# Appendix 14.5

Arklow WwTP Site - Ground Investigation

# Arklow WwTW Land – Ground Investigation

| | |
|---|---|
| Client: | Irish Water |
| Client's Representative: | ARUP Byrne Looby JV |
| Report No.: | 17-1455 |
| Date: | 18 July 2018 |
| Status: | *Final for Issue* |

**Causeway Geotech Ltd**
8 Drumahiskey Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7QL

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

Registered in Northern Ireland. Company Number: NI610766
Approved: ISO 9001 • ISO 14001 • OHSAS 18001

**CONTENTS**

Document Control Sheet

Note on: Methods of describing soils and rocks & abbreviations used on exploratory hole logs

1 AUTHORITY ..... 5

2 SCOPE ..... 5

3 DESCRIPTION OF SITE ..... 5

4 SITE OPERATIONS ..... 6
4.1 Summary of site works ..... 6
4.2 Boreholes ..... 6
4.2.1 Light cable percussion boreholes ..... 6
4.2.2 Boreholes by combined percussion boring and rotary follow-on drilling ..... 7
4.3 Standpipe installations ..... 8
4.4 Trial Pits ..... 8
4.5 Slit trenches ..... 8
4.6 Variable head permeability testing ..... 9
4.7 Surveying ..... 9
4.8 Ground water and ground gas monitoring ..... 9
4.9 Phosphogypsum Survey ..... 10
4.10 Archaeological Supervision ..... 10

5 LABORATORY WORK ..... 10
5.1 Geotechnical laboratory testing of soils ..... 10
5.2 Geotechnical laboratory testing of rock ..... 11
5.3 Environmental laboratory testing of soils ..... 11
5.4 Environmental laboratory testing of waters ..... 12

6 GROUND CONDITIONS ..... 13
6.1 General geology of the area ..... 13
6.2 Ground types encountered during investigation of the site ..... 13
6.3 Groundwater ..... 14

7 REFERENCES ..... 15

## APPENDICES


| | |
|---|---|
| Appendix A | Exploratory hole location plans and surface water sampling locations |
| Appendix B | Borehole logs |
| Appendix C | Core photographs |
| Appendix D | Trial pit logs |
| Appendix E | Trial pit photographs |
| Appendix F | Slit trench logs |
| Appendix G | Variable head test results |
| Appendix H | Groundwater monitoring results |
| Appendix I | Ground gas monitoring results |
| Appendix J | Geotechnical laboratory test results |
| Appendix K | Environmental laboratory test results |
| Appendix L | Radman Associates radiological survey report |
| Appendix M | IAC Archaeology survey report |
| Appendix N | SPT hammer energy measurement report |

## Document Control Sheet

| | | | | | |
|---|---|---|---|---|---|
| **Report No.:** | | 17-1455 | | | |
| **Project Title:** | | Arklow WwTW Land Ground Investigation | | | |
| **Client:** | | Irish Water | | | |
| **Client's Representative:** | | ARUP Byrne Looby JV | | | |
| **Revision:** | A01 | **Status:** | Final for issue | **Issue Date:** | 18 July 2018 |
| **Prepared by:** | | **Reviewed by:** | | **Approved by:** | |
| Neil Haggan<br>BSc(Hons) MSc FGS | | Lucy Newland<br>BSc (Hons) | | Darren O'Mahony<br>BSc MSc MIEI | |

The works were conducted in accordance with:

UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)

British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.

IS EN 1997-2:2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377-2:1990, BS EN ISO 17892-1:2014, and BS EN ISO 17892-2:2014

## METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

| **Abbreviations used on exploratory hole logs** | |
|---|---|
| U | Nominal 100mm diameter undisturbed open tube sample (thick walled sampler) |
| UT | Nominal 100mm diameter undisturbed open tube sample (thin walled sampler) |
| P | Nominal 100mm diameter undisturbed piston sample |
| B | Bulk disturbed sample |
| LB | Large bulk disturbed sample |
| D | Small disturbed sample |
| C | Core sub-sample (displayed in the Field Records column on the logs) |
| L | Liner sample from dynamic sampled borehole |
| W | Water sample |
| ES / EW | Soil sample for environmental testing / Water sample for environmental testing |
| SPT (s) | Standard penetration test using a split spoon sampler (small disturbed sample obtained) |
| SPT (c) | Standard penetration test using 60 degree solid cone |
| x,x/x,x,x,x | Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.<br>The length achieved is stated (mm) for any test increment less than 75mm |
| N=X | SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm) |
| N=X/Z | Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (mm) |
| V<br>VR | Shear vane test (borehole) Hand vane test (trial pit) Shear strength stated in kPa<br>V: undisturbed vane shear strength VR: remoulded vane shear strength |
| dd/mm/yy: 1.0<br>dd/mm/yy: dry | Date & water level at the borehole depth at the end of shift and the start of the following shift |
| Abbreviations relating to rock core – reference Clause 44.4.4 of BS 5930: 2015 | |
| TCR (%) | Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run. |
| SCR (%) | Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures. |
| RQD (%) | Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run. |
| FI | Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing. |
| NI | Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles. |
| AZCL | Assessed zone of core loss: The estimated depth range where core was not recovered. |
| DIF | Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring. |

# Arklow WwTW Land GI

## 1 AUTHORITY

On the instructions of ARUP and Byrne Looby Consulting Engineers, ("the Client's Representative"), acting on the behalf of Irish Water ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed new waste water treatment works and associated infrastructure.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client's Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

## 2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, trial pits, soil and rock core sampling, environmental sampling, groundwater sampling, groundwater and ground gas monitoring, in-situ and laboratory testing, and the preparation of a factual report on the findings.

## 3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted on the site of a disused gypsum factory and previous munitions factory, located in the Ferrybank area of the North Quay in Arklow, County Wicklow. The site is bordered by Mill Road to the north west, North Quay and the Avoca River to the south west, and the Irish Sea to the east.
The site is flat within the area of the factory and surrounding grounds, with surrounding area generally overgrown prior to being stripped back during the asbestos clearance enabling works.

# 4 SITE OPERATIONS

## 4.1 Summary of site works

Site operations, which were conducted between 8th January and 23rd February 2018, comprised:

- twenty-five light cable percussion boreholes;
- three boreholes continued by rotary follow-on methods;
- a groundwater standpipe installation in fifteen boreholes and a ground gas monitoring standpipe installation in three boreholes;
- twenty-nine machine dug trial pits; two extended to slit trenches; and
- a falling head test performed in five installations and variable head test performed in two installations.

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

## 4.2 Boreholes

A total of twenty-five boreholes were put down in a minimum diameter of 150mm through soils and rock strata to their completion depths by a combination of methods, including light percussion boring using Dando Terrier rigs, light cable percussion boring (by Dando 2000 rig), and rotary drilling (by Beretta T44 tracked rotary drilling rig).

The borehole logs state the methodology and plant used for each location, as well as the appropriate depth ranges.

A summary of the boreholes, subdivided by category in accordance with the methods employed for their completion, is presented in the following sub-sections.

Appendix B presents the borehole logs.

### 4.2.1 Light cable percussion boreholes

Twenty-two boreholes (BH01, BH02, BH02A, BH02B, BH02C, BH03, BH06, BH06A, BH07, BH07A, BH07B, BH08- BH10, BH10A, BH10B, BH14, BH15D and BH17-BH20) were put down to completion in minimum

200mm diameter using two light cable percussion boring rigs. All boreholes were terminated either at their scheduled completion depths, or else on encountering virtual refusal on obstructions, including large boulders and weathered bedrock.

Hand dug inspection pits were carried out between ground level and 1.2m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Undisturbed (UT100 and U100) samples were taken where appropriate and as directed within cohesive soils. Environmental samples were taken at standard intervals, as directed by the Client's Representative.

Standard penetration tests were carried out in accordance with EC7 at standard depth intervals using the split spoon sampler ($SPT_{(s)}$) or solid cone attachment ($SPT_{(c)}$). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix N.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded.

Where water was added to assist with boring, a note has been added to the log to account for same.

Appendix B presents the borehole logs.

### 4.2.2 Boreholes by combined percussion boring and rotary follow-on drilling

Three boreholes (BH04, BH05, and BH11) were put down by a combination of light cable percussion boring and rotary follow-on drilling techniques with core recovery in bedrock. Where the cable percussion borehole had not been advanced onto bedrock, rotary percussive methods were employed to advance the borehole to completion/bedrock. Symmetrix cased full-hole drilling was used, with SPTs carried out at standard intervals as required.

Hand dug inspection pits were carried out between ground level and 1.2m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Standard penetration tests were carried out in accordance with EC7 at standard depth intervals throughout the overburden using the split spoon sampler ($SPT_{(s)}$) or solid cone attachment ($SPT_{(c)}$). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix N.

Where coring was carried out within bedrock strata, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using a SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations*.

Appendix B presents the borehole logs, with core photographs presented in Appendix C.

## 4.3 Standpipe installations

A groundwater monitoring standpipe was installed in boreholes BH01, BH02C, BH03, BH04, BH05, BH06A, BH07B, BH08, BH09, BH10B, BH11, BH14, BH15D, BH17, BH18, BH19, and BH20.

A ground gas monitoring standpipe was installed in boreholes BH10B, BH11, and BH19.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

## 4.4 Trial Pits

Twenty-nine trial pits (TP01, TP01A, TP02, TP03, TP03A, and TP04–TP27) were excavated using a 14t tracked excavator fitted with a 600mm wide bucket, to a maximum depth of 3.30m.

Environmental samples were taken at designated depths in each trial pit as advised by the Client's Representative on site.

Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix D presents the trial pit logs with photographs of the pits and arisings provided in Appendix E.

## 4.5 Slit trenches

Two of the trial pits (TP03A and TP07) were extended to slit trenches (ST03A and ST07) due to subsurface obstructions; these were excavated by mechanical excavation using the 14t tracked excavator fitted with a 600mm wide toothless bucket.

Drawing of the trenches and the locations of subsurface obstructions encountered during excavation are shown on the slit trench logs in Appendix F, with photographs presented in Appendix E.

## 4.6 Variable head permeability testing

In-situ permeability tests were carried out in BH02C, BH04, BH05, BH07B, BH01B by falling head permeability methods and in BH14-BH15D (Previous Phase of GI) by variable head permeability methods, following development of the wells. Testing was carried out in accordance with the guidance as set out in BS EN ISO 22282-2: 2012

The permeabilities were calculated using Hvorslev's formula k=A/FT as defined in BS 5930:1999 (pg 52).

The results are presented in Appendix G.

## 4.7 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Leica GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

## 4.8 Ground water and ground gas monitoring

Following completion of site works, ground water, ground gas monitoring and surface water sampling (at three sea locations, five upstream and downstream locations, all at high and low tides) was conducted on three occasions. Ground water field measurements were completed using a Hanna Instruments HI-98194 Multiparameter Waterproof Meter.

Each water sample was subjected to a number of field measurements; with Limits of Detection as follows:

- pH - between 1.0 and 14.0 pH units
- Electrical Conductivity (EC) – 10µS/cm and 30mS/cm
- Dissolved Oxygen (DO) - <0.1mg/l and 0.1% [both to be recorded]
- Redox Potential (ORP) - <1mV

Ground gas measurements were carried out using a GA5000 gas meter.

Details of groundwater and gas monitoring are presented in the report, produced by the Engineer's Environmental Consultant.

The monitoring records are presented in Appendix H and Appendix I. Location Plans of surface water sampling are provided in Appendix A.

## 4.9 Phosphogypsum Survey

Prior to and during the commencement of intrusive works at the proposed WwTW site, a representative from Radman Associates completed a phosphogypsum walkover survey. Suspected deposits of waste phosphogypsum material were present in large bunds in the northern corner of the site. The waste material was derived from previous use of the factory during the production of both fertilizer and plaster board.

The areal extent of the bunded area was surveyed by Causeway Geotech engineer; estimated at around 1000m$^2$. Three trial pits (TP24, TP25, and TP26) were excavated to ascertain the thickness of the deposits at chosen locations. Thicknesses of 1.00m, 2.00m, and 1.40m of the waste material were encountered in BH24, BH25, and BH26 respectively.

Based on the upper and lower thicknesses it is estimated there is somewhere between 1000m$^3$ and 2000m$^3$ of phosphogypsum material situated in the northern site areas; in all likelihood the true value will be around 1500m$^3$ assuming average deposit thickness of 1.50m.

Small traces were also encountered at the location of TP27 and around a number of pipes servicing the old factory building.

The Radman Survey Report is presented in Appendix L.

## 4.10 Archaeological Supervision

Throughout the trial pitting works an Archaeologist from IAC Archaeology was present to observe and record any findings.

The IAC Archaeology Survey Report is presented in Appendix M.

# 5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

## 5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **shear strength** (total stress): unconsolidated undrained triaxial tests
- **direct shear:** shear box tests

- **soil chemistry:** pH, water soluble sulphate content, organic matter content, BRE Test Suite (pyrite bearing/brownfield)

Laboratory testing of soils samples was carried out in accordance with British Standards Institute (1990) *BS 1377:1990, Methods of test for soils for civil engineering purposes. Parts 1 to 9.*

The test results are presented in Appendix J.

## 5.2 Geotechnical laboratory testing of rock

Laboratory testing of rock sub-samples comprised:

- point load index
- unconfined compressive strength (UCS) tests

| Test | Test carried out in accordance with |
|---|---|
| Point load index | ISRM Suggested Methods (1985) Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60 |
| Uniaxial compression strength tests | ISRM Suggested Methods (1981) Suggested method for determining deformability of rock materials in uniaxial compression, Part 2<br>and<br>ISRM (2007) Ulusay R, Hudson JA (eds) The complete ISRM suggested methods for rock characterization, testing and monitoring, 2007 |

The test results are presented in Appendix J.

## 5.3 Environmental laboratory testing of soils

Environmental testing, as specified by the Environmental Consultant was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out for a range of determinants, including:

- Soil leachate and total pollutant content to include Metals (As, Ba, Cd, Cr, Cu, Hg, Mo, Ni, Ob, Sb, Se, and Zn), Chloride, Fluoride, Sulphate Soluble, Total Phenols by HPLC, Dissolved Organic Carbon (DOC), and Total Dissolved Solids (TDS)
- Metals
- Total Organic Carbon (TOC)
- Loss of Ignition (LOI)
- Total petroleum hydrocarbons with BTEX and MBTE – Criteria Working Group (TPH-CWG)

- Speciated polycyclic aromatic hydrocarbons (PAH)
- PCB (7 congeners)
- Cyanides
- Asbestos screen
- pH.
- (Soil) Semi Volatile Organic Compounds (SVOCs)
- (Soil) Volatile Organic Compounds (VOCs)
- (Soil) Suite of potentially explosive substances including: Nitrocellulose, Nitro-glycerine, Picric Acid
- (Soil) Higher resolution gamma spectrometry (all gamma)

Waste acceptance criteria (WAC) testing was carried out on eighty-seven samples.

Results of environmental laboratory testing are presented in Appendix I.

## 5.4 Environmental laboratory testing of waters

Environmental testing, as specified by the Environmental Consultant was conducted on selected environmental water samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out for a range of determinants, including:

- Alkalinity
- Chloride
- Sulphate
- Metals (As, Ba, Ca, Cd, Cr III, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Zn, Hg, V)
- Ammoniacal Nitrogen
- Hexavalent Chromium
- Nitrate
- Phosphate
- BTEX/PRO inc MTBE by GC-FID*
- Total petroleum hydrocarbons with BTEX and MBTE – Criteria Working Group (TPH-CWG)
- BOD
- COD
- Cyanides
- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- (Water) Volatiles + TIC's
- (Water) SVOC + TIC's
- (Water) Higher resolution gamma spectrometry (all gamma)
- (Water) Gross alpha / beta (all alpha and beta)

# 6 GROUND CONDITIONS

## 6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise Alluvium deposits including silts and clays, and Quaternary marine beach sands and gravels. These deposits are underlain by dark grey slate and minor pale sandstone of the Ordovician Kilmacrea Formation with occasional igneous intrusive features.

## 6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Paved surface:** borehole BH08 encountered 100mm of macadam surfacing. In addition, BH20 had a 200mm concrete slab at the surface; concrete slabs were also encountered at depth in a number of borehole and trial pits.

- **Topsoil:** encountered typically in 100-200mm thickness, with topsoil overlying made ground material in a small number of trial pits (TP04, TP21, TP22, TP23, TP24, TP25, and TP26).

- **Made Ground (sub-base):** multiple layers of made ground encountered in all trial pits and boreholes; predominantly reworked sands and gravels with abundant fragments of red brick, concrete, and cement. The maximum depth of made ground encountered was 4.40mbgl in BH09.

- **Made Ground (factory waste material):** white silty substance encountered in TP24, TP25, and TP26 in the northernmost area of the site; suspected phosphogypsum deposits found to a maximum thickness of 2.00m in TP25.

- **Quaternary Marine Beach deposits:** typically, medium dense to dense sandy gravels and gravelly sands with localised pockets of firm to stiff sandy gravelly silty clays interspersed throughout. Found to a maximum depth of 17.20mbgl in BH02C.

- **Glacial Till:** stiff to very stiff sandy gravelly clay, occurs close to or immediately above the rockhead. Found to a maximum depth of 21.90mbgl in BH11.

- **Bedrock (Dolerite and Sandstone):** Rockhead was encountered at depths ranging from 17.80m in BH05 to about 21.90m in borehole BH11 extending to their bases.

## 6.3 Groundwater

Groundwater was encountered during percussion boring through soil as water strikes at 3.00m in BH02C, at 2.50m in BH10B, and at 1.7m in BH19. All other boreholes were dry. It should be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Groundwater was encountered as seepage and occasionally strong inflow in trial pits TP05 TP06, TP08, TP09, TP12, TP15, TP16, TP18, TP21, and TP23; likely this is due to the local tidal influence at these locations.

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

Subsequent groundwater monitoring of the standpipe installations recorded water levels as shown in Table 1 below.

**Table 1: Groundwater monitoring**

| Borehole Number | Water level (mbgl) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Fieldwork Week | | | | | Round | | |
| | Week 2 31/01/18 | Week 3 09/02/18 | Week 4 14/02/18 | Week 5 23/02/18 | Week 6 26/02/18 | Round 1 09/04/18 | Round 2 23/04/18 | Round 3 07/05/18 |
| BH01 | 2.90 | 2.60 | 2.68 | 2.58 | 2.92 | 2.25 | 2.63 | 4.33 |
| BH02C | 3.34 | 2.46 | 2.52 | 2.36 | 2.50 | 2.10 | 2.24 | 5.13 |
| BH03 | - | 3.03 | 2.77 | 2.66 | 2.93 | 2.60 | 2.82 | 4.25 |
| BH04 | - | - | - | 2.66 | 2.73 | 2.69 | 2.91 | 2.63 |
| BH05 | - | - | - | | 2.89 | 2.85 | 2.53 | 2.84 |
| BH06A | - | - | 2.79 | 2.68 | 2.86 | 2.40 | 2.64 | 2.65 |
| BH07B | - | - | - | 2.75 | 2.82 | 2.73 | 2.87 | 2.75 |
| BH08 | - | - | - | - | 2.59 | 2.25 | 2.51 | 2.62 |
| BH09 | - | - | - | - | 2.33 | 2.28 | 2.75 | 2.18 |
| BH10B | - | - | - | - | 2.32 | 2.00 | 2.24 | 2.44 |
| BH10B (gas) | - | - | - | - | Dry | 1.60 | 1.87 | 1.82 |
| BH11 | - | - | - | 1.89 | 2.36 | 1.65 | 1.82 | 1.80 |
| BH11 (gas) | - | - | - | - | 1.65 | 1.65 | 1.81 | 1.90 |

| Borehole Number | Water level (mbgl) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Fieldwork Week | | | | | Round | | |
| | Week 2 31/01/18 | Week 3 09/02/18 | Week 4 14/02/18 | Week 5 23/02/18 | Week 6 26/02/18 | Round 1 09/04/18 | Round 2 23/04/18 | Round 3 07/05/18 |
| BH14 | - | - | - | - | - | 2.00 | 1.96 | 2.07 |
| BH15D | - | - | - | - | - | 2.13 | 1.82 | 2.18 |
| BH17 | - | - | 2.73 | 2.67 | 2.87 | 2.85 | 2.81 | SP damaged |
| BH18 | - | - | - | 2.61 | 2.81 | 2.34 | 2.84 | 2.60 |
| BH19 | 3.20 | 2.67 | 1.78 | 1.54 | 2.49 | 1.40 | 1.42 | 1.40 |
| BH19 (gas) | 1.20 | - | 1.10 | - | 1.15 | 1.25 | 1.25 | Dry |
| BH20 | - | - | 2.76 | 2.61 | 2.60 | 2.40 | 2.64 | 2.60 |

Continued monitoring of the twenty installed standpipes will give an indication of the seasonal and tidal variation in local groundwater levels.

Details of further groundwater monitoring, as well as results of gas monitoring, are presented in Appendix H and Appendix I respectively.

## 7 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

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

BS 5930: 2015: Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1: 2002: Geotechnical investigation and testing - Identification and classification of soil. Part 1 Identification and description. British Standards Institution.

BS EN ISO 14688-2:2004+A1:2013: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

BS EN ISO 22282-2: 2012: Geotechnical investigation and testing – Geohydraulic testing – Part 2: Water permeability tests in a borehole using open systems.

CAUSEWAY GEOTECH

# APPENDIX A

## Exploratory Hole Location Plans

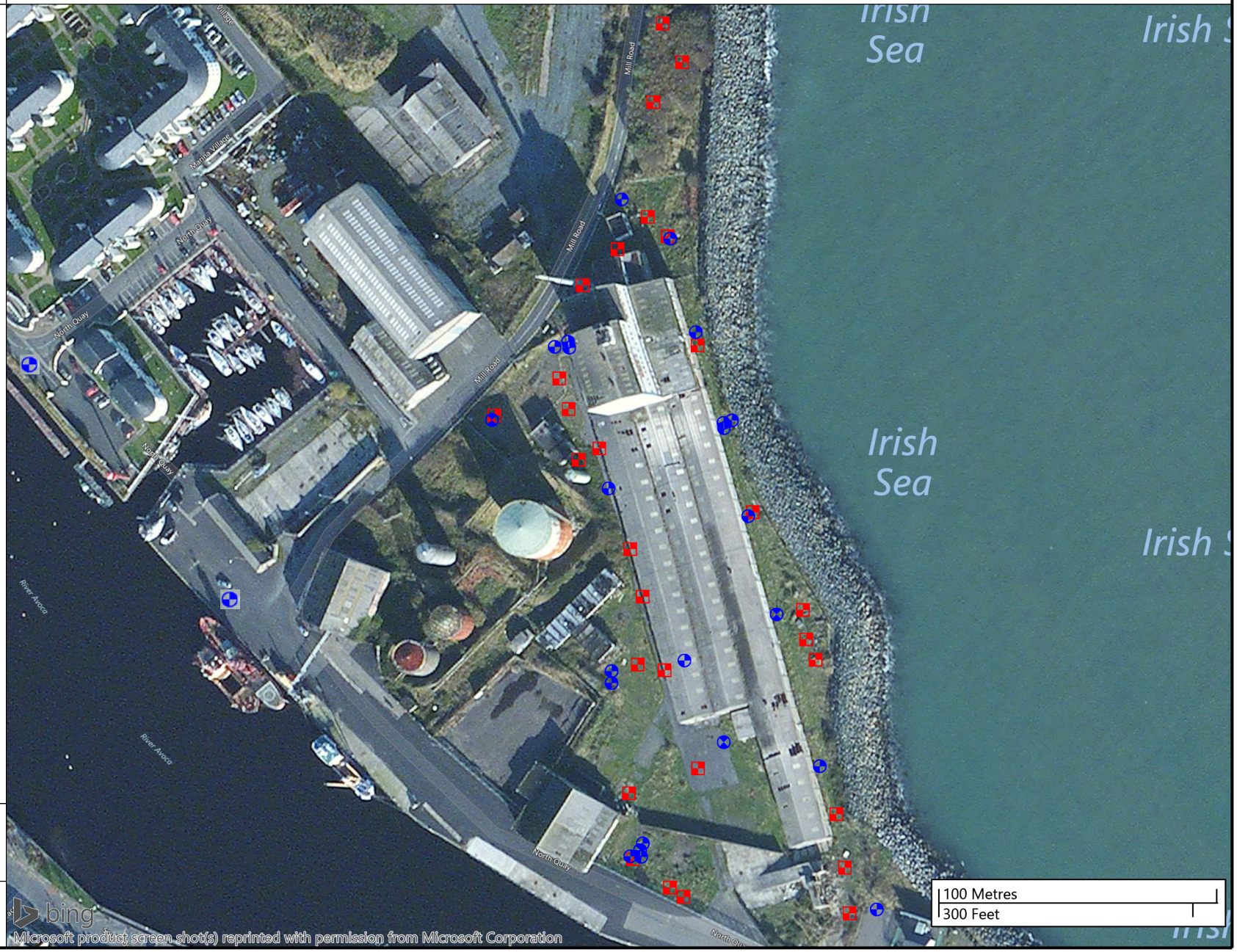


CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** | 17-1455 | **Client:** | Irish Water |
| **Project Name:** | Arklow WwTP Land GI | **Client's Representative:** | Byrne Looby ARUP JV |

Legend Key

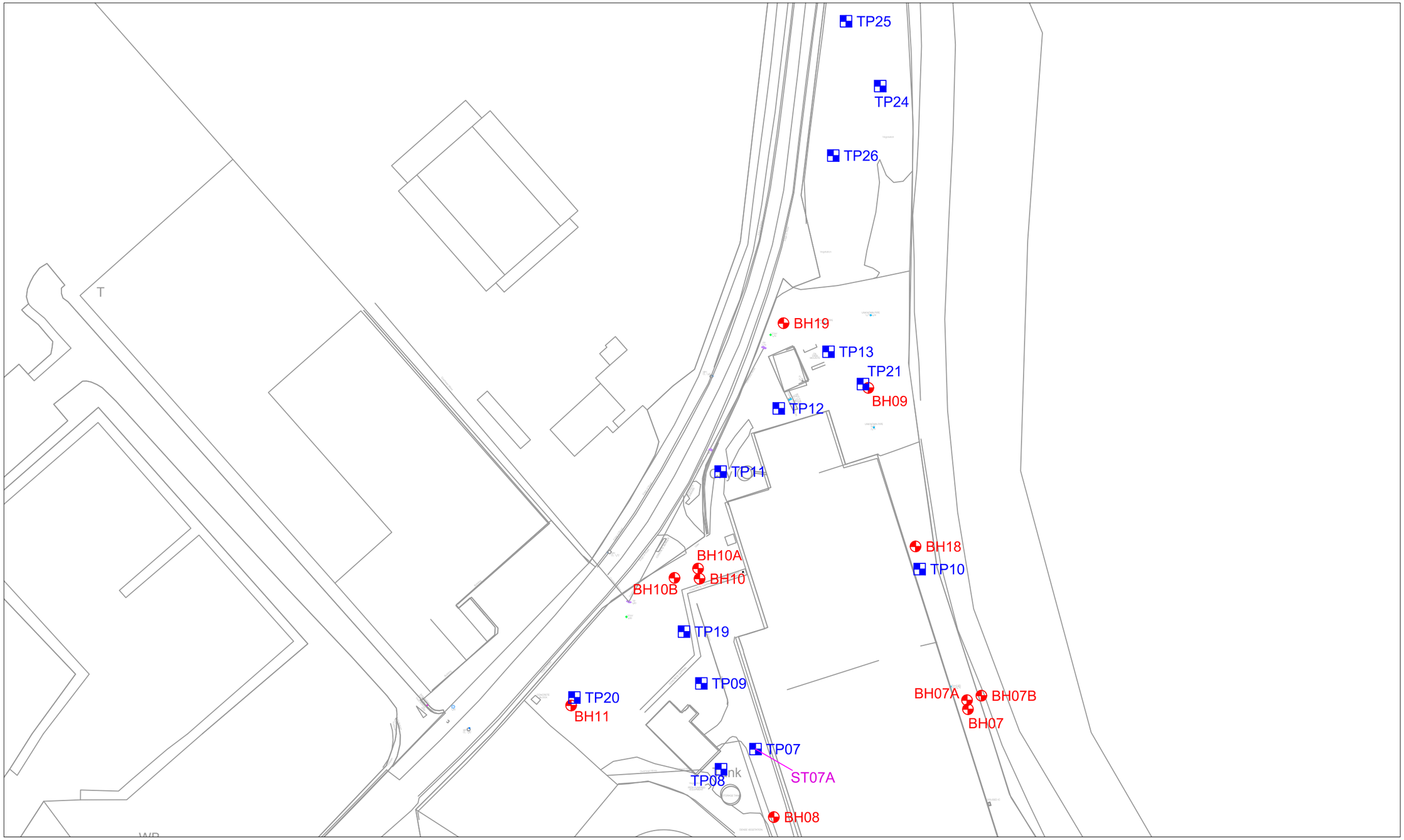
- Locations By Type - Empty
- Locations By Type - CP
- Locations By Type - CP+RC
- Locations By Type - TP



