originally identified under the Water Framework Directive (WFD) 2000/60/EC as substances 'presenting a significant risk to or via the aquatic environment' at a European level. Member States are required to incorporate the identified **PS** into their country-wide monitoring programmes. There are currently 33 **PS** defined within the Priority Substances Directive (2013/39/EU; Annex 1), with a further 12 additional substances due to come into force from 22 December 2018. Directive 2013/39/EU has been transposed into domestic legislation for England and Wales by The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015[(2)].

Under the umbrella of **PS**, there is a sub-set of substances identified as being "hazardous", and these are referred to as **Priority hazardous substances (PHS).** The list of **PHS** is defined at EU level within the Priority Substances Directive (2013/39/EU). The WFD defines hazardous substances as 'substances (or groups of substances) that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances that give rise to an equivalent level of concern.' There are currently **21 PHS** (previously 15 PHS, with a further 6 substances added in 22 December 2018).

There is also another group of substances defined at EU level and which are referred to as **other pollutants (OP)** in Directive 2013/39/EU**.** These are additional substances which although not **priority substances**, have EQS which are identical to those laid down in the legislation which applied prior to 13 January 2009 (Directive 2008/105/EU). The **OP** are listed along with the **priority substance (PS)** within the Priority Substances Directive (2013/39/EU), and their associated EQS are also listed therein. There are 6 **OP** defined within the Priority Substances Directive (2013/39/EU).

In addition to the EU level substances, there are also a group of pollutants defined at a Member State level, referred to as **Specific pollutants (SP)**. These substances are pollutants which are released in significant quantities into water bodies in each of the individual European Member States. Under the WFD, Member States are required to set their own EQS for these substances. An indicative list of **SP** is given in Annex VIII of the WFD. Many of the substances categorised as **SP** in the UK were formerly List 2 substances under the old Groundwater Directive (80/68/EEC). The **SP** are defined within Part 2 (Table 1) of The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015[(2)].

**Risks to groundwater:**

**When assessing risks to groundwater, the following definitions should be understood:**

Under the requirements of the Groundwater Daughter Directive (2006/118/EU), the UK has published a list of substances it considers to be **hazardous substances** with respect to groundwater. In their advisory capacity to the government, this list has been derived by the UK Joint Agencies Groundwater Directive Advisory Group (JAGDAG), of which the Environment Agency is a member. The latest JAGDAG list of **hazardous substances** was published in January 2019[(9)] and the Environment Agency will use the updated list of hazardous substances from this date for all new activities that may lead to the discharge of hazardous substances to groundwater. The list is extensive and can be found in full at:

https://www.wfduk.org/stakeholders/jagdag

RSK GEOSCIENCES

# APPENDIX O
# SUSTAINABILITY CONSIDERATIONS

# APPENDIX O
# GENERIC SUSTAINABILITY CONSIDERATIONS

### APPROACH TO SUSTAINABILITY FOR PHASE 1, PHASE 2 AND RISK ASSESSMENT PROJECTS

Sustainability is inherent within RSK's business culture and daily operations through ISO14001. RSK has staff at over 100 locations globally. RSK strives to find innovative and more sustainable methods of working. For example, local offices are utilised where project work and staff competencies allow, deliverables are issued electronically, low-flow sampling is used to reduce waste water.

RSK's operates according to 9 key principles. These are:

1. Hiring, retaining and rewarding talented and dedicated people
2. Building enduring client relationships
3. Encouraging continuous improvement and innovation
4. Promoting a learning culture in a positive working environment
5. Marking strategic investments for sustainable growth
6. Committing to strong, predictable financial performance
7. Maintaining unwavering commitment to health and safety
8. Promoting the concept of sustainability in all that we do
9. Encouraging staff consultation and clear communication

The principle that specifically relates to sustainability is to '***promote the concept of sustainability in all that we do***' although social, economic and environmental considerations are relevant to each of the 9 principles above. Based on these principles and the United Nations Sustainable Development Goals we have built our Corporate Responsibility and Sustainability Route Map around five sustainability pillars to form a holistic approach to our business sustainability strategy.