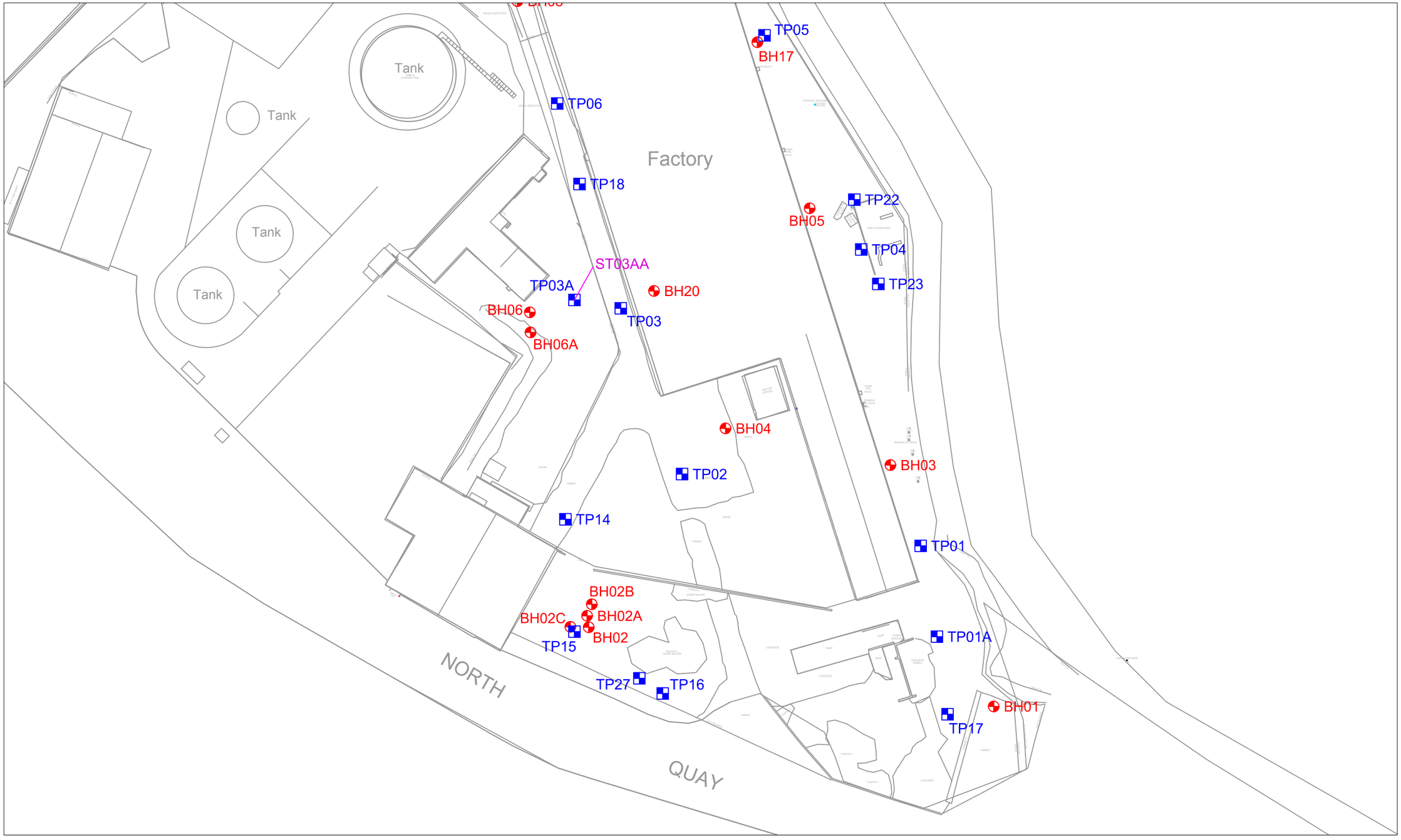

**Title:**

Site Location Plan

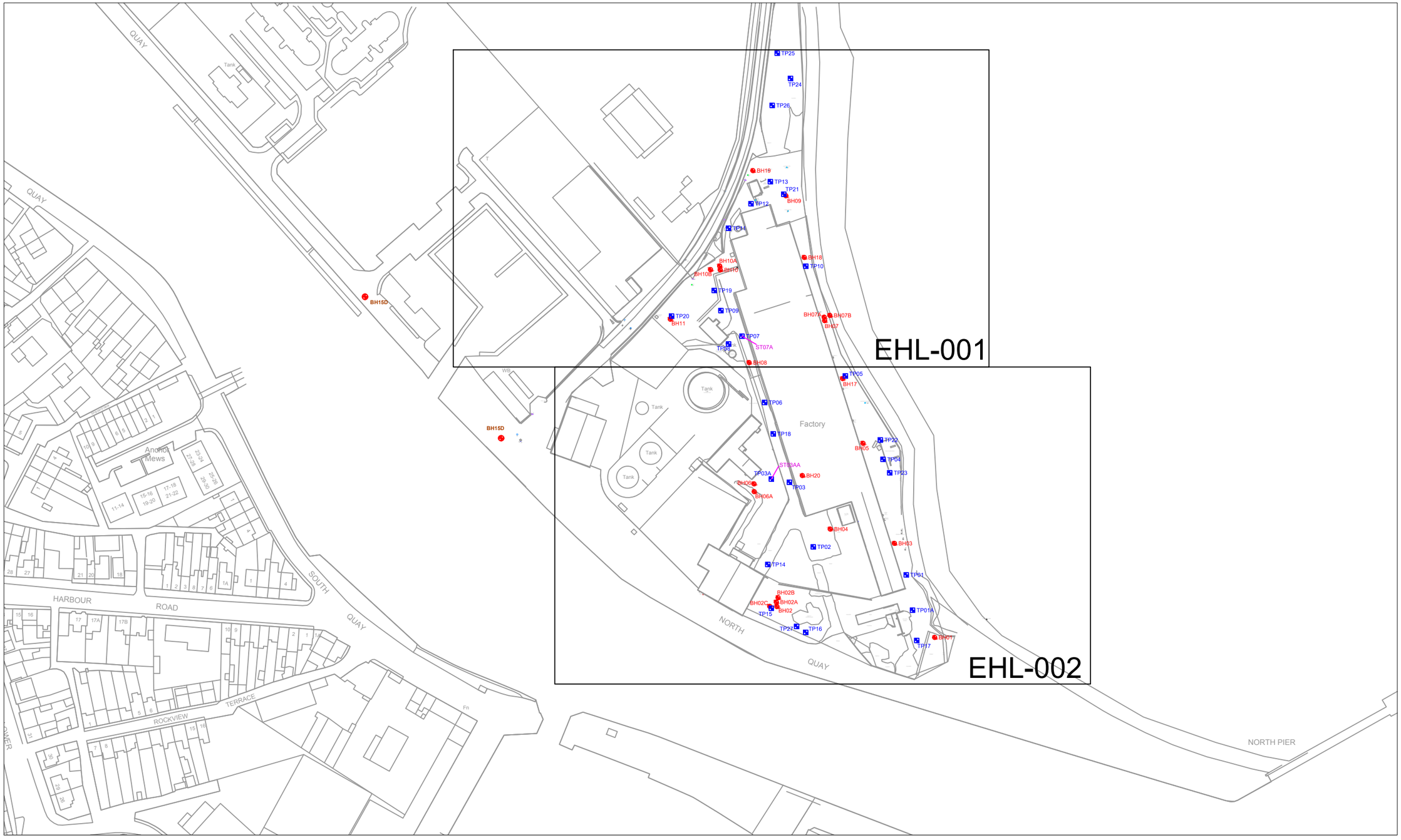
| **Last Revised:** | **Scale:** |
|---|---|
| 17/04/2018 | 1:2000 |




| | | | | | |
|---|---|---|---|---|---|
| PROJECT: Arklow WWTP Land GI | | TITLE: Exploratory hole location plan | | | |
| CLIENT: Irish Water | KEY: Borehole; Trial Pits; SlitTrench | CAUSEWAY GEOTECH | SCALE: NTS@A3 | DATE: 27/04/2018 | |
| ENGINEER: Byrne Looby ARUP JV | | | DRWN: BS<br>CHCK: NH | SERIES: 1 of 2 | DWG No: 17-1455-EHL-001 |




| | | | | | |
|---|---|---|---|---|---|
| PROJECT: Arklow WWTP Land GI | | | TITLE: Exploratory hole location plan | | |
| CLIENT: Irish Water | KEY: Borehole, Trial Pits, SlitTrench | CAUSEWAY GEOTECH | SCALE: NTS@A3 | DATE: 27/04/2018 | |
| ENGINEER: Byrne Looby ARUP JV | | | DRWN: BS<br>CHCK: NH | SERIES: 2 of 2 | DWG No: 17-1455-EHL-001 |



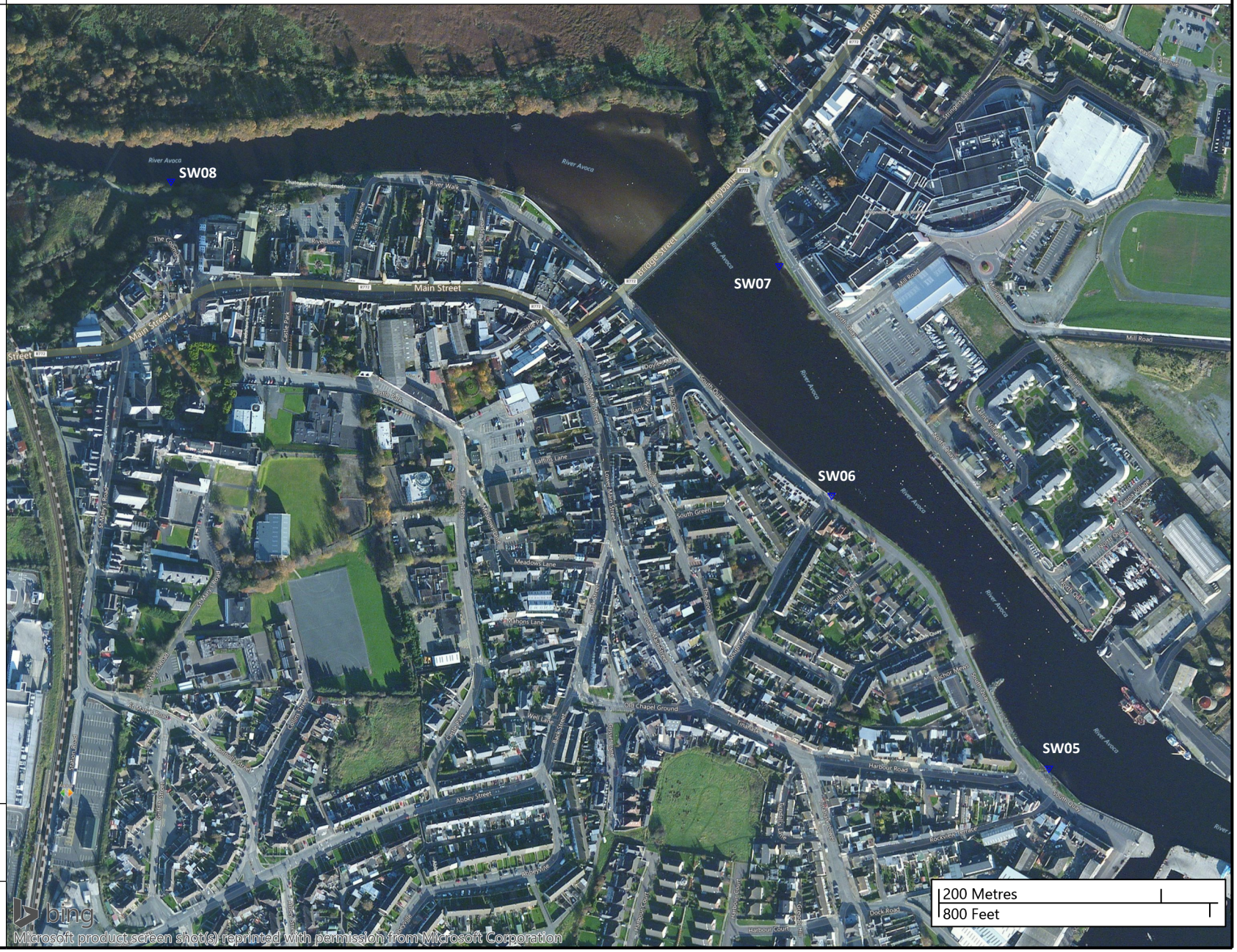

| | | | | | |
|---|---|---|---|---|---|
| PROJECT: Arklow WWTP Land GI | | TITLE: Exploratory hole location plan | | | |
| CLIENT: Irish Water | KEY: Borehole; Trial Pits; SlitTrench | CAUSEWAY GEOTECH | SCALE: NTS@A3 | DATE: 27/04/2018 | |
| ENGINEER: Byrne Looby ARUP JV | | | DRWN: BS<br>CHCK: NH | SERIES: 1 of 1 | DWG No: 17-1455-EHL-Overview |

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** | 17-1455 | **Client:** | Irish Water |
| **Project Name:** | Arklow WwTP Land GI | **Client's Representative:** | Byrne Looby ARUP JV |

Legend Key

Locations By Type - VC




**Title:**

Site Location Plan

| **Last Revised:** | **Scale:** |
|---|---|
| 05/07/2018 | 1:5000 |

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** | 17-1455 | **Client:** | Irish Water |
| **Project Name:** | Arklow WwTP Land GI | **Client's Representative:** | Byrne Looby ARUP JV |

Legend Key

Locations By Type - VC




**Title:**

Site Location Plan

| **Last Revised:** | **Scale:** |
|---|---|
| 05/07/2018 | 1:2500 |

CAUSEWAY GEOTECH

# APPENDIX B

## Borehole Logs



CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH01

**Coordinates:** 325397.02 E, 173032.78 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

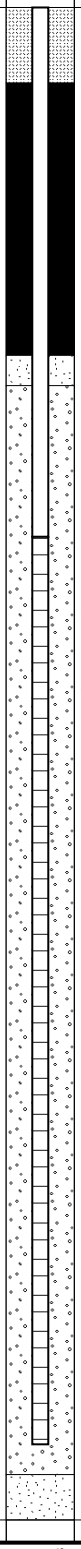
**Driller:** BM

**Ground Level:** 2.54 mOD

**Dates:** 29/01/2018 - 30/01/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description |
|---|---|---|---|---|---|---|---|
| 0.50 | B1<br>ES2 | | | PID = 0.00ppm | | (1.60) | MADE GROUND: Medium dense brownish grey very sandy subangular fine to coarse GRAVEL of mixed lithologies including red brick and cement. Sand is fine to coarse.<br>[Staining on Gravel is yellow and green] |
| 1.00 | B4 | | | | | | |
| 1.20 | D3 | | | | | | |
| 1.20 - 1.65 | SPT (C)<br>N=12 | 1.20 | | N=12 (2,2/2,3,3,4) | | | |
| 1.50 | ES5 | | | PID = 0.10ppm | 0.94 | 1.60 | Medium dense yellowish brown slightly silty gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. |
| 2.00 | B7<br>D6 | | | | | (1.30) | |
| 2.00 - 2.45 | SPT (C)<br>N=23 | 2.00 | | N=23 (2,4/4,6,6,7) | | | |
| 2.50 | ES8 | | | PID = 0.10ppm | | | |
| 3.00 | B10<br>D9 | | | | -0.36 | 2.90 | Medium dense to dense brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 3.00 - 3.45 | SPT (C)<br>N=39 | 3.00 | | N=39 (2,6/7,9,11,12) | | | |
| 4.00 | B12<br>D11 | | | | | | |
| 4.00 - 4.45 | SPT (C)<br>N=21 | 4.00 | | N=21 (4,4/5,5,5,6) | | | |
| 5.00 | B14<br>D13 | | | | | (4.60) | |
| 5.00 - 5.45 | SPT (C)<br>N=24 | 5.00 | | N=24 (5,6/6,6,6,6) | | | |
| 6.00 | B16<br>D15 | | | | | | |
| 6.00 - 6.45 | SPT (C)<br>N=36 | 6.00 | | N=36 (5,6/7,7,8,14) | | | |
| 7.50 | B18<br>D17 | | | | -4.96 | 7.50 | Very dense brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 7.50 - 7.60 | SPT (C) | 7.50 | | 50 (25 for 75mm/50 for 25mm) | | (0.80) | |
| 9.00 | B23<br>D19 | | | | -5.76 | 8.30 | Very dense brown gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. |
| 9.00 - 9.44 | SPT (C) | 9.00 | | N=50 (2,3/50 for 295mm) | | (3.30) | |




**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 7.50 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 7.00 | 7.50 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.00 |

| | |
|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI |
| **Coordinates:** 325397.02 E 173032.78 N | **Client:** Irish Water |
| | **Client's Representative:** Byrne Looby ARUP JV |
| **Ground Level:** 2.54 mOD | **Dates:** 29/01/2018 - 30/01/2018 |

**Borehole No.:** **BH01**

Sheet 2 of 2

**Scale:** 1:50

**Driller:** BM

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| 10.50 | B24 | | | | | | | Very dense brown gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. |
| 10.50 - 10.95 | SPT (C) N=47 | 10.50 | | N=47 (3,5/8,10,12,17) | | | | |
| | | | | | -9.06 | 11.60 | | |
| 12.00 | B25 D20 | | | | | (0.80) | | Medium dense grey gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. [Shell fragments layer at 12.30m] |
| 12.00 - 12.45 | SPT (C) N=21 | 12.00 | | N=21 (2,3/1,3,7,10) | -9.86 | 12.40 | | Medium dense to dense brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | | | | | (1.50) | | |
| 13.50 | B26 D21 | | | | | | | |
| 13.50 - 13.95 | SPT (C) N=31 | 13.50 | | N=31 (4,6/6,7,9,9) | -11.36 | 13.90 | | Stiff brown silty CLAY with pocket-sized lenses of fine to coarse sand. [Sand lenses are 2-10cm thick; total sand content approximately 9-15cm overall] |
| 14.00 | D22 | | | | | | | |
| 14.30 | U27 | | | Ublow=50 100% | | (1.10) | | |
| | | | | | -12.46 | 15.00 | | End of Borehole at 15.00m |

Water: Backfill

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 15.00 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 7.00 | 7.50 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 0.20 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH02

**Coordinates:** 325311.13 E 173049.58 N

**Client:** Irish Water

**Client's Representative:** Byrne Looby ARUP JV

**Ground Level:** 2.30 mOD

**Dates:** 24/01/2018

Sheet 1 of 1

**Scale:** 1:50

**Driller:** MK

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2.10 | (0.20) 0.20 | | MADE GROUND: Brownish grey sandy gravelly BOULDERS. Sand is fine to coarse. Gravel is subangular fine to coarse. End of Borehole at 0.20m | | |

**Remarks**

Terminated on boulder - moved to rebore position BH02A

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 0.20 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH02A

**Coordinates:** 325310.78 E, 173052.01 N

**Client:** Irish Water

**Client's Representative:** Byrne Looby ARUP JV

**Ground Level:** 2.29 mOD

**Dates:** 24/01/2018

Sheet 1 of 1

**Scale:** 1:50

**Driller:** MK

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2.09 | (0.20) 0.20 | | MADE GROUND: Brownish grey sandy gravelly BOULDERS. Sand is fine to coarse. Gravel is subangular fine to coarse. | | |
| | | | | | | | | End of Borehole at 0.20m | | |

**Remarks**

Terminated on boulder - moved to rebore position BH02B

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 0.30 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH02B

**Coordinates:** 325311.78 E 173054.45 N

**Client:** Irish Water

**Client's Representative:** Byrne Looby ARUP JV

**Ground Level:** 2.28 mOD

**Dates:** 24/01/2018

Sheet 1 of 1

**Scale:** 1:50

**Driller:** MK

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.98 | (0.30) 0.30 | | MADE GROUND: Brownish grey sandy gravelly BOULDERS. Sand is fine to coarse. Gravel is subangular fine to coarse. | | |
| | | | | | | | | End of Borehole at 0.30m | | |

**Remarks**

Terminated on boulder - moved to rebore position BH02C

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 18.20 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH02C

**Coordinates:** 325307.25 E 173049.67 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** MK

**Ground Level:** 2.28 mOD

**Dates:** 24/01/2018 - 29/01/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| 0.50 | B1<br>D2<br>ES3 | | | PID = 0.20ppm | | (2.00) | | MADE GROUND: Brownish grey gravelly fine to coarse SAND. Gravel is subangular of mixed lithologies including red brick and cement. |
| 2.00 | B4<br>D5<br>ES6 | | | | 0.28 | 2.00 | | Very loose brownish grey silty gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. |
| 2.00 - 2.45 | SPT (C)<br>N=2 | 2.00 | | N=2 (0,1/1,0,0,1)<br>PID = 0.10ppm | | (0.80) | | |
| 3.00 | B7<br>D8 | | | | -0.52 | 2.80 | | Medium dense brown silty gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| 3.00 - 3.45 | SPT (C)<br>N=11 | 3.00 | | N=11 (1,1/1,2,4,4)<br>Water Strike at 3.00m<br>Water Strike at 3.10m | | (1.20) | | |
| 4.00 | B9<br>D10 | | | | -1.72 | 4.00 | | Loose brownish grey slightly silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 4.00 - 4.45 | SPT (C)<br>N=7 | 4.00 | | N=7 (1,1/1,2,2,2) | | | | |
| 5.00 | B11<br>D12 | | | | | (1.80) | | |
| 5.00 - 5.45 | SPT (C)<br>N=8 | 5.00 | | N=8 (1,2/1,2,2,3) | | | | |
| 6.00 | B13<br>D14 | | | | -3.52 | 5.80 | | Medium dense reddish brown silty gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies. |
| 6.00 - 6.45 | SPT (C)<br>N=12 | 6.00 | | N=12 (2,2/3,2,3,4) | | (0.70) | | |
| 7.00 | B15<br>D16 | | | | -4.22 | 6.50 | | Very loose brown slightly silty gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. |
| 7.00 - 7.45 | SPT (C)<br>N=3 | 7.00 | | N=3 (1,0/0,1,1,1) | | (1.30) | | |
| 9.00 | B17<br>D18 | | | | -5.52 | 7.80 | | Loose to medium dense brown silty gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies.<br>[with shell fragments] |
| 9.00 - 9.45 | SPT (C)<br>N=8 | 9.00 | | N=8 (2,1/2,2,2,2) | | | | |

Water

Backfill

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 3.00 | 7.50 | | |
| 3.10 | 12.00 | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 2.00 | 3.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 6.00 | 6.30 | 00:30 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 18.20 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH02C

**Coordinates:** 325307.25 E, 173049.67 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** MK

**Ground Level:** 2.28 mOD

**Dates:** 24/01/2018 - 29/01/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Loose to medium dense brown silty gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. [with shell fragments] | | |
| 10.50 | B19 D20 | | | | | | | | | |
| 10.50 - 10.95 | SPT (C) N=18 | 10.50 | | N=18 (2,2/3,5,5,5) | | | | | | |
| | | | | | | (4.50) | | | | |
| 12.00 | B21 D22 | | | | | | | | | |
| 12.00 - 12.45 | SPT (C) N=25 | 12.00 | | N=25 (5,6/8,7,6,4) | -10.02 | 12.30 | | Medium dense greyish brown silty fine to coarse SAND. | | |
| | | | | | | (1.50) | | | | |
| 13.50 | B23 D24 | | | | | | | | | |
| 13.50 - 13.95 | SPT (S) N=27 | 13.50 | | N=27 (5,6/6,7,6,8) | -11.52 | 13.80 | | Medium dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies with 2-5cm thick lenses of silty clay. | | |
| 14.00 - 14.45 | U33 | 14.00 | | Ublow=40 100% | | | | | | |
| 15.00 | B25 D26 | | | | | (2.70) | | | | |
| 15.00 - 15.45 | SPT (C) N=29 | 15.00 | | N=29 (7,7/6,7,7,9) | | | | | | |
| 16.50 | B27 D28 | | | | -14.22 | 16.50 | | Dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | | |
| 16.50 - 16.95 | SPT (C) N=36 | 16.50 | | N=36 (6,7/8,9,9,10) | | (0.70) | | | | |
| 17.00 | B29 D30 | | | | -14.92 | 17.20 | | Very stiff brown slightly sandy slightly gravelly silty CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies. Cobbles and boulders are subrounded to rounded of mixed lithologies. | | |
| 17.00 - 17.45 | SPT (C) N=38 | 17.00 | | N=38 (7,7/8,10,10,10) | | (1.00) | | | | |
| 18.00 - 18.45 | SPT (C) N=41 | 18.00 | | N=41 (8,10/9,10,11,11) | | | | | | |
| 18.20 | B31 D32 | | | | -15.92 | 18.20 | | End of Borehole at 18.20m | | |

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 18.20 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 6.00 | 6.30 | 00:30 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.70 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH03

**Coordinates:** 325375.11 E 173083.98 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** BM

**Ground Level:** 2.39 mOD

**Dates:** 01/02/2018 - 06/02/2018

**Logger:** ST

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.40) | | MADE GROUND: Grey slightly sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | | | | 1.99 | 0.40 | | |
| 0.50 | B4<br>ES1 | | | PID = 0.40ppm | | | | MADE GROUND: Medium dense reddish brown slightly silty very sandy subangular fine to coarse GRAVEL of mixed lithologies, predominantly red bricks and pieces of cement. Sand is fine to coarse. |
| 1.00 | B5 | | | | | (1.20) | | |
| 1.20 | D12 | | | | | | | |
| 1.20 - 1.65 | SPT (C)<br>N=20 | 1.20 | | N=20 (3,5/5,5,5,5) | | | | |
| 1.50 | ES2 | | | PID = 0.70ppm | 0.79 | 1.60<br>(0.30) | | MADE GROUND: Medium dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | | | | 0.49 | 1.90 | | |
| 2.00 | B6<br>D13 | | | | | | | Medium dense yellowish brown slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 2.00 - 2.45 | SPT (C)<br>N=15 | 2.00 | | N=15 (2,3/3,4,4,4) | | | | |
| 2.50 | ES3 | | | PID = 0.00ppm | | (1.40) | | |
| 3.00 | B20<br>D14 | | | | | | | |
| 3.00 - 3.45 | SPT (C)<br>N=27 | 3.00 | | N=27 (3,5/5,6,7,9) | -0.91 | 3.30 | | Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 4.00 | B7<br>D15 | | | | | | | |
| 4.00 - 4.45 | SPT (C)<br>N=27 | 4.00 | | N=27 (3,6/5,6,8,8) | | | | |
| | | | | | | (2.70) | | |
| 5.00 | B8<br>D16 | | | | | | | |
| 5.00 - 5.45 | SPT (C)<br>N=29 | 5.00 | | N=29 (4,5/6,7,8,8) | | | | |
| 6.00 | B9<br>D17 | | | | -3.61 | 6.00 | | Dense brownish grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 6.00 - 6.45 | SPT (C)<br>N=31 | 6.00<br>10.00 | 2.90 | N=31 (5,5/6,8,8,9)<br>06-02-2018 | | | | |
| | | | | | | (1.50) | | |
| 7.50 | B10<br>D18 | | | | -5.11 | 7.50 | | Medium dense yellowish brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 7.50 - 7.95 | SPT (C)<br>N=17 | 7.50 | | N=17 (3,3/4,4,4,5) | | | | |
| | | | | | | (2.50) | | |
| 9.00 | B11<br>D19 | | | | | | | |
| 9.00 - 9.45 | SPT (C)<br>N=19 | 9.00 | | N=19 (3,4/4,4,5,6) | | | | |
| | | | | | -7.61 | 10.00 | | |

Water | Backfill

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.40 | 6.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 13.00 | 14.60 | 02:30 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.70 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH03

**Coordinates:** 325375.11 E, 173083.98 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 2.39 mOD

**Dates:** 01/02/2018 - 06/02/2018

**Driller:** BM

**Logger:** ST

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 10.00 | 5.40 | 01-02-2018 | | | | Medium dense greyish brown fine to coarse SAND with occasional shell fragments. [Layer of cemented SAND at 10.00m] | | |
| 10.50 | D23 | | | | | | | | | |
| 10.50 - 10.95 | SPT (C) N=13 | 10.50 | 2.90 | N=13 (2,3/2,3,3,5) | | | | | | |
| 11.00 | B21 | | | | | (3.00) | | | | |
| 12.00 | D24 | | | | | | | | | |
| 12.00 - 12.45 | SPT (C) N=15 | 12.00 | 3.60 | N=15 (3,3/3,3,4,5) | | | | | | |
| 13.00 | B22 | | | | -10.61 | 13.00 | | Medium dense brownish grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | | |
| 13.50 | D25 | | | | | | | | | |
| 13.50 - 13.95 | SPT (C) N=17 | 13.50 | 4.10 | N=17 (3,4/3,4,5,5) | | (1.60) | | | | |
| 14.50 - 14.95 | U27 | 15.00 | 3 | Ublow=60 100% | -12.21 | 14.60 | | | | |
| | | | | | | (0.40) | | Soft to firm grey slightly sandy silty CLAY with 2-10cm thick lenses of fine to coarse SAND. | | |
| | | | | | -12.61 | 15.00 | | Very stiff grey slightly sandy silty CLAY. | | |
| 15.30 | D26 | | | | | (0.70) | | | | |
| 15.30 - 15.75 | SPT (S) N=33 | 15.30 | 4.70 | N=33 (4,5/7,7,9,10) | | | | | | |
| | | 15.70 | 3.40 | 06-02-2018 | -13.31 | 15.70 | | End of Borehole at 15.70m | | |

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 15.70 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 13.00 | 14.60 | 02:30 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 18.20 |
| Rotary Percussion | Beretta T44 | 18.20 | 20.00 |
| Rotary Coring | Beretta T44 | 20.00 | 25.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH04

**Coordinates:** 325340.14 E, 173091.76 N

**Client:** Irish Water

Sheet 1 of 3

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 2.51 mOD

**Dates:** 01/02/2018 - 15/02/2018

**Driller:** MK+JR

**Logger:** ST+NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | MADE GROUND: Very soft brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse of mixed lithologies. |
| 0.50 | B3<br>D12<br>ES1 | | | PID = 0.60ppm | | (1.45) | | |
| 1.00 | B4<br>D13 | | | | | | | |
| 1.00 - 1.45 | SPT (C)<br>N=3 | 1.00 | | N=3 (1,1/0,1,1,1) | 1.06 | 1.45 | | |
| | | | | | 0.91 | (0.15) 1.60 | | MADE GROUND: Concrete slab |
| | | | | | | | | NO RECOVERY: Piece of concrete stuck in lead length; pushed down the borehole. |
| | | | | | | (1.40) | | |
| 3.00 | B5<br>D14<br>ES2 | | | | -0.49 | 3.00 | | Loose brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 3.00 - 3.45 | SPT (C)<br>N=9 | 3.00 | | N=9 (3,2/1,2,3,3)<br>PID = 0.40ppm | | (1.00) | | |
| 4.00 | B6<br>D15 | | | | -1.49 | 4.00 | | Medium dense brown silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 4.00 - 4.45 | SPT (C)<br>N=11 | 4.00<br>4.50<br>4.50 | 2.80<br>3.00 | N=11 (3,3/2,2,3,4)<br>01-02-2018<br>31-01-2018 | | | | |
| 5.00 | B7<br>D16 | | | | | | | |
| 5.00 - 5.45 | SPT (C)<br>N=10 | 5.00 | | N=10 (2,3/2,2,3,3) | | (3.80) | | |
| 6.00 | B8<br>D17 | | | | | | | |
| 6.00 - 6.45 | SPT (C)<br>N=23 | 6.00 | | N=23 (4,5/5,6,6,6) | | | | |
| 7.50 | B9<br>D18 | | | | | | | |
| 7.50 - 7.58 | SPT (C) | 7.50 | | 50 (25 for 70mm/50 for 5mm) | -5.29 | 7.80 | | Very dense brownish grey slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.<br>[Layer of cemented SAND at 10.00m] |
| 9.00 | B10<br>D19 | | | | | (2.70) | | |
| 9.00 - 9.35 | SPT (C) | 9.00<br>10.50 | 3.00 | 50 (5,8/50 for 195mm)<br>05-02-2018 | | | | |

**Remarks**

Cable Percussion / RC follow-on

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer after 5.00m of rock core recovered

**Core Barrel**

**Flush Type**

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 3.00 | 3.50 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 1.50 | 3.00 | 01:00 |
| 7.60 | 7.90 | 01:00 |
| 11.00 | 11.80 | 01:00 |
| 16.60 | 18.00 | 00:30 |
| 18.00 | 18.20 | 01:00 |

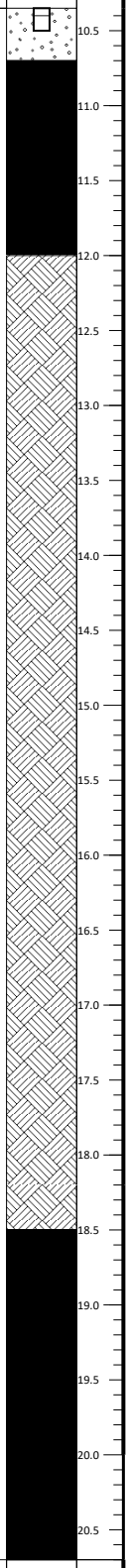
CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH04 |
| **Coordinates:** 325340.14 E 173091.76 N | **Client:** Irish Water | Sheet 2 of 3 |
| | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.51 mOD | **Dates:** 01/02/2018 - 15/02/2018 | **Driller:** MK+JR |
| | | **Logger:** ST+NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 18.20 |
| Rotary Percussion | Beretta T44 | 18.20 | 20.00 |
| Rotary Coring | Beretta T44 | 20.00 | 25.00 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| 10.50 | B11 D20 | | | | -7.99 | 10.50 | | Very dense brownish grey slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. [Layer of cemented SAND at 10.00m] |
| 10.50 - 10.95 | SPT (C) N=18 | 10.50 | 3.20 | N=18 (3,4/4,5,4,5) | | | | |
| | | 10.50 | 4.00 | 01-02-2018 | | (1.30) | | Medium dense grey slightly silty gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| | | | | | -9.29 | 11.80 | | |
| 12.00 | B21 D24 | | | | | | | Medium dense brownish grey very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 12.00 - 12.45 | SPT (C) N=29 | 12.00 | 4.00 | N=29 (5,5/7,7,8,7) | | (2.70) | | |
| 13.50 | B22 D25 | | | | | | | |
| 13.50 - 13.95 | SPT (C) N=25 | 13.50 | 3.50 | N=25 (5,5/5,7,7,6) | | | | |
| | | | | | -11.99 | 14.50 | | |
| 15.00 | B23 D26 | | | | | | | Very stiff slightly sandy slightly gravelly brownish grey CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. |
| | U27 | 15.00 | 3 | Ublow=35 100% | | (2.10) | | |
| | | 16.40 | 3.20 | 06-02-2018 | | | | |
| | | 16.40 | 3.50 | 05-02-2018 | | | | |
| 16.50 | B28 D30 | | | | -14.09 | 16.60 | | |
| 16.50 - 16.95 | SPT (C) N=37 | 16.50 | 4.20 | N=37 (5,8/6,9,10,12) | | | | Dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | | | | | (1.40) | | |
| | | | | | -15.49 | 18.00 | | |
| 18.00 - 18.20 | SPT (C) | 18.00 | 3.00 | 50 (25 for 125mm/50 for 75mm) | | | | Very dense grey sandy angular to subangular fine to coarse GRAVEL of mixed lithologies with medium cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded. |
| 18.20 | B29 D31 | 18.20 | 3.00 | 06-02-2018 | | (1.50) | | |
| 18.50 - 18.90 | SPT (C) | 18.50 | | N=50 (7,7/50 for 255mm) | | | | |
| | | | | | -16.99 | 19.50 | | WEATHERED SANDSTONE BEDROCK (drillers description) |
| | | | | | | (0.50) | | |
| | | | | | -17.49 | 20.00 | | Medium strong to strong grey massive medium grained SANDSTONE. Largely unweathered, slightly closer fracture spacing, patchy reddish brown and grey discolouration on discontinuity surfaces. Discontinuities: |
| | TCR | SCR | RQD | FI | | | | |

Water / Backfill




**Remarks**
Cable Percussion / RC follow-on
Groundwater monitoring standpipe installed
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer after 5.00m of rock core recovered

**Core Barrel**

**Flush Type**

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 12.00 | 250 |
| 18.20 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 1.50 | 3.00 | 01:00 |
| 7.60 | 7.90 | 01:00 |
| 11.00 | 11.80 | 01:00 |
| 16.60 | 18.00 | 00:30 |
| 18.00 | 18.20 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 18.20 |
| Rotary Percussion | Beretta T44 | 18.20 | 20.00 |
| Rotary Coring | Beretta T44 | 20.00 | 25.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH04

**Coordinates:** 325340.14 E, 173091.76 N

**Client:** Irish Water

Sheet 3 of 3

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** MK+JR

**Ground Level:** 2.51 mOD

**Dates:** 01/02/2018 - 15/02/2018

**Logger:** ST+NH

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 53 | 46 | | | | | | Medium strong to strong grey massive medium grained SANDSTONE. Largely unweathered, slightly closer fracture spacing, patchy reddish brown and grey discolouration on discontinuity surfaces. Discontinuities: 1. 0 to 30 degree joints, medium spaced (80/210/1300), planar, smooth with patchy reddish brown and grey staining. 2. 40 to 60 degree joints, medium spaced (160/240/390), planar, smooth with reddish brown staining locally penetrating up to 10mm. 3. 70 to 80 degree joints, medium spaced (180/220/300) planar, smooth, occurring along zones mineralized quartz veining, pervasive greyish green discolouration along mineralized zones and on joint surfaces. | | |
| 21.50 | | | | | | | | | | | |
| | 100 | 73 | 60 | | | | | | | | |
| | | | | 8 | | | (5.00) | | | | |
| 23.00 | | | | | | | | | | | |
| | 100 | 69 | 62 | | | | | | | | |
| 24.50 | | | | | | | | | | | |
| | 100 | 98 | 98 | | | | | | | | |
| 25.00 | | | | | | -22.49 | 25.00 | | End of Borehole at 25.00m | | |
| | TCR | SCR | RQD | FI | | | | | | | |

**Remarks**

Cable Percussion / RC follow-on

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer after 5.00m of rock core recovered

**Core Barrel**

**Flush Type**

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 25.00 | 150 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 1.50 | 3.00 | 01:00 |
| 7.60 | 7.90 | 01:00 |
| 11.00 | 11.80 | 01:00 |
| 16.60 | 18.00 | 00:30 |
| 18.00 | 18.20 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 17.90 |
| Rotary Percussion | Beretta T44 | 17.90 | 18.00 |
| Rotary Coring | Beretta T44 | 18.00 | 25.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH05

**Coordinates:** 325357.99 E, 173138.45 N

**Client:** Irish Water

Sheet 1 of 3

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 3.14 mOD

**Dates:** 06/02/2018 - 19/02/2018

**Driller:** BM+JR

**Logger:** ST+NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.40) | | MADE GROUND: Grey subangular coarse GRAVEL fill. |
| | | | | | 2.74 | 0.40 | | |
| 0.50 | B1 | | | | | | | MADE GROUND: Medium dense black subangular coarse GRAVEL fill with fragments of red brick throughout. |
| | ES4 | | | PID = 0.20ppm | | | | |
| 1.00 | B2 | | | | | (1.20) | | |
| 1.20 | D3 | | | | | | | |
| 1.20 - 1.65 | SPT (C) | 1.20 | 1.20 | N=28 (3,5/9,8,6,5) | | | | |
| | N=28 | 1.20 | 0.00 | 06-02-2018 | | | | |
| | | 1.20 | 0.00 | 07-02-2018 | 1.54 | 1.60 | | |
| 1.50 | ES5 | | | | | | | Medium dense brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| | | | | PID = 0.00ppm | | | | |
| 2.00 | B7 | | | | | (1.10) | | |
| | D16 | | | | | | | |
| 2.00 - 2.45 | SPT (C) | 2.00 | 1.90 | N=11 (2,3/2,3,3,3) | | | | |
| | N=11 | | | | | | | |
| 2.50 | ES6 | | | | 0.44 | 2.70 | | |
| | | | | PID = 0.60ppm | | | | Medium dense brown slightly silty gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. |
| 3.00 | B8 | | | | | | | |
| | D17 | | | | | (1.10) | | |
| 3.00 - 3.45 | SPT (C) | 3.00 | 2.60 | N=14 (2,2/3,3,4,4) | | | | |
| | N=14 | | | | | | | |
| | | | | | -0.66 | 3.80 | | |
| 4.00 | B9 | | | | | | | Medium dense brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | D18 | | | | | | | |
| 4.00 - 4.45 | SPT (C) | 4.00 | 2.20 | N=19 (3,4/4,4,5,6) | | | | |
| | N=19 | | | | | | | |
| | | | | | | (1.80) | | |
| 5.00 | B10 | | | | | | | |
| | D19 | | | | | | | |
| 5.00 - 5.45 | SPT (C) | 5.00 | 3.10 | N=23 (3,4/5,5,5,8) | | | | |
| | N=23 | | | | | | | |
| | | | | | -2.46 | 5.60 | | |
| 6.00 | B11 | | | | | | | Dense brown slightly silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | D20 | | | | | | | |
| 6.00 - 6.45 | SPT (C) | 6.00 | 2.70 | N=34 (4,4/6,6,10,12) | | | | |
| | N=34 | | | | | | | |
| | | | | | | (3.40) | | |
| 7.50 | B12 | | | | | | | |
| | D21 | | | | | | | |
| 7.50 - 7.65 | SPT (C) | 7.50 | 3.00 | 50 (25 for 75mm/50 for 75mm) | | | | |
| | | | | | | | | |
| 9.00 | B13 | | | | -5.86 | 9.00 | | |
| | D22 | | | | | | | Medium dense to dense grey slightly silty gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. |
| 9.00 - 9.45 | SPT (C) | 9.00 | 3.10 | N=27 (4,5/5,7,7,8) | | | | |
| | N=27 | | | | | | | |

Water / Backfill

**Remarks**

Cable Percussion / RC follow-on

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer after 6.50m of rock core recovered

**Core Barrel**

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 7.50 | 7.70 | 01:00 |
| 17.80 | 17.90 | 01:00 |

**Flush Type**

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 6.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 17.90 |
| Rotary Percussion | Beretta T44 | 17.90 | 18.00 |
| Rotary Coring | Beretta T44 | 18.00 | 25.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH05

**Coordinates:** 325357.99 E 173138.45 N

**Client:** Irish Water

Sheet 2 of 3

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 3.14 mOD

**Dates:** 06/02/2018 - 19/02/2018

**Driller:** BM+JR

**Logger:** ST+NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 10.50 | B14 D23 | | | | | | | Medium dense to dense grey slightly silty gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. | | |
| 10.50 - 10.95 | SPT (C) N=33 | 10.50 | 3.40 | N=33 (4,5/7,8,8,10) | | | | | | |
| | | 12.00 | 2.80 | 08-02-2018 | | (3.30) | | | | |
| 12.00 | B15 D24 | | | | | | | | | |
| 12.00 - 12.45 | SPT (C) N=19 | 12.00 | 3.00 | N=19 (3,3/3,5,5,6) | -9.16 | 12.30 | | Medium dense greyish brown slightly silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | | |
| | | 12.00 | 3.30 | 07-02-2018 | | | | | | |
| 13.50 | B25 D30 | | | | | | | | | |
| 13.50 - 13.95 | SPT (C) N=25 | 13.50 | 3.10 | N=25 (3,4/5,5,7,8) | | (3.40) | | | | |
| 15.00 | B26 D31 | | | | | | | | | |
| 15.00 - 15.45 | SPT (C) N=13 | 15.00 | 2.90 | N=13 (5,2/3,3,3,4) | | | | | | |
| | | | | | -12.56 | 15.70 | | Soft brownish grey sandy silty CLAY. Sand is fine to coarse. | | |
| 16.00 | B27 | | | | | (0.60) | | | | |
| 16.00 - 16.45 | U32 | 16.50 | 3.4 | Ublow=60 100% | -13.16 | 16.30 | | Dense brown very sandy subangular fine to coarse GRAVEL of mixed lithologies with low cobble content. Sand is fine to coarse. Cobbles are subrounded to rounded. | | |
| 17.00 | B28 | | | | | (1.50) | | | | |
| 17.50 - 17.78 | SPT (C) | 17.00 | 2.90 | 50 (25 for 125mm/50 for 160mm) | | | | | | |
| | | | | | -14.66 | 17.80 (0.20) | | | | |
| 17.80 - 17.90 | B29 | | | | | 18.00 | | | | |
| 17.90 - 17.95 | SPT (C) | 17.95 | 3.00 | 50 (25 for 30mm/50 for 25mm) | -14.86 | | | BEDROCK (drillers description) | | |
| | 98 26 12 | 17.80 | 3.00 | 08-02-2018 | | | | Highly weathered highly fractured DOLERITE red staining on discontinuity surfaces - recovered as brown sandy silty angular fine to coarse GRAVEL, cobbles and boulders of dolerite. Sand is fine to coarse. | | |
| 19.00 | | | | | | | | | | |
| | | | NA | | | (2.90) | | | | |
| | 99 11 0 | | | | | | | | | |
| 20.50 | | | | | | | | | | |
| | TCR SCR RQD | | FI | | | | | | | |

**Remarks**

Cable Percussion / RC follow-on

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer after 6.50m of rock core recovered

**Core Barrel**

**Flush Type**

| Water Strikes | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| | | | |

| Water Added | |
|---|---|
| From (m) | To (m) |
| | |

| Casing Details | |
|---|---|
| To (m) | Diam (mm) |
| 12.00 | 250 |
| 17.90 | 200 |

| Chiselling Details | | |
|---|---|---|
| From (m) | To (m) | Time (hh:mm) |
| 7.50 | 7.70 | 01:00 |
| 17.80 | 17.90 | 01:00 |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH05 |
| **Coordinates:** 325357.99 E 173138.45 N | **Client:** Irish Water | Sheet 3 of 3 |
| | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 3.14 mOD | **Dates:** 06/02/2018 - 19/02/2018 | **Driller:** BM+JR |
| | | **Logger:** ST+NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 17.90 |
| Rotary Percussion | Beretta T44 | 17.90 | 18.00 |
| Rotary Coring | Beretta T44 | 18.00 | 25.00 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | -17.76 | 20.90 | + + + | Highly weathered highly fractured DOLERITE red staining on discontinuity surfaces - recovered as brown sandy silty angular fine to coarse GRAVEL, cobbles and boulders of dolerite. Sand is fine to coarse. | | |
| | 100 | 49 | 41 | 8 | | | | | Medium strong to strong massive dark grey medium grained SANDSTONE. Partially weathered: Slight closer fracture spacing, faint greyish green and brown staining on discontinuity surface. Discontinuities: 1. 20 to 40 degree joints, closed spacing ( 90/230/390), planar, smooth, patchy brown staining on joint surfaces with minor brown clay infill. 2. 50 to 70 degree joints, medium spaced (90/200/220), planar smooth faint greyish green and brown staining on joint surface. | | |
| 22.00 | | | | | | | | | | | |
| | 97 | 39 | 28 | 10 | | | (4.10) | | | | |
| 23.50 | | | | | | | | | | | |
| | 100 | 66 | 58 | 6 | | | | | | | |
| 25.00 | | | | | | -21.86 | 25.00 | | End of Borehole at 25.00m | | |
| | TCR | SCR | RQD | FI | | | | | | | |

**Remarks**
Cable Percussion / RC follow-on
Groundwater monitoring standpipe installed

Terminated on instruction of Engineer after 6.50m of rock core recovered

**Core Barrel**

**Flush Type**

| Water Strikes | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| | | | |

| Water Added | | Casing Details | |
|---|---|---|---|
| From (m) | To (m) | To (m) | Diam (mm) |
| | | 24.50 | 150 |

| Chiselling Details | | |
|---|---|---|
| From (m) | To (m) | Time (hh:mm) |
| 7.50 | 7.70 | 01:00 |
| 17.80 | 17.90 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 0.50 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH06

**Coordinates:** 325298.65 E, 173116.38 N

**Client:** Irish Water

Sheet 1 of 1

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** MK

**Ground Level:** 2.57 mOD

**Dates:** 09/02/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.50) | | MADE GROUND: Soft to firm brown slightly sandy slightly gravelly CLAY with high concentration of red brick, glass, and concrete blocks. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | | 2.07 | 0.50 | | End of Borehole at 0.50m | | |

**Remarks**

Terminated on concrete - moved to rebore position BH06A

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH06A

**Coordinates:** 325298.79 E, 173112.12 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 2.52 mOD

**Dates:** 09/02/2018 - 13/02/2018

**Driller:** MK

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | 0.00 | | 09-02-2018 | | | | MADE GROUND: Very soft brown slightly sandy slightly gravelly CLAY fill with red brick and concrete fragments throughout. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse mixed lithologies. |
| 0.50 | B5<br>D15<br>ES1 | | | PID = 0.10ppm | | (1.50) | | |
| 1.00 - 1.45 | SPT (C)<br>N=2 | 1.00<br>1.00<br>1.00 | | N=2 (0,0/0,1,1,0)<br>09-02-2018<br>12-02-2018 | | | | |
| 1.50 | B6<br>D16 | | | | 1.02 | 1.50<br>(0.30) | | MADE GROUND: Brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse mixed lithologies. |
| | ES2 | | | PID = 0.20ppm | 0.72 | 1.80 | | MADE GROUND: Loose black sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>[slightly clayey, shell fragments, and possible red brick]<br>[Larger gravel pieces can be broken by hand - slaty] |
| 2.00 | B7<br>D17<br>ES3 | | | | | (1.00) | | |
| 2.00 - 2.45 | SPT (C)<br>N=8 | 2.00 | | N=8 (1,2/2,2,2,2)<br>PID = 0.00ppm | | | | |
| | | | | | -0.28 | 2.80 | | Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies.<br>[Clumps of very soft black very sandy SILT] |
| 3.00 | B8<br>D18<br>ES4 | | | | | | | |
| 3.00 - 3.45 | SPT (C)<br>N=12 | 3.00 | | N=12 (2,2/2,3,3,4)<br>PID = 0.10ppm | | | | |
| 4.00 | B9<br>D19 | | | | | | | |
| 4.00 - 4.45 | SPT (C)<br>N=15 | 4.00 | | N=15 (1,2/3,3,4,5) | | (3.20) | | |
| 5.00 | B10<br>D20 | | | | | | | |
| 5.00 - 5.45 | SPT (C)<br>N=20 | 5.00 | | N=20 (2,3/3,5,5,7) | | | | |
| 6.00 | B11<br>D21 | | | | -3.48 | 6.00 | | Medium dense brownish grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 6.00 - 6.45 | SPT (C)<br>N=23 | 6.00 | | N=23 (3,5/5,6,6,6) | | | | |
| | | | | | | (1.50) | | |
| 7.50 | B12<br>D22 | | | | -4.98 | 7.50 | | Medium dense to dense brown slightly silty slightly gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine of mixed lithologies. |
| 7.50 - 7.95 | SPT (C)<br>N=14 | 7.50 | | N=14 (1,2/2,3,4,5) | | | | |
| | | | | | | (4.40) | | |
| 9.00 | B13<br>D23 | | | | | | | |
| 9.00 - 9.45 | SPT (C)<br>N=40 | 9.00 | | N=40<br>(5,8/9,10,10,11) | | | | |
| | | 10.50 | 3.00 | 13-02-2018 | | | | |

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.50 | 4.50 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 1.50 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 0.30 | 1.00 | 01:00 |
| 6.50 | 6.80 | 00:30 |
| 7.00 | 7.30 | 00:30 |
| 12.20 | 14.00 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH06A

**Coordinates:** 325298.79 E, 173112.12 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** MK

**Ground Level:** 2.52 mOD

**Dates:** 09/02/2018 - 13/02/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense to dense brown slightly silty slightly gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine of mixed lithologies. |
| 10.50 | B14 D24 | | | | | | | |
| 10.50 - 10.95 | SPT (C) N=28 | 10.50 | | N=28 (5,4/4,6,8,10) | | | | |
| | | 10.50 | 2.70 | 12-02-2018 | | | | |
| | | | | | -9.38 | 11.90 (0.30) | | Soft to firm brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. |
| 12.00 | B25 D26 | | | | | | | |
| 12.20 - 12.65 | SPT (C) N=38 | 12.20 | | N=38 (7,7/9,10,10,9) | -9.68 | 12.20 | | Medium dense to dense brownish grey very sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse. [Clumps of brown CLAY] [GRAVEL size increases with depth] |
| | | | | | | (2.00) | | |
| 13.50 | B27 D28 | | | | | | | |
| 13.80 - 14.25 | SPT (C) N=27 | 13.80 | | N=27 (4,5/6,6,7,8) | | | | |
| 14.20 | U31 | 14.20 | 3 | Ublow=50 100% | -11.68 | 14.20 | | Firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine. |
| 14.40 | B29 D30 | | | | | (0.60) | | |
| 14.50 - 14.95 | SPT (S) N=17 | 14.50 | | N=17 (1,2/2,3,6,6) | -12.28 | 14.80 (0.20) | | Stiff grey slightly sandy silty CLAY. Sand is fine to coarse. |
| | | 15.00 | 3.50 | 15-02-2018 | -12.48 | 15.00 | | End of Borehole at 15.00m |

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 15.00 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 0.30 | 1.00 | 01:00 |
| 6.50 | 6.80 | 00:30 |
| 7.00 | 7.30 | 00:30 |
| 12.20 | 14.00 | 01:00 |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH07 |
| **Coordinates:** | **Client:** | Sheet 1 of 1 |
| 325337.10 E | Irish Water | |
| 173205.22 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.55 mOD | **Dates:** 13/02/2018 | **Driller:** BM |
| | | **Logger:** NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 3000 | 0.00 | 0.80 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2.55 | (0.70) | | MADE GROUND: Grey hardcore sandy angular to subangular fine to coarse GRAVEL fill. Sand is fine to coarse. | | |
| | | | | | 1.85 | 0.70 | | MADE GROUND: Concrete slab | | |
| | | | | | 1.75 | (0.10) 0.80 | | End of Borehole at 0.80m | | |

**Remarks**

Terminated on concrete - moved to rebore position BH07A

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 0.80 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH07A |
| **Coordinates:** | **Client:** | Sheet 1 of 1 |
| 325336.90 E | Irish Water | |
| 173207.13 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.51 mOD | **Dates:** 13/02/2018 | **Driller:** BM |
| | | **Logger:** NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 0.80 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2.51 | (0.70) | | MADE GROUND: Grey hardcore sandy angular to subangular fine to coarse GRAVEL fill. Sand is fine to coarse. | | |
| | | | | | 1.81 | 0.70 | | MADE GROUND: Concrete slab | | |
| | | | | | 1.71 | (0.10) 0.80 | | End of Borehole at 0.80m | | |

**Remarks**

Terminated on concrete - moved to rebore position BH07B

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 0.80 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 14.80 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH07B

**Coordinates:** 325339.93 E, 173208.08 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** BM

**Ground Level:** 2.59 mOD

**Dates:** 13/02/2018 - 15/02/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | 0.00 | | 13-02-2018 | | (0.30) | | MADE GROUND: Grey hardcore sandy angular to subangular fine to coarse GRAVEL fill. Sand is fine to coarse. |
| | | | | | 2.29 | 0.30 | | |
| 0.50 | B7 | | | | | | | MADE GROUND: Grey subangular to subrounded fine to coarse GRAVEL fill. |
| | ES1 | | | PID = 0.10ppm | | (0.90) | | |
| 1.00 | B8 | | | | | | | |
| 1.20 | D19 | | | | 1.39 | 1.20 | | |
| 1.20 - 1.65 | SPT (C) N=12 | 1.20 | - | N=12 (2,3/3,3,3,3) | | | | MADE GROUND: Medium dense brown sandy subangular fine to coarse GRAVEL fill with red brick and fragments of concrete throughout. Sand is fine to coarse. |
| 1.50 | ES2 | | | PID = 0.00ppm | | (1.10) | | |
| 2.00 | B9 | | | | | | | |
| | D20 | | | | | | | |
| 2.00 - 2.30 | SPT (C) | 2.00 | 1.70 | 50 (6,12/50 for 145mm) | 0.29 | 2.30 | | Medium dense reddish grey very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. [becoming reddish brown at 4.00m] |
| 2.50 | ES3 | | | PID = 0.20ppm | | | | |
| 3.00 | B10 | | | | | | | |
| | D21 | | | | | | | |
| 3.00 - 3.45 | SPT (C) N=12 | 3.00 | 2.60 | N=12 (3,2/3,3,3,3) | | (1.90) | | |
| 3.50 | ES4 | | | PID = 0.20ppm | | | | |
| 4.00 | B11 | | | | | | | |
| | D22 | | | | -1.61 | 4.20 | | |
| 4.00 - 4.45 | SPT (C) N=14 | 4.00 | 3.00 | N=14 (2,3/4,3,3,4) | | | | Medium dense brownish grey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 4.50 | ES5 | | | PID = 0.10ppm | | | | |
| 5.00 | B12 | | | | | | | |
| | D23 | | | | | | | |
| 5.00 - 5.45 | SPT (C) N=14 | 5.00 | 3.10 | N=14 (3,3/3,4,3,4) | | (2.50) | | |
| 5.50 | ES6 | | | PID = 0.20ppm | | | | |
| 6.00 | B13 | | | | | | | |
| | D24 | | | | | | | |
| 6.00 - 6.45 | SPT (C) | 6.00 | 3.40 | N=16 (3,4/3,4,4,5) | | | | |
| | N=16 | 7.00 | 2.30 | 14-02-2018 | | | | |
| | | | | | -4.11 | 6.70 | | |
| | | | | | | (0.30) | | Brown very sandy subangular to subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | 7.00 | 3.40 | 13-02-2018 | -4.41 | 7.00 | | |
| | | | | | | | | Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 7.50 | B14 | | | | | | | |
| | D25 | | | | | | | |
| 7.50 - 7.95 | SPT (C) N=14 | 7.50 | 2.30 | N=14 (3,3/3,3,4,4) | | | | |
| | | | | | | (5.30) | | |
| 9.00 | B15 | | | | | | | |
| | D26 | | | | | | | |
| 9.00 - 9.45 | SPT (C) N=15 | 9.00 | 2.80 | N=15 (3,4/3,4,4,4) | | | | |

Water | Backfill

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.20 | 7.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 5.00 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 11.80 | 12.00 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 14.80 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH07B

**Coordinates:** 325339.93 E, 173208.08 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** BM

**Ground Level:** 2.59 mOD

**Dates:** 13/02/2018 - 15/02/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. | | |
| 10.50 | B16 D27 | | | | | | | | | |
| 10.50 - 10.95 | SPT (C) N=16 | 10.50 | 3.60 | N=16 (3,3/3,4,4,5) | | | | | | |
| 12.00 | B17 D28 | | | | | | | | | |
| 12.00 - 12.45 | SPT (C) N=18 | 12.00 | 4.00 | N=18 (3,3/5,4,4,5) | -9.71 | 12.30 | | Stiff brown slightly sandy CLAY. Sand is fine to coarse | | |
| 12.50 - 12.95 | U30 | 12.50 | 3 | Ublow=30 100% | | (0.50) | | | | |
| | | | | | -10.21 | 12.80 | | Firm grey slightly sandy silty CLAY. Sand is fine to coarse. | | |
| 13.00 | B18 D29 | | | | | (0.60) | | | | |
| 13.00 - 13.45 | SPT (S) N=12 | 13.00 | 2.90 | N=12 (2,3/3,2,3,4) | -10.81 | 13.40 | | Dense to very dense brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | | |
| | | 13.50 | 2.40 | 15-02-2018 | | | | | | |
| | | 13.50 | 3.00 | 14-02-2018 | | (1.40) | | | | |
| 14.50 - 14.80 | SPT (C) | 14.50 | 3.20 | 50 (25 for 125mm/50 for 175mm) | | | | | | |
| | | 14.80 | 3.20 | 15-02-2018 | -12.21 | 14.80 | | End of Borehole at 14.80m | | |

**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 14.80 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 11.80 | 12.00 | 01:00 |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH08 |
| **Coordinates:** | **Client:** | Sheet 1 of 2 |
| 325296.01 E | Irish Water | |
| 173182.39 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.61 mOD | **Dates:** 21/02/2018 - 23/02/2018 | **Driller:** MK |
| | | **Logger:** ST |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 12.90 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | 2.51 | (0.10) 0.10 | | MADE GROUND: Tarmac |
| | | | | | | | | MADE GROUND: Brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 0.50 | B1 | | | | | (0.70) | | |
| | D3 | | | | | | | |
| | ES5 | | | PID = 0.10ppm | 1.81 | 0.80 | | MADE GROUND: Medium dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies including red bricks and cement. Sand is fine to coarse. |
| 1.00 | B2 | | | | | | | |
| | D4 | | | | | (0.70) | | |
| | ES6 | | | | | | | |
| 1.00 - 1.45 | SPT (C) | 1.00 | | N=11 (2,2/3,4,2,2) | 1.11 | 1.50 | | MADE GROUND: Black sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | N=11 | | | PID = 0.20ppm | | (0.20) | | |
| | | 1.30 | | 21-02-2018 | 0.91 | 1.70 | | MADE GROUND: Medium dense brownish red sandy subangular fine to coarse GRAVEL of mixed lithologies including red bricks and cement. Sand is fine to coarse. |
| | | 1.30 | | 22-02-2018 | | | | |
| 2.00 | B7 | | | | | | | |
| | D8 | | | | | (0.90) | | |
| | ES9 | | | | | | | |
| 2.00 - 2.45 | SPT (C) | 2.00 | | N=17 (3,3/4,3,5,5) | | | | |
| | N=17 | | | PID = 0.00ppm | 0.01 | 2.60 | | MADE GROUND: Brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies including bricks and cement. |
| 3.00 | B10 | | | | | (0.70) | | |
| | D11 | | | | | | | |
| | ES12 | | | | -0.69 | 3.30 | | Loose to medium dense greyish brown slightly silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to medium of mixed lithologies. |
| 3.00 - 3.45 | SPT (C) | 3.00 | | N=14 (1,3/2,3,4,5) | | | | |
| | N=14 | | | PID = 0.30ppm | | | | |
| 4.00 | B13 | | | | | | | |
| | D14 | | | | | | | |
| | ES15 | | | | | | | |
| 4.00 - 4.45 | SPT (C) | 4.00 | | N=8 (2,2/2,3,1,2) | | | | |
| | N=8 | | | PID = 0.00ppm | | | | |
| | | | | | | (3.00) | | |
| 5.00 | B16 | | | | | | | |
| | D17 | | | | | | | |
| | ES18 | | | | | | | |
| 5.00 - 5.45 | SPT (C) | 5.00 | | N=17 (3,4/5,5,4,3) | | | | |
| | N=17 | | | PID = 0.10ppm | | | | |
| 6.00 | B19 | | | | | | | |
| | D20 | | | | | | | |
| 6.00 - 6.45 | SPT (C) | 6.00 | | N=21 (3,4/5,7,5,4) | -3.69 | 6.30 | | Medium dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | N=21 | | | | | | | |
| 7.50 | B21 | | | | | | | |
| | D22 | | | | | | | |
| 7.50 - 7.95 | SPT (C) | 7.50 | | N=23 (4,6/6,6,5,6) | | | | |
| | N=23 | | | | | (3.20) | | |
| 9.00 | B23 | | | | | | | |
| | D24 | | | | | | | |
| 9.00 - 9.45 | SPT (C) | 9.00 | | N=26 (3,4/6,7,7,6) | | | | |
| | N=26 | | | | -6.89 | 9.50 | | Medium dense brown slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular fine of mixed lithologies. |

**Remarks**

Groundwater monitoring standpipe installed.