An example from each of the five sustainability pillars (safety, health and quality (SHEQ), our people and ethics, environment and communities, clients and suppliers, financial and governance) is overleaf. RSK's route map can be found in its entirety on the RSK website.

We are committed to reviewing progress made towards our sustainability targets and goals by publishing a Route Map Annual Report to demonstrate we are addressing the global sustainability challenge.

Individual offices have a nominated CR representative who works with the office manager to implement energy saving practices where possible. RSK has also selected a UK wide supplier of electricity which uses renewable sources (where RSK has control of the electricity supply contract) and implemented vehicle charge points.

| Sustainability pillar | Sub topic | Corporate responsibility targets | | | | Our Goal |
|---|---|---|---|---|---|---|
| Financial year | | 2019 | 2020 | 2021 | 2022 | |
| Safety, health and quality (SHEQ), | Safety: | 100% of all workers covered by the SHEQ management system (MS) | All RSK staff trained in Golden Safety Rules | Driver and vehicle management training for all business drivers | 100% of worker have completed behavioural safety training module | Collective commitment to getting safety right UNSDG 17 |
| Our people and ethics, | Inclusivity | Gender pay gap reported publicly | Equality and inclusivity training module rollout | 80% retention rate of employees returning to work after parental leave | Develop and roll out agile working policy | Be a fully inclusive employer UNSDG 10 & 5 |
| Environment and communities, | Resource efficiency and waste | Establish innovative waste management centre in southern Iraq | Report water use for all offices and implement an action plan for reducing water use | RSK-wide green travel plan | 50% of waste diverted from landfill across all operations | Produce less waste and promote the circular economy in all we do<br>UNSDG 11, 12, 13 |
| Clients and suppliers, | Relationship management | Engagement strategy developed for business-critical suppliers | 60% of business is repeat business | 90% of invoices paid within agreed terms (clients and suppliers) | 70% of business is repeat business | All our business relationships to be mutually beneficial UNSDG 8, 9, 17 |
| Financial and governance | Business probity | Business critical documents associated with ethics and compliance available on the intranet | Training about anti-corruption policies and procedures for all staff | Update audit protocol for corporate compliance issues | Update risk assessment process for 3 countries where clients are looking to procure our services | Exemplary professional integrity at all times<br>UNSDG 8, 16 |

## SUSTAINABILITY FOR SHELL PROJECTS

Sustainability is implemented in Shell projects by RSK already using the methods mentioned earlier. Specifically for Shell, sustainability is incorporated at various stages of the E2E plans. At project commencement sustainability and risk-based decision making are linked to the business objectives. Once investigation work is required, best management practices (BMPs) are identified and reported (termed Tier 0).

### Tier 0 – Best Management Practices

Where feasible, many BMPs such as those listed below and presented in the accompanying table are already utilised on the majority of projects in accordance with the RSK principles above, where technically appropriate for the specific project. RSK has identified a list of BMPs with methods of measurement and reporting that can be used as a checklist during desk-based and site investigation work. For each investigation undertaken one or two of these can be selected, the rationale for its selection reported and performance against the BMP reviewed. For example, if a BMP of using local resource and local subcontractors is selected a review could be undertaken against the distance driven to and from site each month. A full list of BMPs relevant to general work and, phase 1 and 2 investigations are presented in the accompanying table in this appendix.

**Example BMPs for office and site investigation**

| BMP | Benefit / Impact | | | Measurement | UN SDG |
|---|---|---|---|---|---|
| | Social | Economic | Environment | | |
| Use local resource | People away from home less | Generates local employment<br>Less travel costs | Reduced emissions | Mileage by staff and subcontractors | 4.4, 8.1, 8.4, 8.8, 11.6, 12.4 |
| RSK site personnel are trained to operate effectively and safely | Investment in staff, reduce accidents | Reduced liability, reduced sick days | Reduced emissions | Training records, Annual PDR | 3.6, 3.9, 4.4, 4.7, 8.3, 8.8, 12.4, 12.6 |
| Maintain vehicles | Reduce accidents | More fuel efficient, reduced repair costs | Reduced emissions | Vehicle maintenance checklist | 11.6, 13.2 |
| Conference calls | Less face to face time for building relationships | Reduced travel costs | Reduced emissions | Reason for travel | 3.6, 5.5, 5.B, 8.2, 11.6, 12.6 |
| Use low-flow sampling techniques | Truer reflection of dissolved phase impact and thus more certainty in decision making | Reduced waste disposal costs | Reduced waste production | Sampling methodology employed on projects | 9.4, 6.3, 12.5 |
| Use onsite testing kits | Time saving and thus faster decision making | Reduced laboratory costs where onsite testing is cheaper | Reduced waste owing to fewer samples analysed | Percentage of onsite testing versus laboratory | 12.5 |
| Use a slug for permeability testing | NA | Reduced waste disposal costs | Reduced potential for waste water spillage | Qualitative statement | 12.5 |