Terminated on instruction of Engineer.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.50 | 6.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 1.50 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 0.00 | 1.30 | 01:00 |
| 1.70 | 2.60 | 00:30 |
| 11.00 | 11.70 | 00:30 |
| 12.90 | 12.90 | 00:30 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 12.90 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH08

**Coordinates:** 325296.01 E, 173182.39 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** MK

**Ground Level:** 2.61 mOD

**Dates:** 21/02/2018 - 23/02/2018

**Logger:** ST

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense brown slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular fine of mixed lithologies. |
| 10.50 | B25 D26 | | | | | (1.50) | | |
| 10.50 - 10.95 | SPT (C) N=19 | 10.50 | | N=19 (3,3/4,4,5,6) | -8.39 | 11.00 | | |
| | | | | | | | | Grey gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| | | | | | | (0.70) | | |
| | | | | | -9.09 | 11.70 | | |
| | | | | | | | | Stiff grey slightly sandy silty CLAY with lenses of fine to medium sand 2-10mm thick. |
| 12.00 | B28 D27 | | | | | (0.50) | | |
| 12.00 - 12.45 | U29 | 12.00 | | Ublow=50 100% | -9.59 | 12.20 | | |
| | | | | | | | | Very dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | | | | | (0.70) | | |
| 12.70 - 12.90 | SPT (C) | 12.00 | | 50 (25 for 125mm/50 for 80mm) | -10.29 | 12.90 | | |
| | | | | | | | | End of Borehole at 12.90m |
| | | 12.90 | 3.00 | 22-02-2018 | | | | |

Water | Backfill

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

**Remarks**

Groundwater monitoring standpipe installed.

Terminated on instruction of Engineer.

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 12.90 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 0.00 | 1.30 | 01:00 |
| 1.70 | 2.60 | 00:30 |
| 11.00 | 11.70 | 00:30 |
| 12.90 | 12.90 | 00:30 |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH09 |
| **Coordinates:** | **Client:** | Sheet 1 of 2 |
| 325316.01 E | Irish Water | |
| 173273.21 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.21 mOD | **Dates:** 21/02/2018 - 22/02/2018 | **Driller:** BM |
| | | **Logger:** ST |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 17.00 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | 0.00 | | 21-02-2018 | | (0.40) | | MADE GROUND: Greyish brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | | | | 1.81 | 0.40 | | |
| 0.50 | B1 | | | | | | | MADE GROUND: Loose brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| | | | | | | (1.00) | | |
| 1.00 | B2 | | | | | | | |
| | ES12 | | | PID = 0.10ppm | | | | |
| 1.20 | D17 | | | | | | | |
| 1.20 - 1.65 | SPT (S) N=8 | 1.00 | Dry | N=8 (1,2/1,2,3,2) | 0.81 | 1.40 | | MADE GROUND: Loose to medium dense purplish brown sandy subangular fine to coarse GRAVEL of mixed lithologies including red bricks. |
| 2.00 | B3 | | | | | | | |
| | D18 | | | | | | | |
| | ES13 | | | | | | | |
| 2.00 - 2.45 | SPT (S) N=9 | 2.00 | 1.80 | N=9 (2,1/2,2,2,3) PID = 0.20ppm | | | | |
| | | | | | | (3.00) | | |
| 3.00 | B4 | | | | | | | |
| | D19 | | | | | | | |
| | ES14 | | | | | | | |
| 3.00 - 3.45 | SPT (S) N=12 | 3.00 | 2.10 | N=12 (2,2/3,3,3,3) PID = 0.20ppm | | | | |
| 4.00 | B5 | | | | | | | |
| | D20 | | | | | | | |
| | ES15 | | | | | | | |
| 4.00 - 4.45 | SPT (S) N=12 | 4.00 | 2.90 | N=12 (2,3/2,3,3,4) PID = 0.00ppm | -2.19 | 4.40 | | Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium of mixed lithologies. |
| 5.00 | B6 | | | | | | | |
| | D21 | | | | | | | |
| | ES16 | | | | | | | |
| 5.00 - 5.45 | SPT (S) N=13 | 5.00 | 3.50 | N=13 (2,2/3,3,3,4) PID = 0.00ppm | | | | |
| | | | | | | (2.60) | | |
| 6.00 | B7 | | | | | | | |
| | D22 | | | | | | | |
| 6.00 - 6.45 | SPT (S) N=18 | 6.00 | 3.70 | N=18 (3,3/4,4,4,6) | | | | |
| | | | | | -4.79 | 7.00 | | Medium dense greyish brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 7.50 | B8 | | | | | | | |
| | D23 | | | | | | | |
| 7.50 - 7.95 | SPT (S) N=18 | 7.50 | 4.10 | N=18 (3,3/4,4,4,6) | | | | |
| | | | | | | (4.90) | | |
| 9.00 | B9 | | | | | | | |
| | D24 | | | | | | | |
| 9.00 - 9.45 | SPT (S) N=18 | 9.00 | 4.60 | N=18 (3,4/5,4,4,5) | | | | |

Water / Backfill

**Remarks**

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.40 | 9.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 5.00 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 17.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH09

**Coordinates:** 325316.01 E, 173273.21 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 2.21 mOD

**Dates:** 21/02/2018 - 22/02/2018

**Driller:** BM

**Logger:** ST

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense greyish brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 10.50 | B10<br>D25 | | | | | | | |
| 10.50 - 10.95 | SPT (S)<br>N=20 | 10.50 | 4.80 | N=20 (3,4/5,5,5,5) | | | | |
| | | 12.50 | 2.50 | 22-02-2018 | | | | |
| | | | | | -9.69 | 11.90 | | |
| 12.00 | B11<br>D26 | | | | | | | Soft brownish grey slightly sandy silty CLAY with fine to coarse sand lenses 2 to 15cm thick. |
| | UT28 | 12.00 | 5.2 | Ublow=30 100% | | (0.60) | | |
| 12.50 | D27 | | | | -10.29 | 12.50 | | |
| | | 12.50 | 5.00 | 21-02-2018 | | (0.40) | | Soft to firm brownish grey sandy silty CLAY. Sand is fine to coarse. |
| | | | | | -10.69 | 12.90 | | Medium dense brown sandy subangular to subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 13.50 | B29<br>D33 | | | | | | | |
| 13.50 - 13.95 | SPT (S)<br>N=25 | 13.50 | 2.90 | N=25 (3,5/5,6,7,7) | | | | |
| | | | | | | (2.40) | | |
| 15.00 | B30<br>B31<br>D34 | | | | | | | |
| | | | | | -13.09 | 15.30 | | |
| 15.30 - 15.75 | U36 | 15.00 | 3.1 | Ublow=30 100% | | | | Soft to firm brown slightly sandy silty CLAY. Sand is fine to medium. |
| | | | | | | (0.90) | | |
| | | | | | -13.99 | 16.20 | | |
| 16.50 | B32<br>D35 | | | | | | | Very dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| | | | | | | (0.80) | | |
| 16.50 - 16.84 | SPT (S) | 16.50 | 3.20 | 50 (5,6/50 for 190mm) | | | | |
| | | 17.00 | 3.40 | 22-02-2018 | -14.79 | 17.00 | | End of Borehole at 17.00m |

Water | Backfill

**Remarks**

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 17.00 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH10 |
| **Coordinates:** | **Client:** | Sheet 1 of 1 |
| 325280.29 E | Irish Water | |
| 173232.84 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.25 mOD | **Dates:** 23/01/2018 | **Driller:** MK |
| | | **Logger:** NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 1.00 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | MADE GROUND: Greyish brown SAND and GRAVEL fill. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. | | |
| 0.50 | B1<br>D2<br>ES3 | | | PID = 0.50ppm | | (1.00) | | | | |
| | | | | | 1.25 | 1.00 | | End of Borehole at 1.00m | | |

**Remarks**

Refusal met on red brick structure - moved to rebore position BH10A

| Water Strikes | | | | Chiselling Details | | |
|---|---|---|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) | From (m) | To (m) | Time (hh:mm) |
| | | | | | | |

| Water Added | | Casing Details | |
|---|---|---|---|
| From (m) | To (m) | To (m) | Diam (mm) |
| | | | |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH10A |
| **Coordinates:** | **Client:** | Sheet 1 of 1 |
| 325279.99 E | Irish Water | |
| 173234.98 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.24 mOD | **Dates:** 23/01/2018 | **Driller:** MK |
| | | **Logger:** NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 1.20 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.50 | B1<br>D2<br>ES3 | | | PID = 0.50ppm | | (1.20) | | MADE GROUND: Greyish brown SAND and GRAVEL fill. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | | 1.04 | 1.20 | | End of Borehole at 1.20m | | |

**Remarks**

Refusal met on red brick structure - next attempt will be BH10B

| Water Strikes | | | | Chiselling Details | | |
|---|---|---|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) | From (m) | To (m) | Time (hh:mm) |
| | | | | | | |

| Water Added | | Casing Details | |
|---|---|---|---|
| From (m) | To (m) | To (m) | Diam (mm) |
| | | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 20.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH10B

**Coordinates:** 325274.99 E 173233.01 N

**Client:** Irish Water

**Client's Representative:** Byrne Looby ARUP JV

**Ground Level:** 2.23 mOD

**Dates:** 19/02/2018 - 21/02/2018

Sheet 1 of 3

**Scale:** 1:50

**Driller:** MK

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | 0.00 | | 19-02-2018 | | | | MADE GROUND: Medium dense brown gravelly CLAY fill. Gravel is subangular fine to coarse of mixed lithologies. [some red bricks at 1.00m] [clumps of hard purple thinly bedded CLAY with black organic material, timber and red brick fragments at 2.00m] |
| 1.00 | B1 D6 ES11 | | | | | (2.50) | | |
| 1.00 - 1.45 | SPT (C) N=10 | 1.00 | | N=10 (1,2/2,2,3,3) PID = 0.10ppm | | | | |
| 2.00 | B2 D7 ES12 | | | | | | | |
| 2.00 - 2.45 | SPT (C) N=9 | 2.00 | | N=9 (2,1/2,2,3,2) PID = 0.00ppm Water strike at 2.50m | -0.27 | 2.50 | | Loose grey slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| 3.00 | B3 D8 ES13 | | | | | (1.70) | | |
| 3.00 - 3.45 | SPT (C) N=8 | 3.00 | | N=8 (2,3/2,1,2,3) PID = 0.20ppm | | | | |
| 4.00 | B4 D9 ES14 | | | | -1.97 | 4.20 | | Medium dense greyish brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 4.00 - 4.45 | SPT (C) N=12 | 4.00 | | N=12 (1,2/3,3,3,3) PID = 0.30ppm | | | | |
| | | 5.50 | 2.30 | 20-02-2018 | | | | |
| 5.00 | B5 D10 ES15 | | | | | (2.10) | | |
| 5.00 - 5.45 | SPT (C) N=16 | 5.00 | | N=16 (2,3/3,4,5,4) PID = 0.40ppm | | | | |
| | | 5.50 | 1.80 | 19-02-2018 | | | | |
| 6.00 | B16 D23 | | | | | | | |
| 6.00 - 6.45 | SPT (C) N=15 | 6.00 | | N=15 (3,2/2,3,5,5) | -4.07 | 6.30 | | Medium dense to dense brown slightly sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 7.50 | B17 D24 | | | | | | | |
| 7.50 - 7.95 | SPT (C) N=16 | 7.50 | | N=16 (2,4/4,3,5,4) | | (4.20) | | |
| 9.00 | B18 D25 | | | | | | | |
| 9.00 - 9.23 | SPT (C) | 9.00 | | 50 (9,15/50 for 80mm) | | | | |

Water

Backfill

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5

**Remarks**

Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 2.50 | 2.50 | 20 | 2.50 |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.00 | 5.50 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 5.00 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 4.50 | 5.50 | 01:00 |
| 12.30 | 15.00 | 03:00 |

| CAUSEWAY GEOTECH | Project No.: 17-1455 | Project Name: Arklow WwTP Land GI | Borehole No.: BH10B |
|---|---|---|---|
| | Coordinates: 325274.99 E 173233.01 N | Client: Irish Water | Sheet 2 of 3 |
| Method: Cable Percussion; Plant Used: Dando 2000; Top: 0.00; Base: 20.00 | | Client's Representative: Byrne Looby ARUP JV | Scale: 1:50 |
| | Ground Level: 2.23 mOD | Dates: 19/02/2018 - 21/02/2018 | Driller: MK |
| | | | Logger: NH |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense to dense brown slightly sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | | |
| 10.50 | B19 D26 | | | | -8.27 | 10.50 | | Dense brown slightly silty fine to coarse SAND. | | |
| 10.50 - 10.95 | SPT (C) N=40 | 10.50 | | N=40 (5,4/6,9,11,14) | | (1.20) | | | | |
| 11.70 | U30 | | | Ublow=50 100% | -9.47 | 11.70 | | Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies. | | |
| 12.00 | B20 D27 | | | | | (0.60) | | | | |
| 12.00 - 12.45 | SPT (C) N=40 | 12.00 | | N=40 (4,6/8,10,10,12) | -10.07 | 12.30 | | Dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | | |
| | | | | | | (2.00) | | | | |
| 13.50 | B21 D28 | | | | | | | | | |
| 13.50 - 13.95 | SPT (C) N=37 | 13.50 | | N=37 (5,6/8,10,9,10) | | | | | | |
| | | | | | -12.07 | 14.30 | | Stiff brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine of mixed lithologies. | | |
| 14.50 | U31 | | | Ublow=50 0% | | | | | | |
| 15.00 | B22 D29 | 15.00 | 4.00 | 20-02-2018 | | (2.50) | | | | |
| 16.50 | B32 D35 | | | | | | | | | |
| 16.50 - 16.95 | SPT (C) N=21 | 15.00 | | N=21 (3,4/6,6,5,4) | -14.57 | 16.80 | | Stiff to very stiff greyish brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mixed lithologies. | | |
| 18.00 | B33 D36 | | | | | | | | | |
| 18.00 - 18.45 | SPT (C) N=17 | 18.00 | | N=17 (4,3/3,3,5,6) | | (3.20) | | | | |
| 19.00 | U38 | | | Ublow=50 100% | | | | | | |
| 19.50 | B34 D37 | | | | | | | | | |
| | | | | | -17.77 | 20.00 | | | | |

**Remarks**
Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

| Water Strikes | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| | | | |

| Water Added | | Casing Details | |
|---|---|---|---|
| From (m) | To (m) | To (m) | Diam (mm) |
| | | 15.00 | 200 |

| Chiselling Details | | |
|---|---|---|
| From (m) | To (m) | Time (hh:mm) |
| 4.50 | 5.50 | 01:00 |
| 12.30 | 15.00 | 03:00 |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH10B |
| **Coordinates:** | **Client:** | Sheet 3 of 3 |
| 325274.99 E | Irish Water | |
| 173233.01 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 2.23 mOD | **Dates:** 19/02/2018 - 21/02/2018 | **Driller:** MK |
| | | **Logger:** NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 20.00 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 20.00 - 20.45 | SPT (S) N=44 | 19.50 | | N=44 (11,10/10,11,12,11) | | | | End of Borehole at 20.00m | | |

20.5
21.0
21.5
22.0
22.5
23.0
23.5
24.0
24.5
25.0
25.5
26.0
26.5
27.0
27.5
28.0
28.5
29.0
29.5

**Remarks**

Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 4.50 | 5.50 | 01:00 |
| 12.30 | 15.00 | 03:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 17.50 |
| Rotary Coring | Beretta T44 | 17.50 | 26.50 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH11

**Coordinates:** 325253.12 E, 173206.01 N

**Client:** Irish Water

Sheet 1 of 3

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 1.72 mOD

**Dates:** 13/02/2018 - 20/02/2018

**Driller:** MK+JR

**Logger:** ST+TH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description |
|---|---|---|---|---|---|---|---|
| | | 0.00 | | 14-02-2018 | | | MADE GROUND: Loose brown silty very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. [slightly clayey, red bricks] |
| 1.00 | B6 D20 ES1 | | | | | (1.80) | |
| 1.00 - 1.45 | SPT (C) N=9 | 1.00 | - | N=9 (2,2/2,3,2,2) PID = 0.10ppm | | | |
| | | | | | -0.08 | 1.80 | MADE GROUND: Soft red and purple sandy gravelly SILT. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. [black clayey/silty organic matter and reeds] |
| 2.00 | B7 D21 ES2 | | | | | (1.00) | |
| 2.00 - 2.45 | SPT (C) N=7 | 2.00 | 1.70 | N=7 (2,1/1,2,2,2) PID = 0.00ppm | | | |
| | | | | | -1.08 | 2.80 | Medium dense brown sandy subangular to subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 3.00 | B8 D22 ES3 | | | | | | |
| 3.00 - 3.45 | SPT (C) N=10 | 3.00 | 2.90 | N=10 (2,3/2,3,3,2) PID = 0.10ppm | | | |
| 4.00 | B9 D23 ES4 | | | | | (2.60) | |
| 4.00 - 4.45 | SPT (C) N=18 | 4.00 | 3.10 | N=18 (2,3/3,4,5,6) PID = 0.00ppm | | | |
| 5.00 | B10 D24 ES5 | | | | | | |
| 5.00 - 5.45 | SPT (C) N=18 | 5.00 | 3.30 | N=18 (2,2/3,4,6,5) PID = 0.00ppm | -3.68 | 5.40 | Medium dense brown very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 6.00 | B11 D25 | | | | | | |
| 6.00 - 6.45 | SPT (C) N=16 | 6.00<br>7.50 | 3.50<br>1.80 | N=16 (2,3/3,3,4,6)<br>15-02-2018 | | (2.10) | |
| 7.50 | B12 D26 | | | | -5.78 | 7.50 | Medium dense brownish grey slightly silty slightly gravelly fine to coarse SAND (predominantly medium). Gravel is subangular to subrounded fine of mixed lithologies. |
| 7.50 - 7.95 | SPT (C) N=15 | 7.50<br>7.50 | 3.90<br>4.00 | N=15 (3,2/3,3,4,5)<br>14-02-2018 | | | |
| | | | | | | (1.50) | |
| 9.00 | B13 D27 | | | | -7.28 | 9.00 | Loose dense grey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 9.00 - 9.45 | SPT (C) N=7 | 9.00 | 2.20 | N=7 (2,3/3,2,1,1) | | | |
| | | | | | | (1.70) | |

Water

Backfill

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

**Remarks**

Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer after 5.50m of rock core recovered

**Core Barrel**

**Flush Type**

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.50 | 7.50 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 7.50 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 5.50 | 7.50 | 02:00 |
| 12.50 | 13.60 | 01:30 |
| 15.00 | 17.40 | 02:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 17.50 |
| Rotary Coring | Beretta T44 | 17.50 | 26.50 |

| | |
|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI |
| **Coordinates:** 325253.12 E 173206.01 N | **Client:** Irish Water |
| | **Client's Representative:** Byrne Looby ARUP JV |
| **Ground Level:** 1.72 mOD | **Dates:** 13/02/2018 - 20/02/2018 |

**Borehole No.:** BH11

Sheet 2 of 3

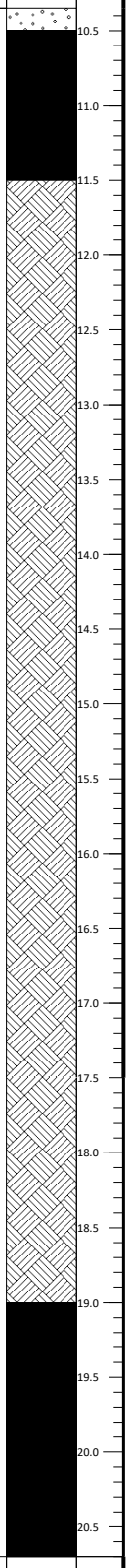
**Scale:** 1:50

**Driller:** MK+JR

**Logger:** ST+TH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description |
|---|---|---|---|---|---|---|---|
| 10.50 | B14 D28 | | | | | | Loose dense grey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 10.50 - 10.95 | SPT (C) N=6 | 10.50 | 2.70 | N=6 (4,2/1,1,2,2) | -8.98 | 10.70 (0.30) | Soft to firm grey slightly sandy slightly gravelly silty CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 10.70 | B15 D29 | | | | -9.28 | 11.00 (1.20) | Grey very gravelly silty fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 12.20 - 12.65 | U34 | 12.20 | 2.9 | Ublow=40 100% | -10.48 | 12.20 (0.20) | Firm grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 12.40 | B16 D30 | | | | -10.68 | 12.40 (1.60) | Loose brownish grey very sandy subangular fine to coarse GRAVEL. Sand is fine to coarse. |
| 13.50 | B17 D31 | | | | | | |
| 13.50 - 13.95 | SPT (C) N=9 | 13.50 | 3.40 | N=9 (1,0/0,2,3,4) | -12.28 | 14.00 (1.70) | Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| | | 15.00 | 1.60 | 16-02-2018 | | | |
| 15.00 | B18 D32 | | | | | | |
| 15.00 - 15.45 | SPT (C) N=24 | 15.00 | 3.80 | N=24 (2,3/4,5,7,8) | | | |
| | | 15.00 | 4.00 | 15-02-2018 | -13.98 | 15.70 (1.70) | Very stiff grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 16.50 | B19 D33 | | | | | | |
| 16.50 - 16.95 | U35 | 16.50 | 3.1 | Ublow=50 100% | | | |
| 17.00 - 17.40 | SPT (S) | 17.00 | 3.10 | N=50 (11,11/50 for 255mm) | | | |
| | | 17.50 | 4.00 | 16-02-2018 | -15.68 | 17.40 (0.10) | |
| | | 0 | | 19-02-2018 | -15.78 | 17.50 | Grey sandy subangular fine to coarse GRAVEL (predominantly coarse). Sand is fine to coarse. |
| | | 17.50 | | 19-02-2018 | | | Very stiff slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 19.00 - 19.34 | | | | 50 (8,10/50 for 190mm) | | (2.50) | |
| | | | | | -18.28 | 20.00 (1.00) | Dark grey BOULDER of weak massive sandstone. |
| | TCR | SCR | RQD | FI | | | |

Water / Backfill




**Remarks**

Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer after 5.50m of rock core recovered

**Core Barrel**

**Flush Type**

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 17.50 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 5.50 | 7.50 | 02:00 |
| 12.50 | 13.60 | 01:30 |
| 15.00 | 17.40 | 02:00 |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH11 |
| **Coordinates:** | **Client:** | Sheet 3 of 3 |
| 325253.12 E | Irish Water | |
| 173206.01 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** | **Dates:** | **Driller:** MK+JR |
| 1.72 mOD | 13/02/2018 - 20/02/2018 | **Logger:** ST+TH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion Rotary Coring | Dando 2000 Beretta T44 | 0.00 17.50 | 17.50 26.50 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dark grey BOULDER of weak massive sandstone. | | |
| | | | | | | -19.28 | 21.00 | | | | |
| | 98 | 0 | 0 | | | | (0.90) | | Stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse of mixed lithologies. | | |
| | | | | | | -20.18 | 21.90 | | | | |
| 22.50 | | | | NA | | | | | Highly weathered highly fractured SANDSTONE bedrock - recovered as greenish grey and brown slightly sandy slightly silty angular fine to coarse GRAVEL, cobbles, and boulders of sandstone. Sand is fine to coarse. | | |
| | 99 | 17 | 17 | | | | (2.10) | | | | |
| 24.00 | | | | | | -22.28 | 24.00 | | | | |
| | 100 | 26 | 7 | 9 | | | | | Strong dark grey massive medium grained SANDSTONE. Partially weathered: patchy greyish brown discolouration, slightly closer fracture spacing, slightly reduced strength, strong localised reddish brown and orange discolouration on some discontinuities.<br>Discontinuities:<br>1. 0 to 30 degree fractures medium spaced (140/240/370) planar, rough, with patchy reddish brown staining on fracture surface.<br>2. 40 to 60 degree joints, closely spaced (50/160/280) undulating, rough with reddish brown and orange discolouration on fracture surface. | | |
| | | | | 16 | | | (2.50) | | | | |
| 25.50 | | | | | | | | | | | |
| | 100 | 56 | 56 | 3 | 19-02-2018 | | | | | | |
| 26.50 | | | | | | -24.78 | 26.50 | | End of Borehole at 26.50m | | |
| | TCR | SCR | RQD | FI | | | | | | | |

**Remarks**
Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer after 5.50m of rock core recovered

**Core Barrel**

**Flush Type**

| Water Strikes | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| | | | |

| Water Added | | Casing Details | |
|---|---|---|---|
| From (m) | To (m) | To (m) | Diam (mm) |
| | | 26.50 | 150 |

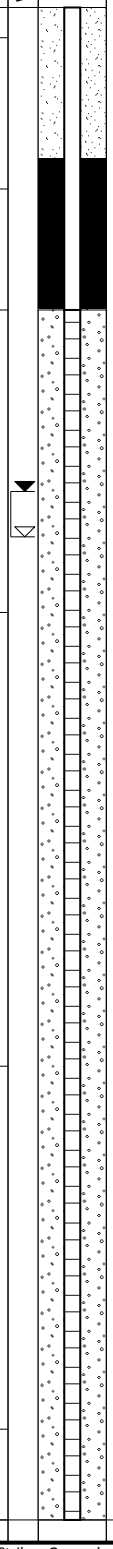
| Chiselling Details | | |
|---|---|---|
| From (m) | To (m) | Time (hh:mm) |
| 5.50 | 7.50 | 02:00 |
| 12.50 | 13.60 | 01:30 |
| 15.00 | 17.40 | 02:00 |

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 16-5027 | **Project Name:** Arklow Sewerage Scheme | **Borehole No.:** BH14 |
| | **Coordinates:** E | **Client:** Irish Water | Sheet 1 of 2 |
| **Method:** Cable Percussion | N | **Client's Representative:** Arup Byrne Looby | **Scale:** 1:50 |
| **Plant:** Dando | **Ground Level:** mOD | **Dates:** 21/09/2016 - 21/09/2016 | **Driller:** WD<br>**Logger:** IH |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.20) | | TARMACADAM |
| | | | | | | 0.20 | | MADE GROUND: Brown, sandy, gravelly fill |
| | | | | | | (1.00) | | |
| 1.00 | D1 | | | | | | | |
| 1.00 - 1.45 | SPT (C) N=5 | | | N=5 (2,1/1,1,1,2) | | 1.20 | | |
| 1.20 | B2 | | | | | | | Loose, light brown, slightly silty sandy GRAVEL with low cobble content. Gravel is fine to coarse, subangular to subrounded. Sand is fine to coarse. Cobbles are subrounded. |
| 1.60 | B3 | | | | | (0.80) | | |
| 2.00 | B4 | | | | | 2.00 | | |
| 2.00 - 2.45 | SPT (C) N=8 | | | N=8 (2,2/2,2,2,2) | | | | Loose to medium dense, Brown/grey, slightly silty, gravelly SAND with low cobble content. Gravel is fine to coarse, angular to subrounded. Sand is fine to coarse. Cobbles are subangular to subrounded, 63-80mm dia. |
| 3.00 | B5 | | | | | (2.00) | | |
| 3.00 - 3.45 | SPT (C) N=12 | | | N=12 (3,3/4,2,3,3) | | | | |
| 4.00 | B6 | | | | | 4.00 | | |
| 4.00 - 4.45 | SPT (C) N=16 | | | N=16 (4,4/4,4,4,4) | | | | Medium dense, red/brown, slightly silty, very sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse. |
| 5.00 | B7 | | | | | | | |
| 5.00 - 5.45 | SPT (C) N=16 | | | N=16 (4,5/5,4,4,3) | | | | |
| 5.40 | B8 | | | | | (3.00) | | |
| 5.90 | D9 | | | | | | | |
| 6.50 - 6.95 | SPT (C) N=14 | | | N=14 (3,4/3,3,4,4) | | | | |
| 7.00 | B10 | | | | | 7.00 | | Medium dense, light yellow/brown, slightly gravelly, fine to medium SAND. Gravel is subangular, fine. |
| 8.00 | B11 | | | | | | | |
| 8.00 - 8.45 | SPT (C) N=22 | | | N=22 (7,7/4,5,7,6) | | (2.40) | | |
| 8.50 | D12 | | | | | | | |
| 9.40 | B13 | | | | | 9.40 | | |
| 9.50 - 9.95 | SPT (C) N=64 | | | N=64 (4,8/9,11,22,22) | | | | Very stiff, grey/brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse. |
| ~~10.00~~ | D14 | | | | | | | |

Continued on Next Page

Water / Backfill




**Remarks**

| Water Added | | Water Strike - General | | | |
|---|---|---|---|---|---|
| From (m) | To (m) | Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| | | 3.50 | | 20 | 3.20 |

| Casing Details | | Chiselling Details | | |
|---|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) | Time (hh:mm) |
| | | | | |

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 16-5027 | **Project Name:** Arklow Sewerage Scheme | **Borehole No.:** BH14 |
| **Coordinates:** E N | **Client:** Irish Water | Sheet 2 of 2 |
| **Method:** Cable Percussion | **Client's Representative:** Arup Byrne Looby | **Scale:** 1:50 |
| **Plant:** Dando | **Ground Level:** mOD | **Dates:** 21/09/2016 - 21/09/2016 | **Driller:** WD / **Logger:** IH |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| 11.00 | B15 | | | | | | | |
| 11.00 - 11.45 | SPT (C) N=37 | | | N=37 (7,8/8,9,10,10) | | | | |
| 11.50 | D16 | | | | | | | |
| 12.00 | B17 | | | | | | | |
| 12.50 - 12.95 | SPT (C) N=60 | | | N=60 (8,10/10,15,15,20) | | (5.60) | | |
| 12.80 | B18 | | | | | | | |
| 13.00 | B19 | | | | | | | |
| 14.00 | D20 | | | | | | | |
| 14.00 - 14.45 | SPT (C) N=47 | | | N=47 (7,7/10,10,10,17) | | | | |
| | | | | | | 15.00 | | End of borehole at 15.000m |

Water: Backfill

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

**Remarks**

| Water Added | | Water Strike - General | | | |
|---|---|---|---|---|---|
| From (m) | To (m) | Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| | | 3.50 | | 20 | 3.20 |

| Casing Details | | Chiselling Details | | |
|---|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) | Time (hh:mm) |
| | | | | |

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 16-5027 | **Project Name:** Arklow Sewerage Scheme | **Borehole No.:** BH15D |
| | **Coordinates:** E | **Client:** Irish Water | Sheet 1 of 3 |
| **Method:** Cable Percussive | N | **Client's Representative:** Arup Byrne Looby | **Scale:** 1:50 |
| **Plant:** Dando 1500 | **Ground Level:** mOD | **Dates:** 31/08/2016 - 07/09/2016 | **Driller:** JO'SB |
| | | | **Logger:** IH |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.07) | | TARMAC |
| 0.20 - 1.60 | B1 | | | | | (0.13) 0.20 | | Compacted black, gravelly CLAY. Gravel is fine to medium, rounded (drillers description). |
| 0.20 - 1.60 | D2 | | | | | | | Brown, silty sandy GRAVEL with medium cobble content. Gravel is fine to coarse, subangular to subrounded. Sand is fine to coarse. Cobbles are subangular. |
| | | | | | | (2.40) | | |
| 1.60 - 2.60 | B3 | | | | | | | |
| 1.60 - 2.60 | D4 | | | | | | | |
| 1.60 - 1.90 | SPT (C) | | | 42 (3,4/42 for 150mm) | | | | |
| 2.60 - 4.10 | B5 | | | | | 2.60 | | Loose to medium dense, orange/brown, slightly silty, sandy GRAVEL. Gravel is fine to coarse, subangular to subrounded. Sand is fine to coarse. |
| 2.60 - 4.10 | D6 | | | | | | | |
| 2.60 - 3.05 | SPT (C) N=26 | | | N=26 (3,4/5,6,7,8) | | | | |
| 3.60 - 4.05 | SPT (C) N=19 | | | N=19 (3,3/5,4,5,5) | | | | |
| 4.10 - 5.60 | B7 | | | | | | | |
| 4.10 - 5.60 | D8 | | | | | | | |
| 4.60 - 5.05 | SPT (C) N=18 | | | N=18 (2,4/4,2,5,7) | | (4.20) | | |
| 5.60 - 6.80 | B9 | | | | | | | *With shell fragments from 5.60 - 6.80m.* |
| 5.60 - 6.80 | D10 | | | | | | | |
| 5.60 - 6.05 | SPT (C) N=4 | | | N=4 (1,2/1,1,1,1) | | | | |
| 6.60 - 7.05 | SPT (C) N=11 | | | N=11 (2,2/3,4,1,3) | | | | |
| 6.80 - 8.50 | B11 | | | | | 6.80 | | Loose to medium dense, light brown, silty SAND. Sand is fine to medium. |
| 6.80 - 8.50 | D12 | | | | | | | |
| | | | | | | (4.00) | | |
| 8.50 - 10.00 | B13 | | | | | | | |
| 8.50 - 10.00 | D14 | | | | | | | |
| 8.50 - 8.95 | SPT (C) N=8 | | | N=8 (2,1/2,2,1,3) | | | | |
| ~~10.00 - 10.80~~ | B15 | | | | | | | |

Continued on Next Page

**Remarks**

| Water Added | |
|---|---|
| From (m) | To (m) |
| 1.60 | |

| Water Strike - General | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| 4.00 | | 20 | 3.90 |

| Casing Details | |
|---|---|
| To (m) | Diam (mm) |
| 10.70 | 200 |
| 20.00 | 150 |

| Chiselling Details | | |
|---|---|---|
| From (m) | To (m) | Time (hh:mm) |
| 1.80 | 1.90 | 01:30 |

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 16-5027 | **Project Name:** Arklow Sewerage Scheme | **Borehole No.:** BH15D |
| **Coordinates:** E | **Client:** Irish Water | Sheet 2 of 3 |
| **Method:** Cable Percussive | **Client's Representative:** Arup Byrne Looby | **Scale:** 1:50 |
| **Plant:** Dando 1500 | **Ground Level:** mOD | **Dates:** 31/08/2016 - 07/09/2016 | **Driller:** JO'SB |
| | | | **Logger:** IH |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| 10.00 - 10.80 | D16 | | | | | | | |
| 10.00 - 10.45 | SPT (C) N=22 | | | N=22 (4,5/5,5,6,6) | | | | |
| 10.70 - 11.15 | U17 | | | | | | | |
| 10.70 - 10.70 | SPT (C) | | | 40 (0 for 0mm/40 for 0mm) | | 10.80 | | |
| | | | | | | (0.50) | | Hard grey/brown CLAY. |
| 10.80 - 11.30 | B18 | | | | | | | |
| 10.80 - 11.30 | D19 | | | | | 11.30 | | |
| 11.15 - 11.60 | SPT (C) N=23 | | | N=23 (6,6/5,6,4,8) | | | | Medium dense, light brown/orange, slightly silty, very gravelly SAND. Gravel is fine to medium, angular to subangular. Sand is fine to coarse. |
| 11.30 - 12.00 | B20 | | | | | (0.70) | | |
| 11.30 - 12.00 | D21 | | | | | | | |
| 12.00 - 13.50 | B22 | | | | | 12.00 | | |
| 12.00 - 13.50 | D23 | | | | | | | Dense, dark grey, gravelly SAND with high cobble content Gravel is fine to coarse, subangular to subrounded. Sand is medium to coarse. Cobbles are subangular to subrounded, 63-90mm dia. |
| 12.65 - 13.10 | SPT (C) N=40 | | | N=40 (4,7/10,9,12,9) | | (1.50) | | |
| 13.50 - 15.00 | B24 | | | | | 13.50 | | |
| 13.50 - 15.00 | D25 | | | | | | | Medium Dense to Dense, dark grey, slightly gravelly SAND with some lenses of firm Clay present. Gravel is fine to medium, subangular to subrounded. Sand is medium to coarse. |
| 14.15 - 14.60 | SPT (C) N=31 | | | N=31 (3,6/7,6,10,8) | | (1.50) | | |
| 15.00 - 16.00 | B26 | | | | | 15.00 | | |
| 15.00 - 16.00 | D27 | | | | | | | Soft to firm, brown/grey CLAY |
| 16.00 - 16.45 | U28 | | | | | | | |
| 16.00 - 17.50 | B30 | | | | | | | |
| 16.00 - 17.50 | D31 | | | | | | | |
| 16.50 - 16.95 | SPTLS29 | | | | | | | |
| 16.50 - 16.95 | SPT (S) N=8 | | | N=8 (2,2/1,2,3,2) | | (3.50) | | |
| 17.50 - 18.50 | B32 | | | | | | | |
| 17.50 - 18.50 | D33 | | | | | | | |
| 18.00 - 18.45 | SPT (S) N=25 | | | N=25 (3,4/5,7,6,7) | | | | *Below 18.0m: Stiff to very stiff.* |
| 18.50 - 20.00 | B34 | | | | | 18.50 | | |
| 18.50 - 20.00 | D35 | | | | | | | Grey/Brown, slightly clayey, gravelly SAND with low cobble content. Gravel is fine to coarse, subangular to subrounded. Sand is medium to coarse. Cobbles are subangular to subrounded, 63-100mm dia. |
| | | | | | | (1.50) | | |
| | | | | | | 20.00 | | |

Continued on Next Page

Water | Backfill

**Remarks**

| Water Added | | Water Strike - General | | | |
|---|---|---|---|---|---|
| From (m) | To (m) | Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| 1.60 | | 4.00 | | 20 | 3.90 |

| Casing Details | | Chiselling Details | | |
|---|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) | Time (hh:mm) |
| 10.70 | 200 | 1.80 | 1.90 | 01:30 |
| 20.00 | 150 | | | |

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 16-5027 | **Project Name:** Arklow Sewerage Scheme | | **Borehole No.:** BH15D |
| **Coordinates:** E | **Client:** Irish Water | | Sheet 3 of 3 |
| **Method:** Cable Percussive | **Client's Representative:** Arup Byrne Looby | | **Scale:** 1:50 |
| **Plant:** Dando 1500 | **Ground Level:** mOD | **Dates:** 31/08/2016 - 07/09/2016 | **Driller:** JO'SB |
| N | | | **Logger:** IH |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| 20.00 - 20.08 | SPT (C) | | | 25 (31 for 75mm/25 for 0mm) | | | | End of borehole at 20.000m | | |

20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5

**Remarks**

| Water Added | |
|---|---|
| From (m) | To (m) |
| 1.60 | |

| Water Strike - General | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| 4.00 | | 20 | 3.90 |

| Casing Details | |
|---|---|
| To (m) | Diam (mm) |
| 10.70 | 200 |
| 20.00 | 150 |

| Chiselling Details | | |
|---|---|---|
| From (m) | To (m) | Time (hh:mm) |
| 1.80 | 1.90 | 01:30 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable percussion | Dando 2000 | 0.00 | 15.90 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH17

**Coordinates:** 325346.90 E, 173173.67 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

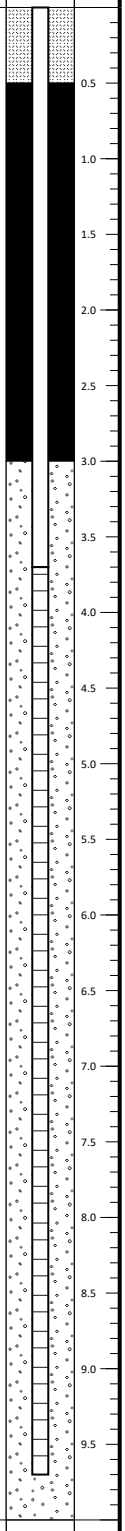
**Driller:** BM

**Ground Level:** 3.15 mOD

**Dates:** 09/02/2018 - 13/02/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description |
|---|---|---|---|---|---|---|---|
| | | 0.00 | | 09-02-2018 | | (0.40) | MADE GROUND: Grey hardcore angular to subangular fine to coarse GRAVEL fill. |
| | | | | | 2.75 | 0.40 | |
| 0.50 | B4 ES1 | | | PID = 0.20ppm | | (0.80) | MADE GROUND: Black very sandy angular to subangular fine to coarse GRAVEL fill with red brick fragments throughout. Sand is fine to coarse. [clayey/silty] |
| 1.00 | B5 | | | | | | |
| 1.20 | D17 | | | | 1.95 | 1.20 | |
| 1.20 - 1.65 | SPT (C) N=15 | 1.20 | - | N=15 (2,3/3,3,4,5) | | | Medium dense reddish brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 1.50 | ES2 | | | PID = 0.10ppm | | (1.30) | |
| 2.00 | B6 D18 | | | | | | |
| 2.00 - 2.45 | SPT (C) N=16 | 2.00 | 1.70 | N=16 (3,3/4,4,4,4) | | | |
| | | | | | 0.65 | 2.50 | |
| 2.50 | ES3 | | | PID = 0.00ppm | | | Medium dense brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 3.00 | B7 D19 | | | | | (1.30) | |
| 3.00 - 3.45 | SPT (C) N=17 | 3.00 | 1.60 | N=17 (2,3/4,4,4,5) | | | |
| | | | | | -0.65 | 3.80 | |
| 4.00 | B8 D20 | | | | | (0.50) | Brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium of mixed lithologies. |
| 4.00 - 4.45 | SPT (C) N=19 | 4.00 | 2.10 | N=19 (2,4/5,4,5,5) | -1.15 | 4.30 | Medium dense brown slightly clayey slightly gravelly very silty fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| 5.00 | B9 D21 | | | | | | |
| 5.00 - 5.45 | SPT (C) N=14 | 5.00 | 2.10 | N=14 (3,3/3,3,3,5) | | | |
| | | 6.00 | 2.70 | 12-02-2018 | | (3.20) | |
| 6.00 | B10 D22 | | | | | | |
| 6.00 - 6.45 | SPT (C) | 6.00 | 3.00 | N=13 (4,3/3,3,3,4) | | | |
| | N=13 | 6.00 | 3.00 | 09-02-2018 | | | |
| 7.50 | B11 D23 | | | | -4.35 | 7.50 (0.20) | Brown gravelly fine to coarse SAND (partially cemented). Gravel is subangular fine to coarse of mixed lithologies. |
| 7.50 - 7.68 | SPT (C) | 7.50 | 3.50 | 50 (25 for 50mm/50 for 125mm) | -4.55 | 7.70 | Brown very gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. |
| | | | | | | (1.30) | |
| 9.00 | B12 D24 | | | | -5.85 | 9.00 | |
| 9.00 - 9.45 | SPT (C) N=15 | 9.00 | 3.40 | N=15 (3,3/3,4,4,4) | | | Medium dense brown gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. |




**Remarks**

Groundwater monitoring standpipe installed

[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 0.00 | 6.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 9.20 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable percussion | Dando 2000 | 0.00 | 15.90 |

| | | |
|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Borehole No.:** BH17 |
| **Coordinates:** 325346.90 E 173173.67 N | **Client:** Irish Water | Sheet 2 of 2 |
| | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 3.15 mOD | **Dates:** 09/02/2018 - 13/02/2018 | **Driller:** BM |
| | | **Logger:** NH |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense brown gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies. | | |
| 10.50 | B13 D25 | | | | | | | | | |
| 10.50 - 10.95 | SPT (C) N=13 | 10.50 | 4.00 | N=13 (3,4/3,3,3,4) | | | | | | |
| | | | | | | (4.00) | | | | |
| 12.00 | B14 D26 | | | | | | | | | |
| 12.00 - 12.45 | SPT (C) N=15 | 12.00 | 4.20 | N=15 (3,3/4,3,4,4) | | | | | | |
| 13.00 | B15 | | | | -9.85 | 13.00 | | Soft grey slightly sandy silty CLAY. Sand is fine to coarse. | | |
| 13.20 | UT28 | 13.20 | 3.6 | Ublow=20 50% | | (0.40) | | | | |
| | | | | | -10.25 | 13.40 | | Brown very sandy subangular to subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. [slightly clayey] | | |
| | | | | | | (1.70) | | | | |
| 15.00 | B16 D27 | | | | -11.95 | 15.10 | | Stiff brownish grey sandy silty CLAY. Sand is fine to coarse. | | |
| | U29 | 15.00 | 3.4 | Ublow=60 75% | | | | | | |
| 15.50 - 15.95 | SPT (S) N=21 | 15.00 | 3.20 | N=21 (3,3/3,4,7,7) | | (0.80) | | | | |
| | | 15.90 | 3.00 | 12-02-2018 | -12.75 | 15.90 | | End of Borehole at 15.90m | | |

**Remarks**
Groundwater monitoring standpipe installed
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 15.90 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH18

**Coordinates:** 325326.00 E, 173239.66 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

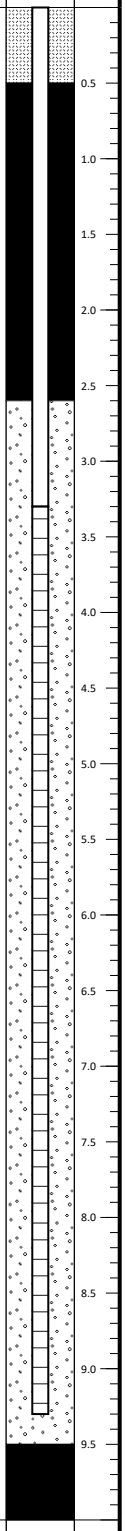
**Ground Level:** 2.71 mOD

**Dates:** 16/02/2018 - 20/02/2018

**Driller:** BM

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.30) | | MADE GROUND: Grey hardcore sandy angular to subangular fine to coarse GRAVEL fill. Sand is fine to coarse. |
| | | | | | 2.41 | 0.30 | | |
| 0.50 | B23<br>ES30 | | | PID = 0.10ppm | | | | MADE GROUND: Grey silty very gravelly SAND. Gravel is subangular to subrounded fine to coarse. |
| 1.00 | B24 | | | | | (1.50) | | |
| 1.20 | D36 | | | | | | | |
| 1.20 - 1.65 | SPT (C)<br>N=9 | 1.00 | - | N=9 (3,2/3,2,2,2) | | | | |
| 1.50 | ES31 | | | PID = 0.10ppm | 0.91 | 1.80 | | |
| 2.00 | B25<br>D37 | | | | | | | Loose to medium dense brown slightly gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine of mixed lithologies. |
| 2.00 - 2.45 | SPT (C)<br>N=9 | 2.00 | - | N=9 (2,2/2,2,2,3) | | | | |
| 2.50 | ES32 | | | PID = 0.10ppm | | | | |
| 3.00 | B26<br>D38 | | | | | (2.20) | | |
| 3.00 - 3.45 | SPT (C)<br>N=11 | 3.00 | 2.70 | N=11 (3,3/2,3,3,3) | | | | |
| 3.50 | ES33 | | | PID = 0.00ppm | | | | |
| 4.00 | B27<br>D39<br>ES34 | | | | -1.29 | 4.00 | | Medium dense reddish brown very gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| 4.00 - 4.45 | SPT (C)<br>N=13 | 4.00 | 2.90 | N=13 (3,3/3,3,3,4)<br>PID = 0.00ppm | | | | |
| | | 6.00 | 2.50 | 19-02-2018 | | | | |
| 5.00 | B28<br>D40 | | | | | (2.00) | | |
| 5.00 - 5.45 | SPT (C)<br>N=14 | 5.00 | 3.10 | N=14 (2,3/3,4,3,4) | | | | |
| 5.50 | ES35 | | | PID = 0.20ppm | | | | |
| 6.00 | B29<br>D41 | | | | -3.29 | 6.00 | | Medium dense brown slightly silty gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to medium of mixed lithologies. |
| 6.00 - 6.45 | SPT (C)<br>N=14 | 6.00 | 3.20 | N=14 (2,1/3,3,4,4) | | | | |
| 6.50 | ES7 | | | PID = 0.10ppm | | (1.60) | | |
| 7.50 | B1<br>D16<br>ES8 | | | | -4.89 | 7.60 | | Medium dense greyish brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 7.50 - 7.95 | SPT (C)<br>N=10 | 7.50 | 3.60 | N=10 (2,2/3,2,2,3)<br>PID = 0.10ppm | | | | |
| 8.50 | ES9 | | | PID = 0.10ppm | | (4.20) | | |
| 9.00 | B2<br>D17 | | | | | | | |
| 9.00 - 9.45 | SPT (C)<br>N=11 | 9.00 | 4.10 | N=11 (2,2/2,3,3,3) | | | | |
| 9.50 | ES10 | | | PID = 0.00ppm | | | | |




**Remarks**

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 0.00 | 6.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 4.00 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 15.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH18

**Coordinates:** 325326.00 E, 173239.66 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** BM

**Ground Level:** 2.71 mOD

**Dates:** 16/02/2018 - 20/02/2018

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Medium dense greyish brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies. |
| 10.50 | B3<br>D18<br>ES11 | | | | | | | |
| 10.50 - 10.95 | SPT (C)<br>N=15 | 10.50 | 4.30 | N=15 (2,3/4,3,4,4)<br>PID = 0.00ppm | | | | |
| 11.50 | ES12 | | | PID = 0.20ppm | | | | |
| | | | | | -9.09 | 11.80 | | Grey very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse |
| 12.00 | B4<br>D19 | | | | | | | |
| 12.00 - 12.45 | U22 | | | Ublow=40 75% | | (1.00) | | |
| 12.50 | ES13 | | | PID = 0.20ppm | | | | |
| | | | | | -10.09 | 12.80 | | Stiff brownish grey slightly sandy silty CLAY. Sand is fine to coarse. |
| | | | | | | (0.40) | | |
| | | | | | -10.49 | 13.20 | | Medium dense brown slightly silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 13.50 | B5<br>D20<br>ES14 | | | | | | | |
| 13.50 - 13.95 | SPT (C)<br>N=17 | 13.50 | 5.00 | N=17 (3,3/4,4,4,5)<br>PID = 0.10ppm | | (1.80) | | |
| 14.50 | ES15 | | | PID = 0.20ppm | | | | |
| 15.00 | B6<br>D21 | | | | -12.29 | 15.00 | | End of Borehole at 15.00m |
| 15.00 - 15.45 | SPT (C)<br>N=19 | 15.00 | 4.20 | N=19 (3,3/4,4,5,6) | | | | |
| | | 15.00 | 3.50 | 19-02-2018 | | | | |

Water | Backfill

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

**Remarks**

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer at scheduled depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 15.00 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| | | |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 18.00 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH19

**Coordinates:** 325298.06 E, 173286.91 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

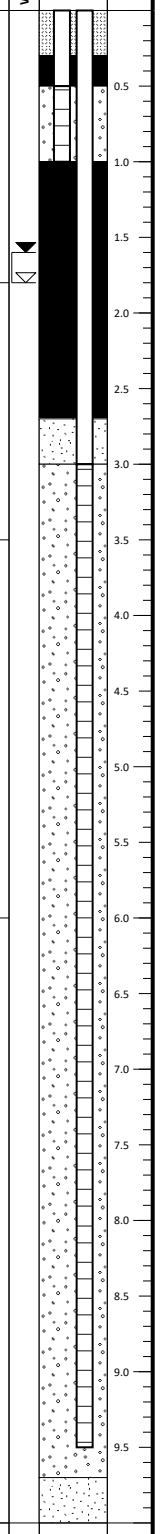
**Ground Level:** 1.34 mOD

**Dates:** 23/01/2018 - 26/01/2018

**Driller:** BM

**Logger:** NH

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| 0.50 | B1 ES2 | | | PID = 0.70ppm 0.2 | | (1.80) | | MADE GROUND: Medium dense brownish grey sandy clayey subangular fine to coarse GRAVEL of mixed lithologies including concrete. Sand is fine to coarse. |
| 1.00 | B4 D3 | | | | | | | |
| 1.00 - 1.45 | SPT (C) N=13 | | | N=13 (2,4/4,3,3,3) | | | | |
| 1.50 | ES5 | | | PID = 0.30ppm 0.3 Water Strike at 1.80m | -0.46 | 1.80 | | Very loose grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. |
| 2.00 | B7 D6 | | | | | | | |
| 2.00 - 2.45 | SPT (C) N=1 | 2.00 | | N=1 (2,1/0,0,0,1) | | (1.70) | | |
| 2.50 | ES8 | | | | | | | |
| 3.00 | B10 D9 | | | | | | | |
| 3.00 - 3.45 | SPT (C) N=2 | 3.00 | | N=2 (0,0/0,1,0,1) | -2.16 | 3.50 | | Very dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 4.00 | B12 D11 | | | | | | | |
| 4.00 - 4.12 | SPT (C) | 4.00 | | 50 (25 for 75mm/50 for 50mm) | | (2.50) | | |
| 5.00 | B14 D13 | | | | | | | |
| 5.00 - 5.22 | SPT (C) | 5.00 | | 50 (12,14/50 for 75mm) | | | | |
| 6.00 | B15 D16 | | | | -4.66 | 6.00 | | Very dense brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. |
| 6.00 - 6.45 | SPT (C) N=49 | 6.00 | | N=49 (3,4/7,9,15,18) | | | | |
| 7.50 | B17 D18 | | | | | | | |
| 7.50 - 7.92 | SPT (C) | 7.50 | | N=50 (3,5/50 for 265mm) | | (4.20) | | |
| 9.00 | B19 D20 | | | | | | | |
| 9.00 - 9.41 | SPT (C) | 9.00 | | N=50 (4,6/50 for 265mm) | | | | |




**Remarks**

Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| 1.80 | 1.80 | 20 | 1.60 |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| | |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 15.40 | 16.50 | 03:00 |

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Borehole No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | BH19 |
| **Coordinates:** | **Client:** | Sheet 2 of 2 |
| 325298.06 E | Irish Water | |
| 173286.91 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:50 |
| **Ground Level:** 1.34 mOD | **Dates:** 23/01/2018 - 26/01/2018 | **Driller:** BM |
| | | **Logger:** NH |

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 18.00 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | -8.86 | 10.20 | | Very dense brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. | | |
| | | | | | | (0.40) | | Grey slightly silty gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. | | |
| 10.50 | B21 D22 | | | | -9.26 | 10.60 | | Stiff grey sandy CLAY. Sand is fine to coarse | | |
| 10.50 - 10.95 | SPT (C) N=21 | 10.50 | | N=21 (2,3/3,6,6,6) | | (0.60) | | | | |
| 10.80 | B23 | | | | | | | | | |
| 11.00 - 11.45 | UT30 | 11.00 | | Ublow=50 100% | -9.86 | 11.20 | | Medium dense to dense grey very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse | | |
| 12.00 | B25 D24 | | | | | | | | | |
| 12.00 - 12.45 | SPT (C) N=22 | 12.00 | | N=22 (4,5/5,5,6,6) | | | | | | |
| | | | | | | (3.50) | | | | |
| 13.50 | B27 D26 | | | | | | | | | |
| 13.50 - 13.95 | SPT (C) N=31 | 13.50 | | N=31 (5,5/7,7,8,9) | | | | | | |
| | | | | | -13.36 | 14.70 | | Firm to stiff grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse | | |
| 15.00 | B29 D28 | | | | | (0.70) | | | | |
| 15.00 - 15.50 | UT31 | | | Ublow=50 100% | -14.06 | 15.40 | | Medium dense to dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | | |
| | | | | | | (1.40) | | | | |
| 16.50 | B32 D34 | | | | | | | | | |
| 16.50 - 16.95 | SPT (C) N=35 | 16.50 | | N=35 (4,6/9,10,8,8) | -15.46 | 16.80 | | Very stiff brownish grey slightly sandy gravelly CLAY. Gravel is subangular fine to coarse of mixed lithologies. | | |
| 17.00 | B33 | | | | | | | | | |
| 17.50 | D35 | | | | | (1.20) | | | | |
| 17.50 - 17.94 | SPT (S) | 17.50 | | N=50 (6,8/50 for 295mm) | | | | | | |
| | | | | | -16.66 | 18.00 | | End of Borehole at 18.00m | | |

**Remarks**

Combined dual 50mm and 19mm gas and groundwater monitoring standpipes installed

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 18.00 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 15.40 | 16.50 | 03:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 16.20 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH20

**Coordinates:** 325324.98 E, 173120.91 N

**Client:** Irish Water

Sheet 1 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Driller:** MK

**Ground Level:** 2.59 mOD

**Dates:** 07/02/2018 - 08/02/2018

**Logger:** ST

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description |
|---|---|---|---|---|---|---|---|---|
| | | 0.00 | 0.00 | 07-02-2018 | 2.39 | (0.20) 0.20 | | MADE GROUND: Concrete slab |
| 0.50 | B1 D9 ES17 | | | PID = 0.20ppm | | (1.10) | | MADE GROUND: Brown gravelly fine to coarse SAND with fragments of red brick. Gravel is subangular fine to medium of mixed lithologies. |
| 1.00 | B2 D10 ES18 | | | | 1.29 | 1.30 | | |
| 1.00 - 1.45 | SPT (C) N=4 | 3.00 | 2.80 | N=4 (0,1/1,1,1,1) PID = 0.40ppm | | (0.90) | | MADE GROUND: Loose brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies predominately red bricks and cement. |
| 2.00 | B3 D11 ES19 | | | | 0.39 | 2.20 | | |
| 2.00 - 2.45 | SPT (C) N=12 | 3.50 | 3.00 | N=12 (2,2/3,3,3,3) PID = 0.20ppm | | (1.10) | | Medium dense slightly gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| 3.00 | B4 D12 ES20 | | | | -0.71 | 3.30 | | |
| 3.00 - 3.45 | SPT (C) N=10 | 3.00 | 2.80 | N=10 (2,1/2,2,3,3) PID = 0.10ppm | | | | Loose to medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| 4.00 | B5 D13 | | | | | | | |
| 4.00 - 4.45 | SPT (C) N=9 | 3.00 | 2.90 | N=9 (1,2/3,2,2,2) | | (2.70) | | |
| 5.00 | B6 D14 | | | | | | | |
| 5.00 - 5.45 | SPT (C) N=12 | 3.50 | 3.30 | N=12 (2,3/4,3,2,3) | | | | |
| 6.00 | B7 D15 | | | | -3.41 | 6.00 | | Dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| 6.00 - 6.45 | SPT (C) N=42 | 3.00 | 3.00 | N=42 (3,3/6,7,15,14) | | | | |
| 7.50 | B8 D16 | | | | | (3.20) | | |
| 7.50 - 7.95 | SPT (C) N=43 | 3.00 | 2.80 | N=43 (5,7/9,10,12,12) | | | | |
| 9.00 | B21 D26 | | | | -6.61 | 9.20 | | |
| 9.00 - 9.32 | SPT (C) | 9.00 | 3.00 | 50 (5,8/50 for 165mm) | | | | Dense brown slightly gravelly silty fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. |
| | | 9.00 | 2.90 | 07-02-2018 | | | | |
| | | 9.00 | 3.00 | 08-02-2018 | | | | |

Water / Backfill

**Remarks**

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| 1.50 | 3.00 |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 9.00 | 250 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 7.00 | 7.30 | 00:30 |
| 7.80 | 8.20 | 00:30 |
| 10.50 | 11.50 | 01:00 |