| Best Management Practice | *Possible* benefit(s) arising: Environment | Social | Economic | BMP selection rationale | BMP measurement: Metric | Evidence | UN Sustainability Goals |
|---|---|---|---|---|---|---|---|
| **1. Generic BMPs** | | | | | | | |
| Work safely, be responsible and report positive interventions and incidents | ✓ | ✓ | ✓ | Phase 2 site investigation | Safety training, NMPI reporting | Engineer training dated January 2022, 1 No. NMPIs reported | 3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents. 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. 8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment |
| Adopt a sustainable procurement policy (consider recycled products, use of hotels with green policies and distance product is from site) | ✓ | ✓ | ✓ | Phase 2 site investigation | Procurement records | ADP (drilling contractor) - hotel chosen due to distance from site etc etc | 8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services. 8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead 12.2 By 2030, achieve the sustainable management and efficient use of natural resources 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse 12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities 17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue |
| Hold project meetings by telephone or video conference | ✓ | ✓ | ✓ | Phase 2 site investigation | Qualitative statement | pre-start meeting held via Teamsre-start meeting held by telephone video conference rather than travelling for meeting | 3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents. 5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decisionmaking in political, economic and public life. 5.B Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women 8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management 12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle |
| Establish electronic networks for data transfers and deliverables, team decisions, and document preparation | ✓ | ✓ | ✓ | Phase 2 site investigation | Document train | Report delivered by email, ENFOS | 5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decisionmaking in political, economic and public life. 5.B Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women 8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management 12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle |
| Established key roles within the project have sustainability responsibilities clearly outlined. | ✓ | ✓ | ✓ | Phase 2 site investigation | Project organogram, records of meeting minutes | Records of meeting minutes | 17.16 Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries 12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle |
| Include discussions of sustainability metrics, activities, evaluations, and plans in site deliverables | ✓ | ✓ | ✓ | Phase 2 site investigation | Records held in job file | Reporting, meeting minutes | 8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle |
| Project and stakeholder policies support a healthy work-life balance | | ✓ | | Phase 2 site investigation | Policies | Qualitative statement | 10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status 10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard 10.4 Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development 5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate |
| Implement a plan to keep workforce informed of sustainability goals | ✓ | ✓ | ✓ | Phase 2 site investigation | Plan held on job file | Qualitative statement | 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development 12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle |
| Implement a plan to provide structured training in sustainable initiatives associated with the project. | | ✓ | | Phase 2 site investigation | Training plan | Training records | 4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development |
| Project and Stakeholder policies discourage unhealthy behavior in the workforce such as smoking or inactive stress management. | | ✓ | ✓ | Phase 2 site investigation | Policies | Training records, qualitative statement | 3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol. 3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents. 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development 3.A Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate. |
| Consideration of stress in the project and workplace and people's ability to perform the task physically and mentally | | ✓ | | Phase 2 site investigation | Project management plan | qualitative statement | 3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment |
| | | | | | | | |
| **BMPs - Investigation and Monitoring** | | | | | | | |
| Work safely - avoid drilling in the highway or busy areas where possible | | ✓ | ✓ | Phase 2 site investigation | Work plan | Site records | 8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment |
| Utilise clean drilling techniques to avoid creation of preferential pathways | ✓ | | ✓ | Phase 2 site investigation | Drilling instruction | Borehole drilling records | 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally |
| Avoid multiple mobilisations | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan | Qualitative statement | 7.3 By 2030, double the global rate of improvement in energy efficiency 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| Minimize vehicle miles - combine jobs where possible | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan | Qualitative statement | 7.3 By 2030, double the global rate of improvement in energy efficiency 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| Don't allow plant or equipment to run on 'idle' | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan, site briefing | Qualitative statement | 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| Minimize waste sent to landfill | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan | Qualitative statement | 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| Minimise noise, vibration, dust (etc.) and limit use of such equipment to normal office hours | | ✓ | | Phase 2 site investigation | HASP | HASP, site records | 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| Include milestones to complete remedial site optimization process in site schedules | ✓ | | ✓ | Phase 2 site investigation | Work plan | | |
| Minimize the use of toxic materials and consider nontoxic chemical alternatives. | ✓ | ✓ | | Phase 2 site investigation | HASP, COSSH | HASP, site records, COSHH | 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment |
| Consider the use of phosphate-free detergents in place of organic solvents or acids. | ✓ | ✓ | | Phase 2 site investigation | HASP, COSHH | HASP, COSHH | 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment |
| Consider the use of rechargeable batteries for field instruments versus disposable batteries | ✓ | | | Phase 2 site investigation | | Qualitative statement | 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment |
| Sequence work and traffic patterns to minimize local traffic congestion | | ✓ | | Phase 2 site investigation | Traffic management plan | Traffic management plan | 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| Select Equipment suitably sized to perform the work | ✓ | ✓ | ✓ | Phase 2 site investigation | HASP | HASP | 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management |
| Perform routine and on-time maintenance to equipment to improve fuel efficiency (i.e., oil changes) | ✓ | | ✓ | Phase 2 site investigation | Calibration and maintenace records | Calibration and maintenance records | 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management 13.2 Integrate climate change measures into national policies, strategies and planning |
| Consider local sources of field labour | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan | PO's | 10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard |
| Consider local sources of field equipment | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan | PO's | 13.2 Integrate climate change measures into national policies, strategies and planning |
| Consider the use of direct sensing technologies to obtain geological, geotechnical, and hydrogeological information. | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan | Report | 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities |
| Consider the use of dedicated sampling equipment. | ✓ | ✓ | | Phase 2 site investigation | Site work instruction sheet | Report | 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse |
| Consider the use of field testing and field screening methods | ✓ | ✓ | ✓ | Phase 2 site investigation | Site work instruction sheet | Report | 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse |
| Consider the distance of the laboratory from the site when evaluating qualified laboratories for testing that cannot be completed on-site | ✓ | ✓ | | Phase 2 site investigation | Work plan | Qualitative statement | 13.2 Integrate climate change measures into national policies, strategies and planning |
| Limit the number and size of shipments to off-site laboratories | ✓ | ✓ | ✓ | Phase 2 site investigation | Work plan | Qualitative statement | 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse |
| Encourage electronic deliverables from laboratories; discourage hard copy deliverables | ✓ | | | Phase 2 site investigation | | Qualitative statement, e-mails | 13.2 Integrate climate change measures into national policies, strategies and planning |