CAUSEWAY GEOTECH

| Method | Plant Used | Top | Base |
|---|---|---|---|
| Cable Percussion | Dando 2000 | 0.00 | 16.20 |

**Project No.:** 17-1455

**Project Name:** Arklow WwTP Land GI

**Borehole No.:** BH20

**Coordinates:** 325324.98 E, 173120.91 N

**Client:** Irish Water

Sheet 2 of 2

**Client's Representative:** Byrne Looby ARUP JV

**Scale:** 1:50

**Ground Level:** 2.59 mOD

**Dates:** 07/02/2018 - 08/02/2018

**Driller:** MK

**Logger:** ST

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Dense brown slightly gravelly silty fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. | | |
| 10.50 | B22<br>D27 | | | | | | | | | |
| 10.50 - 10.95 | SPT (C)<br>N=23 | 10.50 | 2.80 | N=23 (5,7/9,10,2,2) | | (3.10) | | | | |
| 12.00 | B23<br>D28 | | | | | | | | | |
| 12.00 - 12.44 | SPT (C) | 12.00 | 3.50 | N=50 (7,8/50 for 285mm) | -9.71 | 12.30 (0.20) | | Soft brown slightly sandy silty CLAY. Sand is fine to coarse. | | |
| | | | | | -9.91 | 12.50 | | Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. | | |
| 13.50 | B24<br>D29 | | | | | | | | | |
| 13.50 - 13.95 | SPT (C)<br>N=14 | 13.50 | 3.50 | N=14 (2,1/3,4,4,3) | | (2.70) | | | | |
| 15.00 | U31 | 15.00 | 3.2 | Ublow=35 100% | | | | | | |
| 15.00 - 15.45 | SPT (C)<br>N=39 | 15.50 | 3.20 | N=39 (4,5/4,7,12,16) | -12.61 | 15.20 | | Very stiff brownish grey slightly sandy slightly gravelly silty CLAY with 2 to 7cm thick lenses of fine to coarse SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine of mixed lithologies. | | |
| 15.20 | B25<br>D30 | | | | | (1.00) | | | | |
| | | 16.20 | 3.50 | 08-02-2018 | -13.61 | 16.20 | | End of Borehole at 16.20m | | |

**Remarks**

Groundwater monitoring standpipe installed

Terminated on instruction of Engineer at required depth

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

**Casing Details**

| To (m) | Diam (mm) |
|---|---|
| 16.20 | 200 |

**Chiselling Details**

| From (m) | To (m) | Time (hh:mm) |
|---|---|---|
| 7.00 | 7.30 | 00:30 |
| 7.80 | 8.20 | 00:30 |
| 10.50 | 11.50 | 01:00 |

CAUSEWAY GEOTECH

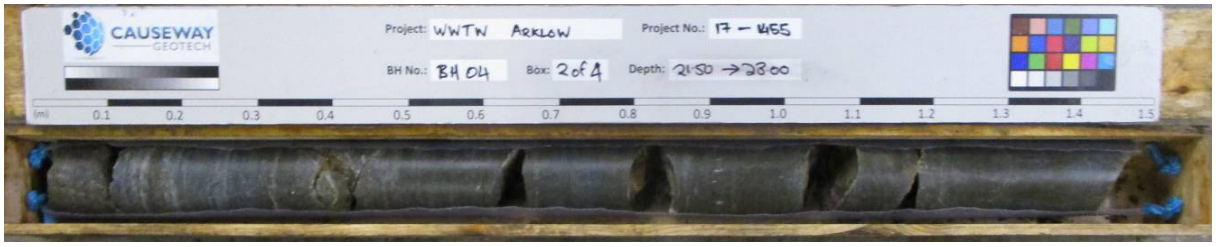
# APPENDIX C

## Core Photographs





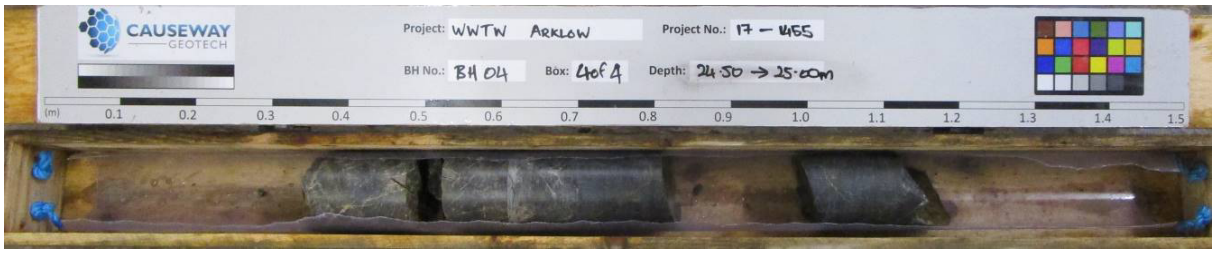

BH04 20.00m to 21.50m




BH04 21.50m to 23.00m




BH04 23.00m to 24.50m




BH04 24.50m to 25.00m



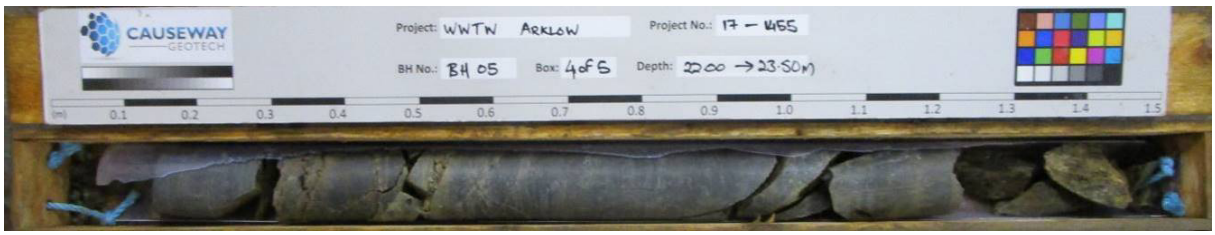

BH05 18.00m to 19.00m




BH05 19.00m to 20.50m



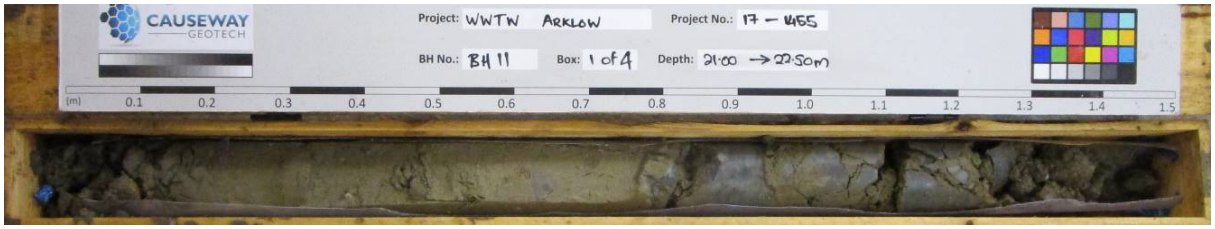

BH05 20.50m to 22.00m




BH05 22.00m to 23.50m




BH05 23.50m to 25.00m



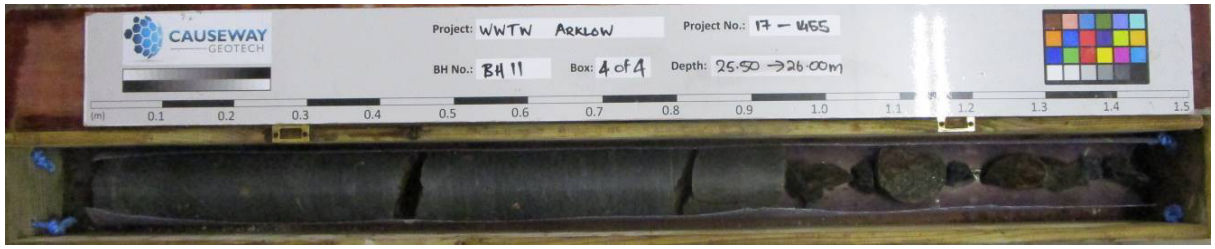

BH11 21.00m to 22.50m




BH22 22.50m to 24.00m




BH11 24.00m to 25.50m




BH11 25.50m to 26.00m

CAUSEWAY GEOTECH

# APPENDIX D

## Trial Pit Logs



| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** TP01 |
| | **Co-ordinates:** 325381.53 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173066.84 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.48 mOD | **Date:** 09/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.40) | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. MG | |
| | | | 2.08 | 0.40 | | | |
| | | | 2.03 | (0.05) 0.45 | | MADE GROUND: Concrete slab MG | |
| | | | | | | End of trial pit at 0.40m | |

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

**Remarks**
No groundwater encountered

Terminated on instruction of engineer. Base of trial pit obstructed by slab or concrete.

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| | |

**Stability:** Stable

**Width:** 1.00

**Length:** 3.00

CAUSEWAY GEOTECH

| Project No.: | Project Name: | Trial Pit No.: |
|---|---|---|
| 17-1455 | Arklow WwTP Land GI | TP01A |
| **Co-ordinates:** 325384.99 E 173047.59 N | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.45 mOD | **Date:** 09/01/2018 |
| | | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.30) | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies with low cobble content. Sand is fine to coarse. Cobbles are subrounded.<br>MG | |
| 0.30 - 1.60 | ES7 | | 2.14 | 0.30 | | | |
| 0.50 | B4 | | | | | MADE GROUND: Brown sandy subangular fine to coarse GRAVEL of mixed lithologies with high cobble content and suspected asbestos sheeting. Sand is fine to coarse.<br>[Patches of orange, yellow, and purple staining on GRAVEL]<br>[Asbestos sample taken] | |
| 0.50 | D5 | | | | | | |
| 0.50 | ES6 | PID = 0.20ppm | | | | MG<br>*Suspected ACM found at 0.30m - sample ES7* | |
| | | | | (1.30) | | | |
| 1.50 | B1 | | | | | | |
| 1.50 | D2 | | 0.84 | 1.60 | | | |
| 1.50 | ES3 | PID = 0.10ppm | | (0.20) | | MADE GROUND: Concrete Slab<br>MG | |
| | | | 0.64 | 1.80 | | End of trial pit at 1.80m | |

**Remarks**
No groundwater encountered
[Red brick walls on either side of pit, possible infilled channel/chamber]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of engineer. Base of trial pit obstructed by slab of concrete.

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| | |

**Stability:** Unstable

**Width:** 1.00

**Length:** 5.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** TP02 |
| **Co-ordinates:** 325330.93 E 173082.08 N | **Client:** Irish Water | **Client's Representative:** Byrne Looby ARUP JV | Sheet 1 of 1 |
| **Method:** Trial Pitting | | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.57 mOD | **Date:** 15/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.47 | (0.10) 0.10 | | MADE GROUND: Tarmac<br>MG | |
| | | | | | | MADE GROUND: Brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>[pieces of plastic and red brick]<br>MG | |
| 0.50 | B1 | | | | | | |
| 0.50 | D2 | | | (0.90) | | | |
| 0.50 | ES3 | | | | | | |
| | | PID = 0.10ppm | | | | | |
| | | | 1.57 | 1.00 | | MADE GROUND: Black gravelly fine to coarse SAND. Gravel is rounded fine to medium. (strong chemical odour)<br>[possible slag/waste mining material]<br>MG | |
| 1.20 | B10 | | | (0.40) | | | |
| 1.20 | D11 | | | | | | |
| 1.20 | ES12 | | | | | | |
| | | PID = 0.10ppm | 1.17 | 1.40 | | MADE GROUND: Brown slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies predominately red bricks and some cement.<br>[some purple staining, possible slag/waste mining material]<br>MG | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | | | (0.60) | | | |
| | | PID = 0.50ppm | | | | | |
| | | | 0.57 | 2.00 | | Light brown fine to coarse SAND.<br>SA | |
| | | | | (0.50) | | | |
| | | Slight seepage | | | | | ▼ |
| 2.50 | B7 | | 0.07 | 2.50 | | End of trial pit at 2.50m | |
| 2.50 | D8 | | | | | | |
| 2.50 | ES9 | | | | | | |
| | | PID = 0.00ppm | | | | | |

**Remarks**
No groundwater encountered
[Curved brick wall encountered at 1.40m - possible chimney]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.40 | Slight seepage |

**Stability:** Unstable

**Width:** 1.50

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP03** |
| | **Co-ordinates:** 325317.93 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173117.23 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.46 mOD | **Date:** 15/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.60) | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. MG | |
| | | | 1.86 | 0.60 | | | |
| | | | 1.81 | (0.05) 0.65 | | MADE GROUND: Concrete slab MG | |
| | | | | | | End of trial pit at 0.60m | |

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

**Remarks**
No groundwater encountered

Terminated on instruction of Engineer on slab of concrete

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Stable

**Width:** 1.00

**Length:** 3.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP03A** |
| **Co-ordinates:** 325308.10 E 173119.00 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.51 mOD | **Date:** 15/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.41 | (0.10) 0.10 | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. MG | |
| | | | 2.21 | (0.20) 0.30 | | MADE GROUND: Concrete slab MG | |
| 0.50 | B1 | | | | | MADE GROUND: Brown sandy subangular fine to coarse GRAVEL of mixed lithologies, predominately red brick. Sand is fine to coarse. [possible fill of channel/chamber] MG | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.10ppm | | (0.70) | | | |
| 1.00 | ES7 | | 1.51 | 1.00 | | MADE GROUND: Light brown fine to coarse SAND with suspected asbestos sheeting. [possible fill of channel/chamber] MG *Suspected ACM found at 1.00m* | |
| 1.50 | B4 | | | (0.60) | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | 0.91 | 1.60 | | End of trial pit at 1.60m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered
Extended to slit trench at request of Engineer
[Red brick walls on either side of pit, possible infilled channel/chamber]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| | |

**Stability:** Unstable

**Width:** 5.00

**Length:** 7.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP04** |
| **Co-ordinates:** 325368.93 E 173129.71 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.44 mOD | **Date:** 10/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.20) | | TOPSOIL<br>TS | |
| | | | 2.24 | 0.20 | | | |
| | | | | (0.15) | | MADE GROUND: Concrete slab<br>[concrete has white and orange staining] | |
| | | | 2.09 | 0.35 | | MG | |
| 0.50<br>0.50<br>0.50 | B1<br>D2<br>ES3 | PID = 0.10ppm | | (1.05) | | Light brown silty very sandy subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>[patches of orange and purple staining]<br>GR | |
| | | | 1.04 | 1.40 | | | |
| 1.50<br>1.50<br>1.50 | B4<br>D5<br>ES6 | PID = 0.10ppm | | (0.70) | | Red slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies.<br>SA | |
| | | | 0.34 | 2.10 | | End of trial pit at 2.10m | |

**Remarks**
No groundwater encountered

Terminated on instruction of Engineer due to pit walls collapsing

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Unstable

**Width:** 1.00

**Length:** 3.00

| CAUSEWAY GEOTECH | Project No.: 17-1455 | Project Name: Arklow WwTP Land GI | Trial Pit No.: TP05 |
|---|---|---|---|
| | Co-ordinates: 325348.41 E 173175.12 N | Client: Irish Water | Sheet 1 of 1 |
| Method: Trial Pitting | | Client's Representative: Byrne Looby ARUP JV | Scale: 1:25 |
| Plant: 14T Tracked Excavator | Ground Level: 3.30 mOD | Date: 10/01/2018 | Logger: ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.50) | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>MG | |
| 0.50 | B1 | | 2.80 | 0.50 | | | |
| 0.50 | D2 | | | | | MADE GROUND: Black very sandy subangular fine to coarse GRAVEL of mixed lithologies with rare boulders and blocks of cement. Sand is fine to coarse. Boulders are subangular to subrounded. (Strong smell of hydrocarbons)<br>[pieces of wood, brick and glass present]<br>MG | |
| 0.50 | ES3 | PID = 0.00ppm | | (0.60) | | | |
| 1.00 | B4 | | | | | | |
| 1.00 | D5 | | 2.20 | 1.10 | | | |
| 1.00 | ES6 | PID = 1.50ppm | | | | MADE GROUND: Light brown silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies.<br>[pieces of red brick, ceramics present]<br>[patches of orange and red staining observed]<br>MG | |
| | | | | (1.70) | | | |
| 2.00 | B7 | | | | | | |
| 2.00 | D8 | | | | | | |
| 2.00 | ES9 | PID = 0.00ppm | | | | | |
| 2.50 | ES10 | | | | | *Suspected Gun Cotton sample at 2.50m* | |
| | | Flow at 2.70 | | | | | ▼ |
| | | | 0.50 | 2.80 | | End of trial pit at 2.80m | |

**Remarks**
[A concrete slab is encountered in the southern half of the pit a a depth of approximately 1.00m]
[A 200mm pipe coming out of the northern side of the pit at 1.20m]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to groundwater inflow

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.70 | Flow at 2.70 |

**Stability:** Unstable

**Width:** 1.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP06** |
| | **Co-ordinates:** 325304.44 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173160.66 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.55 mOD | **Date:** 12/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.45 | (0.10) 0.10 | | MADE GROUND: Tarmac<br>MG | |
| | | | 2.25 | (0.20) 0.30 | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>MG | |
| 0.50<br>0.50<br>0.50 | B1<br>D2<br>ES5 | PID = 1.50ppm | | (0.80) | | MADE GROUND: Black sandy subangular fine to coarse GRAVEL of mixed lithologies predominately bricks and cement. Sand is fine to coarse. (Hydrocarbon smell)<br>MG | |
| | | | 1.45 | 1.10 | | Orangey brown silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies. [occasional possible large gravel sized oyster shells which appear to be stained green on the inside]<br>SA | |
| 1.50<br>1.50<br>1.50 | B3<br>D4<br>ES6 | PID = 0.10ppm | | (1.20) | | | |
| | | Flow at 2.20m | | | | | ▼ |
| | | | 0.25 | 2.30 | | End of trial pit at 2.30m | |

**Remarks**
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to groundwater inflow

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.20 | Flow at 2.20m |

**Stability:** Unstable

**Width:** 1.50

**Length:** 3.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP07** |
| **Co-ordinates:** 325292.13 E 173196.78 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.45 mOD | **Date:** 12/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.35 | (0.10) 0.10 | | MADE GROUND: Tarmac<br>MG | |
| | | | 2.15 | (0.20) 0.30 | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>MG | |
| 0.50<br>0.50<br>0.50 | B1<br>D5<br>ES2 | PID = 0.50ppm | 1.75 | (0.40) 0.70 | | MADE GROUND: Brown silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>[pieces of wood present]<br>[purple and orange staining throughout]<br>MG | |
| 1.50<br>1.50<br>1.50 | B3<br>D6<br>ES4 | PID = 0.10ppm | 0.85<br>0.75 | (0.90) 1.60<br>(0.10) 1.70 | | MADE GROUND: Black sandy subangular fine to coarse GRAVEL of mixed lithologies predominately bricks and cement. Sand is fine to coarse. (Strong hydrocarbon smell)<br>MG<br>MADE GROUND: Concrete slab<br>MG<br>End of trial pit at 1.70m | |

**Remarks**
No groundwater encountered
Extended to slit trench at request of Engineer
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer on concrete slab

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Stable

**Width:** 1.50

**Length:** 9.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP08** |
| **Co-ordinates:** 325284.84 E 173192.52 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.50 mOD | **Date:** 12/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.60) | | MADE GROUND: Brown very sandy subangular fine to coarse GRAVEL of mixed lithologies including red brick and cement. Sand is fine to coarse. MG | |
| 0.50 | B1 | | | | | | |
| 0.50 | D2 | | 1.90 | 0.60 | | | |
| 0.50 | ES8 | PID = 0.00ppm | | | | MADE GROUND: Black silty very sandy subangular fine to coarse GRAVEL of mixed lithologies including red brick and cement. Sand is fine to coarse. (Smell of hydrocarbons) [pieces of plastic and metal rod] MG | |
| 1.00 | B3 | | | (0.90) | | | |
| 1.00 | D4 | | | | | | |
| 1.00 | ES9 | PID = 1.30ppm | | | | | |
| | | | 1.00 | 1.50 | | Orangey brown silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. SA | |
| 2.00 | B5 | | | | | | |
| 2.00 | D6 | | | | | | |
| 2.00 | ES7 | PID = 0.00ppm | | (1.30) | | | |
| | | Flow at 2.70m | | | | | ▼ |
| | | | -0.30 | 2.80 | | End of trial pit at 2.80m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to groundwater inflow

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.70 | Flow at 2.70m |

**Stability:** Stable

**Width:** 2.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** TP09 |
| | **Co-ordinates:** 325280.67 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173210.68 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.48 mOD | **Date:** 11/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | | | MADE GROUND: Brown very sandy subangular fine to coarse GRAVEL of mixed lithologies including pieces of brick and cement. Sand is fine to coarse. [pieces of plastic] MG | |
| 0.50 | B1 | | | (1.00) | | | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | | | | | | |
| | | PID = 0.00ppm | | | | | |
| | | | 1.48 | 1.00 | | MADE GROUND: Blackish brown very sandy subangular fine to coarse GRAVEL of mixed lithologies with low cobble content, red bricks rubbish and cement. Sand is fine to coarse. Cobbles are subangular to subrounded. (Smell of hydrocarbons) [pieces of wood] MG | |
| 1.50 | B4 | | | | | *Red brick structure observed in part of pit* | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | | | | | | |
| 1.70 | ES10 | PID = 1.80ppm | | (1.50) | | *Suspected Gun Cotton sample at 1.70m* | |
| | | Flow at 2.40m | | | | | ▼ |
| 2.50 | B7 | | -0.02 | 2.50 | | End of trial pit at 2.50m | |
| 2.50 | D8 | | | | | | |
| 2.50 | ES9 | | | | | | |
| | | PID = 1.20ppm | | | | | |

**Remarks**
[A 200m thick concrete slab was encountered at 1.0mm in the southern part of the pit; pit was continued to depth where slab finished]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to groundwater inflow

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.40 | Flow at 2.40m |

**Stability:** Stable

**Width:** 2.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP10** |
| | **Co-ordinates:** 325326.87 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173234.87 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.78 mOD | **Date:** 10/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.40) | | MADE GROUND: Brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>MG | |
| | | | 2.38 | 0.40 | | | |
| 0.50 | B1 | | | (0.30) | | MADE GROUND: Brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.<br>MG | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.00ppm | 2.08 | 0.70 | | | |
| | | | | (0.20) | | MADE GROUND: Concrete slab<br>[pieces of crushed rock and bricks cemented together]<br>MG | |
| | | | 1.88 | 0.90 | | | |
| | | | | | | Brown silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies.<br>[minor orange staining observed]<br>SA | |
| | | | | (1.10) | | | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | | | | | |
| | | | 0.78 | 2.00 | | End of trial pit at 2.00m | |

**Remarks**
No groundwater encountered
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Unstable

**Width:** 1.00

**Length:** 3.00

| | Project No.: | Project Name: | Trial Pit No.: |
|---|---|---|---|
| CAUSEWAY GEOTECH | 17-1455 | Arklow WwTP Land GI | TP11 |
| | Co-ordinates: 325284.75 E | Client: Irish Water | Sheet 1 of 1 |
| Method: Trial Pitting | 173255.51 N | Client's Representative: Byrne Looby ARUP JV | Scale: 1:25 |
| Plant: 14T Tracked Excavator | Ground Level: 2.27 mOD | Date: 11/01/2018 | Logger: ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.17 | (0.10) 0.10 | | MADE GROUND: Tarmac<br>MG | |
| 0.50<br>0.50<br>0.50 | B1<br>D2<br>ES3 | PID = 0.10ppm | | (0.90) | | MADE GROUND: Brown silty very sandy subangular fine to coarse GRAVEL with medium cobble content; of mixed lithologies including pieces of brick and cement. Sand is fine to coarse. Cobbles are angular to subangular.<br>[pieces of glass]<br>MG | |
| | | | 1.27 | 1.00 | | MADE GROUND: Light brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>MG | |
| 1.20<br>1.20<br>1.20 | B4<br>D5<br>ES6 | PID = 0.20ppm | | (0.50) | | | |
| 1.50<br>1.60<br>1.60<br>1.60 | ES10<br>B7<br>D8<br>ES9 | PID = 0.10ppm | 0.77 | 1.50<br>(0.40) | | MADE GROUND: Reddish brown silty very sandy subangular fine to coarse GRAVEL with medium cobble content; of mixed lithologies. Sand is fine to coarse. Cobbles are subangular to subrounded.<br>[minor yellow staining observed]<br>MG<br>*Suspected Gun Cotton sample at 1.50m* | |
| | | | 0.37 | 1.90 | | End of trial pit at 1.90m | |

**Remarks**
No groundwater encountered
[Green plastic/fibreglass pipe encountered at 1.90m; broken by excavator, filled with water, water in the pipe stopped flowing after a few minutes]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to concrete slab and pipes at base of pit

| Water Strikes: | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Unstable

**Width:** 1.80

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** TP12 |
| | **Co-ordinates:** 325297.05 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173268.87 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.28 mOD | **Date:** 11/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.18 | (0.10) 0.10 | | MADE GROUND: Tarmac<br>MG | |
| | | | 2.08 | (0.10) 0.20 | | MADE GROUND: Grey slightly sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>MG | |
| 0.50 | B1 | | | | | MADE GROUND: Brown silty very sandy subangular fine to coarse GRAVEL with medium cobble content of mixed lithologies including red bricks. Sand is fine to coarse. Cobbles are subangular to subrounded predominantly of cement.<br>[some red staining observed]<br>MG | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.00ppm | | (1.20) | | | |
| | | | 0.88 | 1.40 | | MADE GROUND: Dark brown silty very gravelly fine to coarse SAND. Gravel is subangular of mixed lithologies including some red bricks and broken pipe.<br>[some red staining observed]<br>[some patches of black silty SAND]<br>MG | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | | (0.90) | | | |
| | | Flow at 2.20m | | | | | ▼ |
| 2.30 | B7 | | -0.02 | 2.30 | | End of trial pit at 2.30m | |
| 2.30 | D8 | | | | | | |
| 2.30 | ES9 | PID = 0.10ppm | | | | | |

**Remarks**
[Backfilled pipe encountered in the southern part of the pit at approximately 1.00m]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.20 | Flow at 2.20m |

**Stability:** Unstable

**Width:** 1.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP13** |
| | **Co-ordinates:** 325307.58 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173280.87 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 1.65 mOD | **Date:** 11/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.30) | | MADE GROUND: Brown slightly clayey gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. MG | |
| | | | 1.35 | 0.30 | | | |
| | | | | (0.10) | | MADE GROUND: Concrete slab MG | |
| | | | 1.25 | 0.40 | | | |
| 0.60 | B1 | | | (0.40) | | MADE GROUND: Brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. MG | |
| 0.60 | D2 | | | | | | |
| 0.60 | ES3 | PID = 0.00ppm | 0.85 | 0.80 | | End of trial pit at 0.80m | |

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

**Remarks**
No groundwater encountered
[Possible underground storage container has a metal lifting hook and hollow scores on the surface to divert water]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to presence of underground storage container at 0.80m

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| | |

**Stability:** Stable

**Width:** 2.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP14** |
| | **Co-ordinates:** 325306.19 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173072.47 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.11 mOD | **Date:** 15/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.01 | (0.10) 0.10 | | MADE GROUND: Concrete slab<br>MG | |
| 0.50 | B1 | | | | | MADE GROUND: Reddish brown very sandy subangular fine to coarse GRAVEL of mixed lithologies predominately red brick. Sand is fine to coarse.<br>MG | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.10ppm | | (1.10) | | | |
| | | | 0.91 | 1.20 | | Light brown slightly silty gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies.<br>SA | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | | | (0.80) | | *ES sample retrieved from infilled culvert at 1.60m - black organic material* | |
| 1.60 | ES7 | PID = 0.00ppm | | | | | |
| | | | 0.11 | 2.00 | | End of trial pit at 2.00m | |

**Remarks**
No groundwater encountered
Old culvert structure encountered in pit
[The culvert is formed by pieces of slate and is filled with black silty organic material]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| | |

**Stability:** Unstable

**Width:** 1.50

**Length:** 3.50

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP15** |
| | **Co-ordinates:** 325308.10 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173048.65 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.29 mOD | **Date:** 08/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.30) | | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.<br>MG | |
| | | | 1.99 | 0.30 | | | |
| | | | | (0.10) | | MADE GROUND: Concrete slab<br>MG | |
| | | | 1.89 | 0.40 | | | |
| 0.50 | B1 | | | | | MADE GROUND: Reddish brown gravelly fine to coarse SAND with medium cobble content. Gravel is subrounded fine to coarse of mixed lithologies. Cobbles are subrounded of sandstone.<br>[occasional possible large gravel sized oyster shells which appear to be stained green on the inside]<br>MG | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.00ppm | | | | | |
| 1.00 | B4 | | | | | | |
| 1.00 | D5 | | | (1.30) | | | |
| 1.00 | ES6 | PID = 0.20ppm | | | | | |
| 1.50 | B7 | | | | | | |
| 1.50 | D8 | | | | | | |
| 1.50 | ES9 | PID = 0.10ppm | 0.59 | 1.70 | | | |
| | | | | (0.50) | | Light brown slightly silty gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies.<br>[possible lenses of soft brown CLAY material]<br>[occasional possible large gravel sized oyster shells which appear to be stained green on the inside]<br>SA | |
| 2.00 | B10 | | | | | | |
| 2.00 | D11 | | | | | | |
| 2.00 | ES12 | PID = 0.30ppm<br>Seepage at 2.20m | 0.09 | 2.20 | | End of trial pit at 2.20m | ▼ |

**Remarks**
Old asbestos pipe encountered in trial pit at 1.50mbgl
[Possible manhole constructed of red brick encountered in pit]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.20 | Seepage at 2.20m |

**Stability:** Unstable

**Width:** 1.00

**Length:** 5.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP16** |
| **Co-ordinates:** 325326.82 E 173035.54 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.39 mOD | **Date:** 08/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.50) | | MADE GROUND: Greyish brown sandy subangular fine to coarse GRAVEL of mixed lithologies predominately red brick. Sand is fine to coarse. MG | |
| 0.40 | B1 | | | | | | |
| 0.40 | D2 | | 1.89 | 0.50 | | | |
| 0.40 | ES3 | PID = 0.10ppm | | | | Reddish brown slightly silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. [occasional possible large gravel sized oyster shells which appear to be stained green on the inside] GR | |
| | | | | (0.90) | | | |
| 1.00 | B4 | | | | | | |
| 1.00 | D5 | | | | | | |
| 1.00 | ES6 | PID = 0.20ppm | | | | | |
| | | | 0.99 | 1.40 | | Light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine to medium of mixed lithologies. SA | |
| 1.70 | ES10 | | | | | *Green staining visible* | |
| 2.00 | B7 | | | | | | |
| 2.00 | D8 | | | | | | |
| 2.00 | ES9 | | | (1.40) | | | |
| | | PID = 0.00ppm | | | | | |
| | | Flow at 2.70m | | | | | ▼ |
| | | | -0.41 | 2.80 | | End of trial pit at 2.80m | |

**Remarks**
[Sand with green staining is well cemented]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to groundwater inflow

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.70 | Flow at 2.70m |

**Stability:** Unstable

**Width:** 1.00

**Length:** 2.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP17** |
| **Co-ordinates:** 325387.24 E 173031.13 N | **Client:** Irish Water | **Client's Representative:** Byrne Looby ARUP JV | Sheet 1 of 1 |
| **Method:** Trial Pitting | | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.13 mOD | **Date:** 10/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.20) | | MADE GROUND: Concrete slab<br>MG | |
| | | | 1.93 | 0.20 | | Light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies.<br>SA | |
| 0.50 | B1 | | | (0.60) | | | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.10ppm | | | | | |
| | | | 1.33 | 0.80 | | Green and red slightly silty gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies.<br>[greenish yellow SAND dominates the north side of the pit while the south side is reddish brown SAND]<br>SA | |
| 1.50 | B4 | | | (1.30) | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | | | | | |
| | | | 0.03 | 2.10 | | End of trial pit at 2.10m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered
[Possible abandoned manhole observed as square opening in concrete slab; no infilled with brown silt SAND to approximately 0.50m]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| | |

**Stability:** Unstable

**Width:** 2.50

**Length:** 3.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP18** |
| **Co-ordinates:** 325309.18 E 173143.59 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.39 mOD | **Date:** 12/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.29 | (0.10) 0.10 | MG | MADE GROUND: Tarmac | |
| | | | 2.09 | (0.20) 0.30 | MG | MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. | |
| 0.50 | B1 | | | | MG | MADE GROUND: Black sandy subangular fine to coarse GRAVEL of mixed lithologies predominately bricks and cement. Sand is fine to coarse. (Smell of hydrocarbons, bands of green and red staining observed) | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 1.20ppm | | (0.80) | | | |
| | | | 1.29 | 1.10 | | Orangey brown slightly silty gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies. | |
| 1.50 | B4 | | | | | SA | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | | | | | |
| | | | | (2.00) | | | |
| 2.50 | B7 | | | | | | |
| 2.50 | D8 | | | | | | |
| 2.50 | ES9 | PID = 0.10ppm | | | | | |
| | | Flow at 3.00m | | | | | ▼ |
| | | | -0.71 | 3.10 | | End of trial pit at 3.10m | |

**Remarks**
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to groundwater inflow

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 3.00 | Flow at 3.00m |

**Stability:** Unstable

**Width:** 1.50

**Length:** 4.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** TP19 |
| | **Co-ordinates:** 325277.00 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173221.64 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.25 mOD | **Date:** 11/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.30) | | MADE GROUND: Brown sandy subangular fine to coarse GRAVEL of mixed lithologies. MG | |
| | | | 1.95 | 0.30 | | MADE GROUND: Brown gravelly fine to coarse SAND with medium cobble content, pieces of brick and cement. Gravel is subangular fine to coarse mixed lithologies. Cobbles are subangular to subrounded. MG | |
| 0.50 | B1 | | | | | | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.00ppm | | (1.00) | | | |
| | | | 0.95 | 1.30 | | Brown silty very gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies. SA | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | | (0.80) | | | |
| | | Flow at 2.00m | | | | | ▼ |
| | | | 0.15 | 2.10 | | End of trial pit at 2.10m | |

**Remarks**
[Pipe encountered on western side of pit orientated NW-SE; left intact]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.00 | Flow at 2.00m |

**Stability:** Unstable

**Width:** 3.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP20** |
| | **Co-ordinates:** 325253.82 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173207.70 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 1.67 mOD | **Date:** 11/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | | | MADE GROUND: Brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. MG | |
| 0.50 | B1 | | | | | | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.10ppm | | | | | |
| | | | | (2.40) | | | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | | | | | |
| | | | -0.73 | 2.40 | | End of trial pit at 2.40m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered
Black 4" PVC water main was struck in this pit; delayed works until repair completed

Terminated on instruction of Engineer due to pit walls collapsing

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Unstable

**Width:** 3.00

**Length:** 5.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP21** |
| **Co-ordinates:** 325314.88 E 173274.03 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.11 mOD | **Date:** 11/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| 0.50 | B1 | | | | | MADE GROUND: Red silty gravelly fine to coarse SAND (predominantly medium) with medium cobble content, and pieces of pipe and plastic. Gravel is subangular fine to coarse of mixed lithologies. [lenses of very red silty SAND observed] [orange SAND observed in western side of pit] MG | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.10ppm | | | | | |
| | | | | (2.20) | | | |
| | | Trickle at 1.20m | | | | | ▼ |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.10ppm | | | | | |
| | | | -0.09 | 2.20 | | End of trial pit at 2.20m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 1.20 | Trickle at 1.20m |

**Stability:** Unstable

**Width:** 3.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** TP22 |
| | **Co-ordinates:** 325367.46 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173140.27 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.36 mOD | **Date:** 10/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | (0.60) | | MADE GROUND: Dark brown very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies predominately red brick. [pieces of broken pipe] MG | |
| 0.50 | B1 | | | | | | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.10ppm | 1.76 | 0.60 | | | |
| | | | | (0.80) | | Light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies. SA | |
| 1.50 | B4 | | 0.96 | 1.40 | | | |
| 1.50 | D5 | | | | | Light grey slightly silty slightly gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to medium of mixed lithologies. SA | |
| 1.50 | ES6 | PID = 0.00ppm | | | | | |
| | | | | (0.90) | | | |
| | | | 0.06 | 2.30 | | End of trial pit at 2.30m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to pit walls collapsing

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Unstable

**Width:** 1.00

**Length:** 4.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP23** |
| **Co-ordinates:** 325372.55 E 173122.40 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.33 mOD | **Date:** 10/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | 2.23 | (0.10) 0.10 | | TOPSOIL<br>TS | |
| | | | 2.08 | (0.15) 0.25 | | MADE GROUND: Concrete slab<br>MG | |
| 0.50 | B1 | | | | | White slightly gravelly fine to coarse SAND. Gravel is subrounded fine to medium of mixed lithologies.<br>SA | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.00ppm | | | | | |
| | | | | (1.95) | | | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.00ppm | | | | | |
| | | | 0.13 | 2.20 | | Red slightly silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies.<br>SA | |
| 2.50 | B7 | | | (0.50) | | | ▼ |
| 2.50 | D8 | | | | | | |
| 2.50 | ES9 | Flow at 2.50m<br>PID = 0.00ppm | -0.37 | 2.70 | | End of trial pit at 2.70m | |

**Remarks**
[Possible wall structure encountered on western side of pit]
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer due to groundwater inflow

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| 2.50 | Flow at 2.50m |

**Stability:** Unstable

**Width:** 2.00

**Length:** 3.00

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** **TP24** |
| | **Co-ordinates:** 325318.53 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173337.09 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.11 mOD | **Date:** 09/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| 0.50 | B1 | | | (1.00) | | MADE GROUND: Light brown/cream SILT (possible phosphogypsum deposit)<br>MG | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.10ppm | | | | | |
| | | | 1.11 | 1.00 | | | |
| | | | | (0.40) | | Brown silty gravelly fine to coarse SAND (predominantly medium) with medium cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are subrounded.<br>SA | |
| 1.40 | B4 | | 0.71 | 1.40 | | End of trial pit at 1.40m | |
| 1.40 | D5 | | | | | | |
| 1.40 | ES6 | PID = 0.00ppm | | | | | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered

Terminated on instruction of Engineer

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Stable

**Width:** 1.00

**Length:** 3.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP25** |
| **Co-ordinates:** 325311.29 E 173350.81 N | **Client:** Irish Water | | Sheet 1 of 1 |
| **Method:** Trial Pitting | **Client's Representative:** Byrne Looby ARUP JV | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.09 mOD | **Date:** 09/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| | | | | | | MADE GROUND: Light brown/cream SILT (possible phosphogypsum deposit) MG | |
| 0.50 | B1 | | | | | | |
| 0.50 | D2 | | | | | | |
| 0.50 | ES3 | PID = 0.20ppm | | | | | |
| | | | | (2.00) | | | |
| 1.50 | B4 | | | | | | |
| 1.50 | D5 | | | | | | |
| 1.50 | ES6 | PID = 0.30ppm | | | | | |
| | | | 0.09 | 2.00 | | Brown silty very gravelly fine to coarse SAND with medium cobble content. Gravel is subangular fine to coarse of mixed lithologies. Cobbles are subrounded. SA | |
| | | | | (0.30) | | | |
| 2.30 | B7 | | -0.21 | 2.30 | | End of trial pit at 2.30m | |
| 2.30 | D8 | | | | | | |
| 2.30 | ES9 | PID = 0.30ppm | | | | | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered

Terminated on instruction of Engineer

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Stable

**Width:** 1.00

**Length:** 3.00

CAUSEWAY GEOTECH

| | | | |
|---|---|---|---|
| **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | | **Trial Pit No.:** **TP26** |
| **Co-ordinates:** 325308.59 E 173322.38 N | **Client:** Irish Water | **Client's Representative:** Byrne Looby ARUP JV | Sheet 1 of 1 |
| **Method:** Trial Pitting | | | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.36 mOD | **Date:** 09/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| 0.50 | B1 | | | | | MADE GROUND: Light brown/cream SILT (possible phosphogypsum deposit) | |
| 0.50 | D2 | | | | | MG | |
| 0.50 | ES3 | PID = 0.30ppm | | (1.40) | | | |
| | | | 0.96 | 1.40 | | | |
| 1.50 | B4 | | | (0.20) | | Brown silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. | |
| 1.50 | D5 | | 0.76 | 1.60 | | SA | |
| 1.50 | ES6 | PID = 0.20ppm | | | | End of trial pit at 1.60m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered

Terminated on instruction of Engineer

**Water Strikes:**

| Struck at (m): | Remarks: |
|---|---|
| | |

**Stability:** Stable

**Width:** 1.00

**Length:** 2.50

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **Project No.:** 17-1455 | **Project Name:** Arklow WwTP Land GI | **Trial Pit No.:** TP27 |
| | **Co-ordinates:** 325321.86 E | **Client:** Irish Water | Sheet 1 of 1 |
| **Method:** Trial Pitting | 173038.75 N | **Client's Representative:** Byrne Looby ARUP JV | **Scale:** 1:25 |
| **Plant:** 14T Tracked Excavator | **Ground Level:** 2.47 mOD | **Date:** 09/01/2018 | **Logger:** ST |

| Depth (m) | Sample / Tests | Field Records | Level (mOD) | Depth (m) (Thickness) | Legend | Description | Water |
|---|---|---|---|---|---|---|---|
| 0.10 | B1 | | | (0.20) | | MADE GROUND: Brown very sandy subangular fine to coarse GRAVEL of mixed lithologies including brick fragments. Sand is fine to coarse. MG | |
| 0.10 | D2 | | 2.27 | 0.20 | | | |
| 0.10 | ES3 | PID = 0.20ppm | | (0.20) | | MADE GROUND: Concrete slab MG | |
| | | | 2.07 | 0.40 | | MADE GROUND: Reddish brown silty very gravelly fine to coarse SAND (predominantly medium) with medium cobble content. Gravel is subangular fine to coarse of mixed lithologies. Cobbles are subangular. [pieces of red brick, glass, and plastic] MG | |
| | | | | (0.80) | | | |
| 1.00 | B4 | | | | | | |
| 1.00 | D5 | | | | | | |
| 1.00 | ES6 | PID = 0.10ppm | 1.27 | 1.20 | | End of trial pit at 1.20m | |

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

**Remarks**
No groundwater encountered
[COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]

Terminated on instruction of Engineer

| **Water Strikes:** | |
|---|---|
| Struck at (m): | Remarks: |
| | |

**Stability:** Unstable

**Width:** 1.00

**Length:** 2.50

CAUSEWAY GEOTECH

# APPENDIX E

## Trial Pit Photographs





TP01



TP01



TP01



TP02



TP02



TP02



TP02



TP03A



TP03A



TP03A



TP04



TP04



TP04



TP05



TP05



TP05



TP06



TP06



TP06



TP07



TP07



TP07



TP08



TP08



TP08



TP09



TP09



TP09




TP09



TP10



TP10



TP10



TP11



TP11



TP11




TP11



TP12



TP12



TP12



TP13



TP13



TP13



TP13



TP14



TP14



TP14



TP14



TP15



TP15



TP15



TP15



TP16



TP16



TP16



TP16



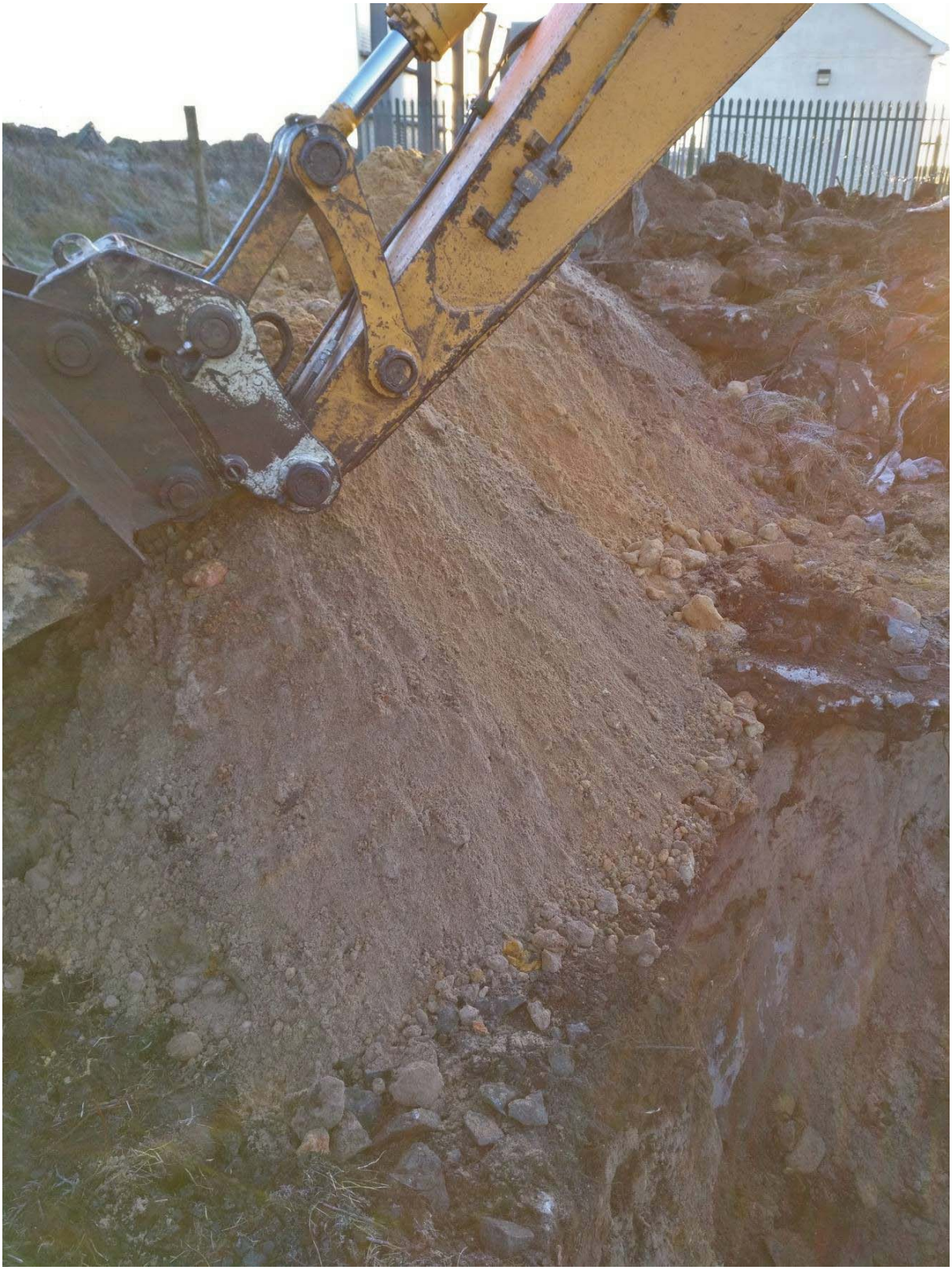
TP17



TP17



TP17



TP17



TP18



TP18



TP18



TP18



TP19



TP19



TP19



TP19



TP20



TP20



TP20



TP20



TP20



TP21



TP21



TP21



TP21



TP22



TP22



TP22



TP22



TP23



TP23




TP23



TP24



TP24



TP25



TP25



TP26



TP26



TP26



TP27



TP27



TP27



TP27

CAUSEWAY GEOTECH

# APPENDIX F

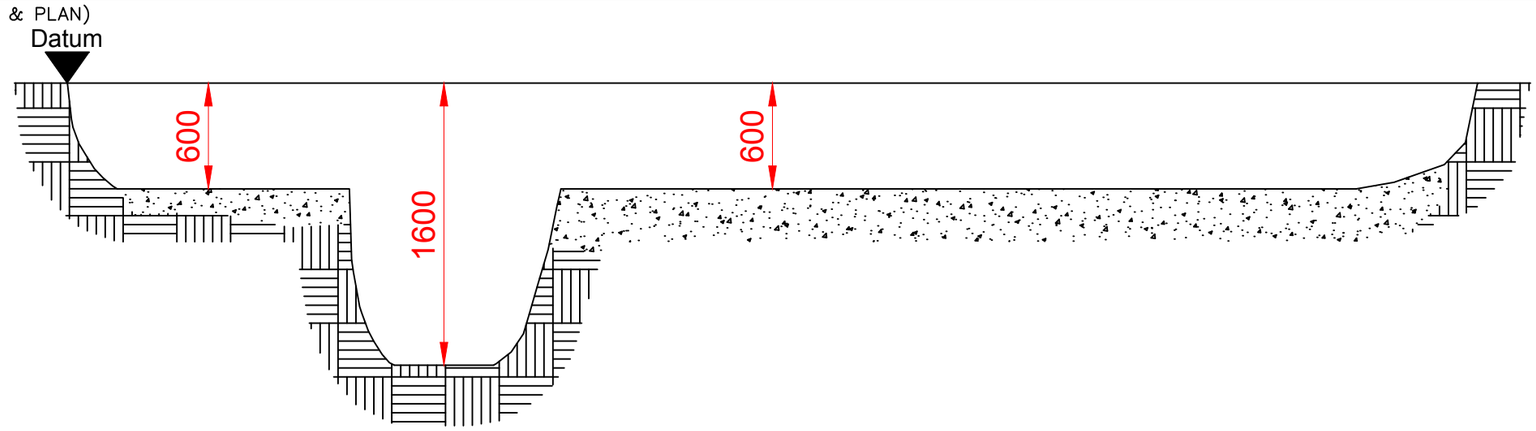
## Slit Trench Logs

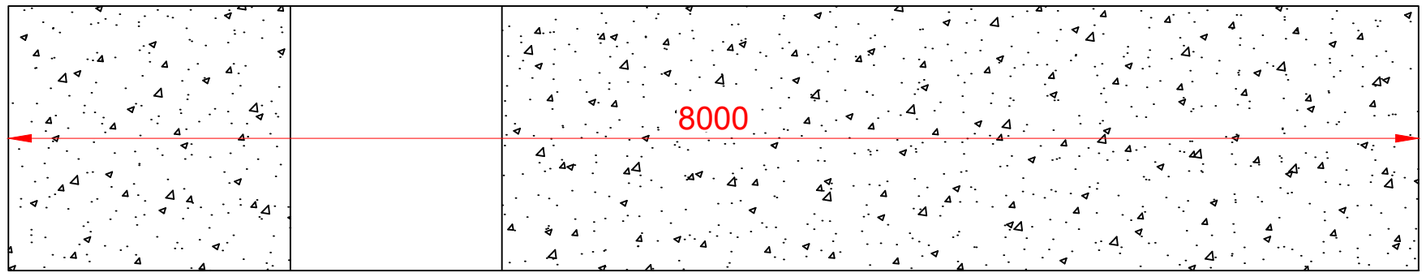


| JOB NUMBER: 17-1455 | JOB NAME: Arklow WWTP Land GI | LOCATION: ST03A |
|---|---|---|

| CLIENT: Irish Water | CLIENTS REPRESENTATIVE: Byrne Looby ARUP JV | CREW: ST | PLANT & EQUIPMENT 3 Tonne Excavator & Hand Tools |
|---|---|---|---|

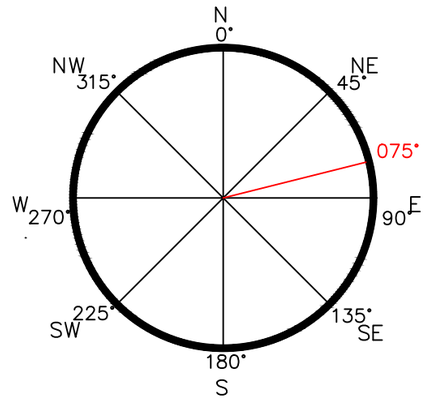
TRENCH: (SECTION & PLAN)




| No: | Type of Service: | Diameter (in mm) | Depth to Top of Service (m) | Distance to Centre of Service (m) | Details/Comments |
|---|---|---|---|---|---|
| 01 | | | | | |
| 02 | | | | | |
| 03 | | | | | |
| 04 | | | | | |
| 05 | | | | | |
| 06 | | | | | |
| 07 | | | | | |
| 08 | | | | | |
| 09 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |

TRENCH – ORIENTATION




TRENCH ORIENTATED : 075° FROM NORTH

COORDINATES: DATUM

EASTING: - 325308.102

NORTHING: - 173119.002

ELEVATION: - 2.509

TRENCH LENGTH (m) :8.00

TRENCH DEPTH (m) : 1.60

TRENCH WIDTH (m) : 1.50

STABILITY: Stable

GROUNDWATER: None

SCALE: NTS@A3

DRAWN: BS

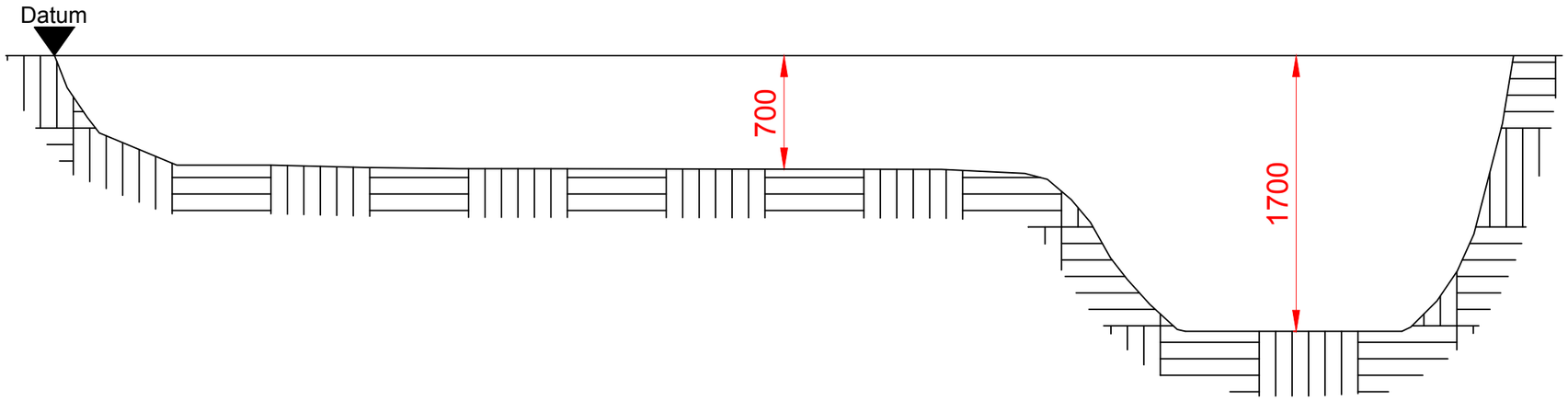
CHECKED: PMM

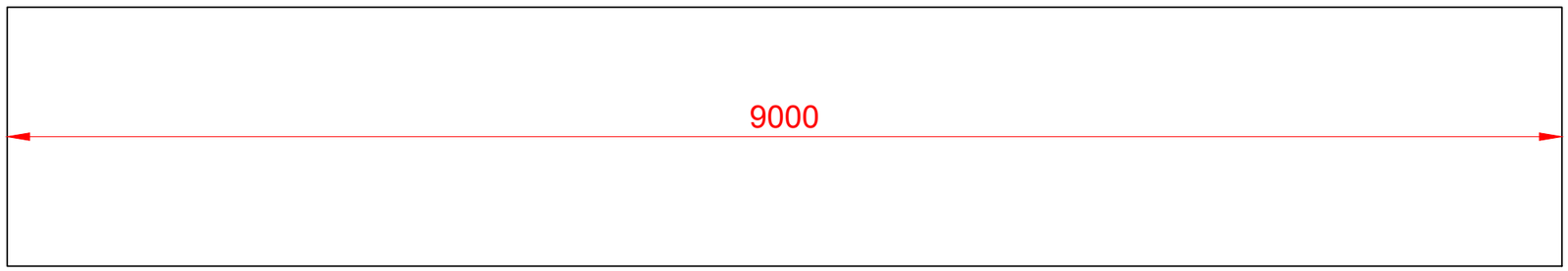
DATE EXCAVATED: 15/01/2018

CAUSEWAY GEOTECH

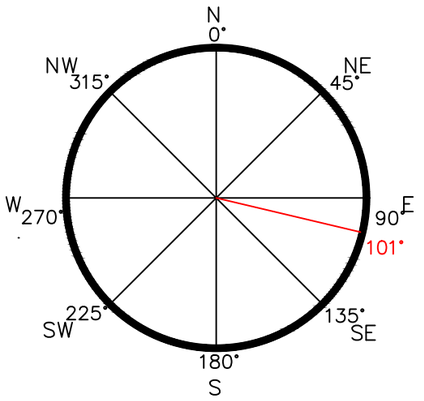
| JOB NUMBER: 17-1455 | JOB NAME: Arklow WWTP Land GI | | LOCATION: ST07 |
|---|---|---|---|
| CLIENT: Irish Water | CLIENTS REPRESENTATIVE: Byrne Looby ARUP JV | CREW: ST | PLANT & EQUIPMENT 3 Tonne Excavator & Hand Tools |

TRENCH: (SECTION & PLAN)




TRENCH – ORIENTATION




TRENCH ORIENTATED : 101° FROM NORTH

COORDINATES: DATUM

EASTING: - 325292.134

NORTHING: - 173196.780

ELEVATION: - 2.452

| No: | Type of Service: | Diameter (in mm) | Depth to Top of Service (m) | Distance to Centre of Service (m) | Details/Comments |
|---|---|---|---|---|---|
| 01 | | | | | |
| 02 | | | | | |
| 03 | | | | | |
| 04 | | | | | |
| 05 | | | | | |
| 06 | | | | | |
| 07 | | | | | |
| 08 | | | | | |
| 09 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |

TRENCH LENGTH (m) :9.00

TRENCH DEPTH (m) : 1.70

TRENCH WIDTH (m) : 1.50

STABILITY: Stable

GROUNDWATER: None

SCALE: NTS@A3

DRAWN: BS

CHECKED: PMM

DATE EXCAVATED: 12/01/2018

CAUSEWAY GEOTECH

CAUSEWAY GEOTECH

# APPENDIX G

## Variable Head Test Results



# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455
Arklow WwTW Land GI

BOREHOLE No.: BH02C

TEST No.: 1

DATE: 7-May-18

TYPE OF TEST: ***Falling*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | | (m) | |
| Depth to top of filter below ground level (m): | *2.20* | (m) | |
| Depth to bottom of filter below ground level (m): | *9.70* | (m) | |
| Diameter of filter (D): | *200* | (mm) | |
| Standing ground water level SWL (mbgl): | *1.53* | (m) | on: 7-May-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 0.00 | 1.53 | 1.0000 |

**CALCULATION OF PERMEABILITY OF SOIL:**

**Added 300L of water from bowser over 10min period**
**No rise in water level observed**
**Water level remained at 1.52mbgl**

**TEST FAILED**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455
Arklow WwTW Land GI

BOREHOLE No.: BH04

TEST No.: 1

DATE: 7-May-18

TYPE OF TEST: ***Falling*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | | (m) | |
| Depth to top of filter below ground level (m): | *4.30* | (m) | |
| Depth to bottom of filter below ground level (m): | *10.70* | (m) | |
| Diameter of filter (D): | *250* | (mm) | |
| Standing ground water level SWL (mbgl): | *2.29* | (m) | on: 7-May-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 0.00 | 2.29 | 1.0000 |

**CALCULATION OF PERMEABILITY OF SOIL:**

**Added 300L of water from bowser over 10min period**
**No rise in water level observed**
**Water level remained at 2.29mbgl**

**TEST FAILED**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455
Arklow WwTW Land GI

BOREHOLE No.: BH05

TEST No.: 1

DATE: 7-May-18

TYPE OF TEST: ***Falling*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | | (m) | |
| Depth to top of filter below ground level (m): | *3.40* | (m) | |
| Depth to bottom of filter below ground level (m): | *9.40* | (m) | |
| Diameter of filter (D): | *250* | (mm) | |
| Standing ground water level SWL (mbgl): | *2.65* | (m) | on: 7-May-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 0.00 | 2.65 | 1.0000 |

**CALCULATION OF PERMEABILITY OF SOIL:**

**Added 300L of water from bowser over 10min period**
**No rise in water level observed**
**Water level remained at 2.65mbgl**

**TEST FAILED**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455
Arklow WwTW Land GI

BOREHOLE No.: BH07B

TEST No.: 1

DATE: 7-May-18

TYPE OF TEST: ***Falling*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | *0* | (m) | |
| Depth to top of filter below ground level (m) | *3.00* | (m) | |
| Depth to bottom of filter below ground level (m) | *10.70* | (m) | |
| Diameter of filter (D): | *200* | (mm) | |
| Standing ground water level SWL (mbgl): | *3.00* | (m) | on: 7-May-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 0.00 | 3.00 | 1.0000 |

**CALCULATION OF PERMEABILITY OF SOIL:**

**Added 300L of water from bowser over 10min period**
**No rise in water level observed**
**Water level remained at 2.99mbgl**

**TEST FAILED**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455
Arklow WwTW Land GI

BOREHOLE No.: BH10B

TEST No.: 1

DATE: 7-May-18

TYPE OF TEST: ***Falling*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | *0* | (m) | |
| Depth to top of filter below ground level (m) | *3.30* | (m) | |
| Depth to bottom of filter below ground level (m) | *10.20* | (m) | |
| Diameter of filter (D): | *200* | (mm) | |
| Standing ground water level SWL (mbgl): | *2.44* | (m) | on: 7-May-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 0.00 | 2.44 | 1.0000 |

**CALCULATION OF PERMEABILITY OF SOIL:**

**Added 300L of water from bowser over 10min period**
**No rise in water level observed**
**Water level remained at 2.44mbgl**

**TEST FAILED**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455 Arklow WwTW Land GI

BOREHOLE No.: BH14

TEST No.: 1

DATE: 24-Apr-18

TYPE OF TEST: ***Rising*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | | (m) | |
| Depth to top of filter below ground level (m) | *2.00* | (m) | |
| Depth to bottom of filter below ground level (m) | *14.00* | (m) | |
| Diameter of filter (D): | *150* | (mm) | |
| Standing ground water level SWL (mbgl): | *1.96* | (m) | on: 24-Apr-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 2.01 | 0.05 | 1.0000 |
| 0.5 | 2.01 | 0.05 | 1.0000 |
| 1 | 2.01 | 0.05 | 1.0000 |
| 1.5 | 2.00 | 0.04 | 0.8000 |
| 2 | 2.00 | 0.04 | 0.8000 |
| 2.5 | 1.99 | 0.03 | 0.6000 |
| 3 | 1.99 | 0.03 | 0.6000 |
| 3.5 | 1.99 | 0.03 | 0.6000 |
| 4 | 1.99 | 0.03 | 0.6000 |
| 4.5 | 1.99 | 0.03 | 0.6000 |
| 5 | 1.98 | 0.02 | 0.4000 |
| 6 | 1.98 | 0.02 | 0.4000 |
| 7 | 1.98 | 0.02 | 0.4000 |
| 8 | 1.97 | 0.01 | 0.2000 |
| 9 | 1.97 | 0.01 | 0.2000 |
| 10 | 1.96 | 0.00 | 0.0000 |

**Whale pump ran for 20mins**
**Removed 400L of water from standpipe**
**Test started at end of 20min pumping period**

## CALCULATION OF PERMEABILITY OF SOIL:

Employing Hvorslev formula: k = A/FT
where:

k is the permeability of soil
A is the cross-section area of standpipe
F is the intake factor (see below)
T is the basic time lag factor as defined in Figure 9 of BS 5930:1981 (page 38)

Values of intake factors (F/D) for various cylindrical intake zones of length to diameter ratio (L/D) are given in Figure 8 of BS 5930:1981 (p37); also Dunn and Razouki formula:

F/D = 2.32*PI*(L/D)/loge[1.1*(L/D)+{1+1.1*(L/D)^2}^0.5]

L/D ratio = 80.00 thus F/D= 113.29
i.e. F = 16.99 (m)
and A = 0.00196 (m^2)
and T = 8.03 mins
(see graph of log H/Ho v Time.)

hence, k = **2.4E-07** **m/s**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455
Arklow WwTW Land GI

BOREHOLE No.: BH14

TEST No.: 1

DATE: 24-Apr-18

TYPE OF TEST: ***Falling*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | | (m) | |
| Depth to top of filter below ground level (m): | *2.00* | (m) | |
| Depth to bottom of filter below ground level (m): | *14.00* | (m) | |
| Diameter of filter (D): | *150* | (mm) | |
| Standing ground water level SWL (mbgl): | *1.96* | (m) | on: 24-Apr-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 0.00 | 1.96 | 1.0000 |

**CALCULATION OF PERMEABILITY OF SOIL:**

**Added 400L of water from bowser over 14min period**
**No rise in water level observed**
**Water level remained at 1.96mbgl**

**TEST FAILED**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455 Arklow WwTW Land GI

BOREHOLE No.: BH15D

TEST No.: 1

DATE: 24-Apr-18

TYPE OF TEST: ***Rising*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | | (m) | |
| Depth to top of filter below ground level (m) | *2.50* | (m) | |
| Depth to bottom of filter below ground level (m) | *16.15* | (m) | |
| Diameter of filter (D): | *150* | (mm) | |
| Standing ground water level SWL (mbgl): | *1.82* | (m) | on: 24-Apr-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 1.90 | 0.08 | 1.0000 |
| 0.5 | 1.87 | 0.05 | 0.6250 |
| 1 | 1.86 | 0.04 | 0.5000 |
| 1.5 | 1.86 | 0.04 | 0.5000 |
| 2 | 1.85 | 0.03 | 0.3750 |
| 2.5 | 1.85 | 0.03 | 0.3750 |
| 3 | 1.84 | 0.02 | 0.2500 |
| 3.5 | 1.84 | 0.02 | 0.2500 |
| 4 | 1.84 | 0.02 | 0.2500 |
| 4.5 | 1.84 | 0.02 | 0.2500 |
| 5 | 1.84 | 0.02 | 0.2500 |
| 6 | 1.84 | 0.02 | 0.2500 |
| 7 | 1.84 | 0.02 | 0.2500 |
| 8 | 1.84 | 0.02 | 0.2500 |
| 9 | 1.83 | 0.01 | 0.1250 |
| 10 | 1.83 | 0.01 | 0.1250 |
| 12 | 1.83 | 0.01 | 0.1250 |
| 14 | 1.83 | 0.01 | 0.1250 |
| 16 | 1.83 | 0.01 | 0.1250 |
| 18 | 1.82 | 0.00 | 0.0000 |

**Whale pump ran for 20mins**
**Removed 400L of water from standpipe**
**Test started at end of 20min pumping period**

## CALCULATION OF PERMEABILITY OF SOIL:

Employing Hvorslev formula: k = A/FT
where:

k is the permeability of soil
A is the cross-section area of standpipe
F is the intake factor (see below)
T is the basic time lag factor as defined in Figure 9 of BS 5930:1981 (page 38)

Values of intake factors (F/D) for various cylindrical intake zones of length to diameter ratio (L/D) are given in Figure 8 of BS 5930:1981 (p37); also Dunn and Razouki formula:

F/D = 2.32*PI*(L/D)/loge[1.1*(L/D)+{1+1.1*(L/D)^2}^0.5]

L/D ratio = 91.00 thus F/D= 125.72
i.e. F = 18.86 (m)
and A = 0.00196 (m^2)
and T = 1.02 mins
(see graph of log H/Ho v Time.)

hence, k = **1.7E-06** **m/s**

***Causeway Geotech Ltd***

# VARIABLE HEAD PERMEABILITY TEST (STANDPIPE PIEZOMETER)

PROJECT: 17-1455 Arklow WwTW Land GI

BOREHOLE No.: BH15D

TEST No.: 1

DATE: 24-Apr-18

TYPE OF TEST: ***Falling*** HEAD

| | | | |
|---|---|---|---|
| Diameter of standpipe (d): | *50* | (mm) | |
| Depth to centre of piezo. tip below ground level (m) | | (m) | |
| Depth to top of filter below ground level (m): | *2.50* | (m) | |
| Depth to bottom of filter below ground level (m): | *16.15* | (m) | |
| Diameter of filter (D): | *150* | (mm) | |
| Standing ground water level SWL (mbgl): | *1.82* | (m) | on: 24-Apr-18 |

| TIME ELAPSED (mins) | WATER LEVEL (mbgl) | HEAD H (m) | HEAD RATIO (H/Ho) |
|---|---|---|---|
| 0 | 0.00 | 1.82 | 1.0000 |

**CALCULATION OF PERMEABILITY OF SOIL:**

**Added 400L of water from bowser over 14min period**
**No rise in water level observed**
**Water level remained at 1.82mbgl**

**TEST FAILED**

***Causeway Geotech Ltd***

CAUSEWAY GEOTECH

# APPENDIX H

## Groundwater Monitoring Results



| BH | Mon 22/01/18 | | Tues 23/01/18 | | Wed 24/01/18 | | Thurs 25/01/18 | | Fri 26/01/18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) |
| BH19 | X | | X | | X | | X | | IN | |
| BH19 (g) | X | | X | | X | | X | | IN | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| BH | Mon 29/01/18 | | Tues 30/01/18 | | Wed 31/01/18 | | Thurs 01/02/18 | | Fri 02/02/18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) |
| BH19 | | | | | 08:20 | 3.20 | | | | |
| BH19 (g) | | | | | 08:21 | 1.20 | | | | |
| BH02C | IN | | | | 08:35 | 3.34 | | | | |
| BH01 | X | | IN | | 10:00 | 2.90 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| BH | Mon 05/02/18 | | Tues 06/02/18 | | Wed 07/02/18 | | Thurs 08/02/18 | | Fri 09/02/18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) |
| BH19 | | | | | 14:43 | 2.67 | | | | |
| BH19 (g) | | | | | 14:44 | 1.15 | | | | |
| BH02C | | | | | 14:08 | 2.46 | | | | |
| BH01 | | | | | 14:28 | 2.60 | | | | |
| BH03 | X | | IN | | 14:36 | 3.03 | | | | |
| BH20 | X | | X | | X | | IN | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| BH | Mon 12/02/18 | | Tues 13/02/18 | | Wed 14/02/18 | | Thurs 15/02/18 | | Fri 16/02/18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) |
| BH19 | | | | | 13:56 | 1.78 | | | | |
| BH19 (g) | | | | | 13:57 | 1.10 | | | | |
| BH02C | | | | | 13.32 | 2.52 | | | | |
| BH01 | | | | | 13:39 | 2.68 | | | | |
| BH03 | | | | | 13:44 | 2.77 | | | | |
| BH20 | | | | | 13:26 | 2.76 | | | | |
| BH06A | X | | IN | | 13:20 | 2.79 | | | | |
| BH17 | X | | IN | | 13:49 | 2.73 | | | | |
| BH04 | X | | X | | X | | IN | | | |
| BH07B | X | | X | | X | | IN | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| BH | Mon 19/02/18 | | Tues 20/02/18 | | Wed 21/02/18 | | Thurs 22/02/18 | | Fri 23/02/18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) |
| BH19 | | | | | 14:51 | 1.54 | | | | |
| BH19 (g) | | | | | 14:52 | 1.05 | | | | |
| BH02C | | | | | 14:34 | 2.36 | | | | |
| BH01 | | | | | 14:37 | 2.58 | | | | |
| BH03 | | | | | 14:39 | 2.66 | | | | |
| BH20 | | | | | 14:30 | 2.61 | | | | |
| BH06A | | | | | 14:25 | 2.68 | | | | |
| BH17 | | | | | 14:43 | 2.67 | | | | |
| BH04 | | | | | 14:28 | 2.66 | | | | |
| BH07B | | | | | 14:45 | 2.75 | | | | |
| BH18 | IN | | | | 14:47 | 2.61 | | | | |
| BH11 | X | | IN | | 14:55 | 1.89 | | | | |
| BH11 (g) | X | | IN | | 15:46 | 1.65 | | | | |
| BH10B | X | | X | | IN | | | | | |
| BH10B (g) | X | | X | | IN | | | | | |
| BH09 | X | | X | | X | | IN | | | |
| BH08 | X | | X | | X | | X | | IN | |
| BH05 | X | | X | | X | | X | | IN | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| BH | Mon 26/02/18 | | Tues 27/02/18 | | Wed 28/02/18 | | Thurs 01/03/18 | | Fri 02/03/18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) | time | depth (m) |
| BH19 | 15:25 | 2.49 | | | | | | | | |
| BH19 (g) | 15:26 | 1.15 | | | | | | | | |
| BH02C | 14:58 | 2.50 | | | | | | | | |
| BH01 | 14:59 | 2.92 | | | | | | | | |
| BH03 | 15:06 | 2.93 | | | | | | | | |
| BH20 | 14:54 | 2.60 | | | | | | | | |
| BH06A | 14:46 | 2.86 | | | | | | | | |
| BH17 | 15:13 | 2.87 | | | | | | | | |
| BH04 | 14:51 | 2.73 | | | | | | | | |
| BH07B | 15:16 | 2.82 | | | | | | | | |
| BH18 | 15:19 | 2.81 | | | | | | | | |
| BH11 | 14:35 | 2.36 | | | | | | | | |
| BH11 (g) | 14:36 | 1.65 | | | | | | | | |
| BH10B | 14:30 | 2.32 | | | | | | | | |
| BH10B (g) | 14:31 | Dry | | | | | | | | |
| BH09 | 15:21 | 2.33 | | | | | | | | |
| BH08 | 14:40 | 2. 59 | | | | | | | | |
| BH05 | 15:10 | 2.89 | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

## Groundwater Monitoring Results - FIRST Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential - ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH01 | 14 | 09.04.2018 | 14:00 | 2.25 | 12.63 | -58.60 | 28.40 | 2.77 | "24.90" | 11.41 | 14.51 | N | 14 | |
| | | | | | 12.77 | -81.20 | 24.20 | 2.35 | "25.12" | 11.40 | 14.51 | N | 21 | |
| | | | | | 12.84 | -60.80 | 48.10 | 4.71 | "21.42" | 11.00 | 14.52 | N | 28 | |
| | | | | | 12.85 | -60.10 | 46.50 | 4.21 | "21.67" | 11.10 | 14.52 | N | 35 | |
| | | | | | **12.92** | **-71.90** | **39.10** | **3.95** | **"21.41"** | **11.02** | **14.53** | **N** | **42** | 3 well volumes removed |
| BH02C | 13 | 09.04.2018 | 13:30 | 2.10 | 12.73 | -11.60 | 31.20 | 3.01 | "32.42" | 10.67 | 14.50 | N | 13 | |
| | | | | | 12.90 | -119.40 | 28.40 | 2.73 | "32.61" | 10.68 | 14.51 | N | 19 | |
| Diver in 12:19 | | | | | 13.01 | -50.40 | 84.80 | 8.30 | "26.33" | 10.30 | 14.51 | N | 26 | |
| (10/04/2018) | | | | | 13.02 | -49.00 | 72.60 | 7.18 | "26.23" | 10.33 | 14.51 | N | 32 | |
| | | | | | **13.13** | **-48.50** | **70.50** | **7.10** | **"26.15"** | **10.32** | **14.51** | **N** | **39** | 3 well volumes removed |
| BH03 | - | 10.04.2018 | 12:50 | 2.60 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH04 | - | 10.04.2018 | 12:46 | 2.69 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH05 | 13 | 09.04.2018 | 14:20 | 2.85 | 7.91 | 134.60 | 29.70 | 3.14 | "13.27" | 9.83 | 14.51 | N | 13 | |
| | | | | | 7.29 | 186.10 | 25.70 | 2.72 | "13.43" | 9.86 | 14.50 | N | 19 | |
| | | | | | 7.27 | 206.90 | 14.50 | 1.56 | 6883 | 9.52 | 14.50 | N | 26 | |
| | | | | | 7.18 | 209.50 | 9.30 | 1.01 | 6805 | 9.52 | 14.50 | N | 32 | |
| | | | | | **7.00** | **236.00** | **18.80** | **1.97** | **9466** | **9.66** | **14.50** | **N** | **39** | 3 well volumes removed |
| BH06A | 14 | 09.04.2018 | 12:30 | 2.40 | 6.92 | 269.10 | 25.70 | 2.65 | "21.91" | 9.80 | 14.56 | N | 14 | |
| | | | | | 6.62 | 284.10 | 26.00 | 2.75 | 6595 | 10.39 | 14.56 | N | 21 | |
| | | | | | 6.50 | 297.40 | 29.40 | 3.11 | 3722 | 10.58 | 14.56 | N | 28 | |
| | | | | | 6.50 | 302.60 | 31.70 | 3.46 | 4588 | 10.38 | 14.55 | N | 35 | |
| | | | | | **6.67** | **250.60** | **23.70** | **2.48** | **9553** | **10.40** | **14.56** | **N** | **42** | 3 well volumes removed |
| BH07B | - | 10.04.2018 | 13:00 | 2.73 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH08 | 16 | 09.04.2018 | 12:05 | 2.25 | 7.06 | 318.70 | 19.60 | 1.91 | "30.50" | 10.32 | 14.60 | N | 16 | |
| | | | | | 7.41 | 298.00 | 20.90 | 2.12 | 1355 | 10.89 | 14.55 | N | 20 | |
| Diver in 12:00 | | | | | 7.12 | 303.70 | 28.20 | 3.06 | 1231 | 11.08 | 14.56 | N | 24 | |
| (10/04/2018) | | | | | 7.03 | 305.30 | 39.40 | 4.14 | 1211 | 11.26 | 14.55 | N | 28 | |
| | | | | | 6.98 | 306.50 | 30.90 | 3.25 | 1204 | 11.58 | 14.56 | N | 32 | |
| | | | | | 6.97 | 307.60 | 35.00 | 3.69 | 1187 | 11.68 | 14.57 | N | 36 | |
| | | | | | 6.94 | 308.60 | 30.40 | 3.24 | 1180 | 11.58 | 14.57 | N | 42 | |
| | | | | | **6.94** | **307.50** | **36.30** | **3.91** | **1177** | **11.08** | **14.58** | **N** | **48** | 3 well volumes removed |

## Groundwater Monitoring Results - FIRST Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential - ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH09 | - | 10.04.2018 | 13:03 | 2.28 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH10B | 14 | 09.04.2018 | 10:40 | 2.00 | 7.16 | 226.90 | 16.60 | 1.89 | 1934 | 9.10 | 14.55 | N | 7 | |
| | | | | (Gas - 1.60) | 7.22 | 225.00 | 26.40 | 2.93 | 1161 | 10.01 | 14.54 | N | 14 | |
| | | | | | 7.11 | 268.50 | 17.10 | 1.84 | 1233 | 10.39 | 14.54 | N | 21 | |
| | | | | | 6.76 | 268.60 | 14.10 | 1.55 | 1589 | 10.26 | 14.54 | N | 28 | |
| | | | | | 6.88 | 247.60 | 4.40 | 0.47 | 1598 | 10.26 | 14.54 | N | 35 | |
| | | | | | **6.9** | **240.10** | **4.20** | **0.46** | **1602** | **10.26** | **14.54** | **N** | **42** | 3 well volumes removed |
| BH11 | 17 | 09.04.2018 | 11:05 | 1.65 | 6.82 | 313.80 | 25.60 | 2.70 | "18.27" | 9.51 | 14.56 | N | 8 | |
| | | | | (Gas - 1.65) | 6.82 | 310.60 | 22.40 | 2.36 | 4232 | 11.72 | 14.57 | N | 17 | |
| | | | | | 6.79 | 311.80 | 20.80 | 2.16 | 7224 | 11.83 | 14.59 | N | 23 | |
| | | | | | 6.71 | 305.20 | 12.00 | 1.23 | 4089 | 11.34 | 14.58 | N | 28 | |
| | | | | | 6.69 | 309.10 | 13.50 | 1.40 | 6453 | 11.50 | 14.59 | N | 34 | |
| | | | | | 6.64 | 309.10 | 8.00 | 0.81 | 7548 | 11.47 | 14.60 | N | 40 | |
| | | | | | 6.59 | 304.30 | 10.10 | 1.38 | 7429 | 11.45 | 14.60 | N | 45 | |
| | | | | | **6.64** | **293.10** | **8.10** | **0.82** | **7132** | **11.46** | **14.60** | **N** | **51** | 3 well volumes removed |
| BH14 | 24 | 09.04.2018 | 16:31 | 2.00 | 8.45 | 261.40 | 20.00 | 2.05 | 3985 | 11.91 | 14.47 | N | 24 | |
| | | | | | 8.04 | 274.50 | 15.50 | 1.62 | 4031 | 11.92 | 14.47 | N | 36 | |
| | | | | | 7.84 | 274.30 | 21.70 | 2.22 | 3622 | 12.01 | 14.47 | N | 48 | |
| | | | | | 7.73 | 269.60 | 18.50 | 1.92 | 3589 | 12.08 | 14.48 | N | 60 | |
| | | | | | 7.62 | 266.10 | 20.70 | 2.02 | 4025 | 12.48 | 14.49 | N | 72 | |
| | | | | | 7.54 | 258.40 | 19.00 | 1.95 | 4030 | 12.52 | 14.49 | N | 84 | |
| | | | | | **7.49** | **236.60** | **18.60** | **1.93** | **3590** | **12.43** | **14.49** | **N** | **96** | 4 well volumes removed |
| BH15D | 21 | 09.04.2018 | 17:20 | 2.13 | 7.63 | 293.80 | 14.90 | 1.53 | 2183 | 12.43 | 14.45 | N | 21 | |
| | | | | | 7.45 | 296.80 | 12.00 | 1.24 | 2198 | 12.47 | 14.46 | N | 31 | |
| | | | | | 7.34 | 295.10 | 10.70 | 1.06 | 2875 | 12.48 | 14.46 | N | 42 | |
| | | | | | 7.31 | 287.00 | 7.90 | 0.81 | 2883 | 12.60 | 14.46 | N | 52 | |
| | | | | | 7.31 | 282.30 | 12.60 | 1.23 | 2819 | 12.53 | 14.46 | N | 63 | |
| | | | | | 7.30 | 282.60 | 11.50 | 1.19 | 2914 | 12.56 | 14.46 | N | 73 | |
| | | | | | **7.38** | **286.70** | **10.70** | **1.11** | **2778** | **12.52** | **14.46** | **N** | **84** | 4 well volumes removed |
| BH17 | 14 | 09.04.2018 | 14:40 | 2.85 | 7.24 | 251.10 | 32.50 | 3.45 | "12.30" | 9.77 | 14.48 | N | 14 | |
| | | | | | 7.29 | 255.00 | 35.80 | 3.87 | 6049 | 9.28 | 14.47 | N | 21 | |
| | | | | | 7.23 | 260.50 | 32.50 | 3.58 | 6016 | 9.28 | 14.48 | N | 28 | |
| | | | | | 7.24 | 273.90 | 41.20 | 4.50 | 6287 | 9.31 | 14.48 | N | 35 | |
| | | | | | **7.19** | **276.60** | **38.00** | **4.19** | **6288** | **9.33** | **14.48** | **N** | **42** | 3 well volumes removed |

## Groundwater Monitoring Results - FIRST Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential - ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH18 | 13 | 09.04.2018 | 15:42 | 2.34 | 7.76 | 251.20 | 44.20 | 4.64 | "17.64" | 9.66 | 14.47 | N | 13 | |
| | | | | | 7.69 | 248.20 | 43.50 | 4.56 | "17.63" | 9.63 | 14.46 | N | 19 | |
| Diver in 12:33 | | | | | 8.02 | 234.20 | 66.20 | 7.45 | 3661 | 8.97 | 14.46 | N | 26 | |
| (10/04/2018) | | | | | 7.93 | 246.50 | 66.50 | 7.48 | 3457 | 8.92 | 14.46 | N | 32 | |
| | | | | | 7.96 | 249.80 | 63.20 | 7.12 | 2370 | 8.82 | 14.46 | N | 39 | |
| | | | | | **7.93** | **254.80** | **62.40** | **7.06** | **2338** | **8.83** | **14.46** | **N** | **42** | 4 well volumes removed |
| BH19 | 14 | 09.04.2018 | 16:00 | 1.40 | 11.99 | 20.90 | 26.20 | 2.80 | 6092 | 10.65 | 14.47 | N | 14 | |
| | | | | (Gas - 1.25) | 12.06 | 46.50 | 20.60 | 2.20 | 6094 | 10.66 | 14.47 | N | 21 | |
| | | | | | 12.14 | 28.00 | 33.50 | 3.37 | "11.09" | 11.10 | 14.47 | N | 28 | |
| | | | | | 12.18 | 16.60 | 27.70 | 2.85 | "11.11" | 11.13 | 14.47 | N | 35 | |
| | | | | | 11.46 | 47.00 | 10.80 | 1.07 | 5790 | 11.07 | 14.47 | N | 42 | |
| | | | | | 11.34 | 41.00 | 4.30 | 0.44 | 5662 | 11.07 | 14.48 | N | 49 | |
| | | | | | **11.31** | **37.40** | **3.50** | **0.37** | **5647** | **11.08** | **14.48** | **N** | **56** | 4 well volumes removed |
| BH20 | 14 | 09.04.2018 | 13:00 | 2.40 | 7.08 | 261.30 | 38.20 | 3.76 | "26.57" | 10.54 | 15.54 | N | 14 | |
| | | | | | 6.81 | 254.70 | 28.60 | 3.09 | 3365 | 10.34 | 14.53 | N | 21 | |
| Diver in 12:27 | | | | | 6.21 | 270.60 | 23.50 | 2.49 | 5506 | 10.47 | 13.52 | N | 28 | |
| (10/04/2018) | | | | | 6.92 | 258.40 | 29.10 | 3.22 | 3311 | 10.33 | 14.53 | N | 35 | |
| | | | | | **6.11** | **269.70** | **19.80** | **2.01** | **4650** | **10.43** | **14.52** | **N** | **42** | 3 well volumes removed |
| SW1 (LW) | | 09.04.2018 | 10:00 | - | 7.46 | 323.70 | 78.15 | 8.54 | "120" | 8.91 | 14.72 | - | - | |
| SW1 (HW) | | 09.04.2018 | 17:50 | - | 7.44 | 278.40 | 85.12 | 9.84 | "280" | 8.63 | 14.45 | - | - | |
| SW2 (LW) | | 09.04.2018 | 10:10 | - | 7.45 | 304.80 | 72.10 | 8.04 | "130" | 8.92 | 14.72 | - | - | |
| SW2 (HW) | | 09.04.2018 | 17:55 | - | 7.43 | 198.40 | 83.20 | 9.62 | "285" | 8.59 | 14.46 | - | - | |
| SW3 (LW) | | 09.04.2018 | 10:20 | - | 7.46 | 280.30 | 71.40 | 8.32 | "115" | 8.89 | 14.73 | - | - | |
| SW3 (HW) | | 09.04.2018 | 18:00 | - | 7.44 | 202.40 | 88.40 | 10.22 | "265" | 8.58 | 14.46 | - | - | |
| SW4 (LW) | | 09.04.2018 | 10:30 | - | 8.52 | 257.00 | 77.70 | 8.67 | "110" | 9.15 | 14.73 | - | - | |
| SW4 (HW) | | 09.04.2018 | 18:05 | - | 8.56 | 214.50 | 86.20 | 9.97 | "527" | 9.09 | 14.47 | - | - | |
| SW5 (LW) | | 10.04.2018 | 12:45 | - | 7.28 | 263.40 | 78.10 | 8.85 | "101" | 8.37 | 14.47 | - | - | |
| SW5 (HW) | | 10.04.2018 | 07:20 | - | 7.70 | 268.40 | 78.30 | 8.72 | "345" | 8.46 | 14.46 | - | - | |
| SW6 (LW) | | 10.04.2018 | 12:55 | - | 7.33 | 260.40 | 71.90 | 8.20 | "107" | 8.38 | 14.48 | - | - | |
| SW6 (HW) | | 10.04.2018 | 07:30 | - | 7.93 | 247.00 | 77.40 | 8.73 | "409" | 8.48 | 14.46 | - | - | |
| SW7 (LW) | | 10.04.2018 | 13:05 | - | 7.43 | 263.60 | 72.70 | 8.28 | "107" | 8.37 | 14.48 | - | - | |
| SW7 (HW) | | 10.04.2018 | 07:40 | - | 6.99 | 284.10 | 77.00 | 8.57 | "440" | 8.48 | 14.46 | - | - | |
| SW8 (LW) | | 10.04.2018 | 13:15 | - | 7.57 | 253.50 | 73.90 | 8.35 | "108" | 8.42 | 14.48 | - | - | |
| SW8 (HW) | | 10.04.2018 | 07:50 | - | 6.99 | 284.60 | 68.50 | 7.79 | "691" | 8.74 | 14.47 | - | - | |

## Groundwater Monitoring Results - SECOND Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential -ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH01 | 14 | 23/04/2018 | 14:38 | 2.63 | 12.83 | -36.40 | 34.70 | 3.26 | "21.04" | 9.24 | 14.63 | N | 14 | |
| | | | | | 12.76 | -38.91 | 35.22 | 3.38 | "24.32" | 9.55 | 14.63 | N | 21 | |
| | | | | | 12.64 | -32.62 | 38.20 | 4.38 | "28.51" | 10.31 | 14.62 | N | 28 | |
| | | | | | 12.82 | -40.46 | 34.84 | 4.04 | "22.14" | 10.21 | 14.62 | N | 35 | |
| | | | | | **13.45** | **-53.34** | **32.90** | **2.84** | **"19.63"** | **10.12** | **14.62** | **N** | **42** | 3 well volumes removed |
| BH02C | 12 | 23/04/2018 | 14:11 | 2.24 | 12.84 | -95.30 | 48.20 | 4.82 | "22.06" | 9.90 | 14.63 | N | 12 | |
| | | | | | 12.99 | -88.81 | 42.67 | 4.22 | "21.20 | 10.01 | 14.62 | N | 18 | |
| Diver out 14:12 | | | | | 13.31 | -63.20 | 36.40 | 3.34 | "21.80" | 10.10 | 14.62 | N | 24 | |
| Diver in 14:34 | | | | | 13.36 | -100.03 | 36.89 | 4.01 | "19.30" | 10.25 | 14.62 | N | 30 | |
| | | | | | **13.24** | **-126.80** | **37.70** | **4.16** | **"18.36"** | **10.35** | **14.63** | **N** | **36** | 3 well volumes removed |
| BH03 | - | 23/04/2018 | 15:32 | 2.82 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH04 | - | 23/04/2018 | 14:08 | 2.91 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH05 | 13 | 23/04/2018 | 15:36 | 2.53 | 7.31 | 264.30 | 33.60 | 4.24 | "25.18" | 12.31 | 14.62 | N | 13 | |
| | | | | | 7.28 | 262.19 | 34.11 | 4.34 | "26.54" | 11.54 | 14.62 | N | 20 | |
| | | | | | 7.22 | 252.20 | 34.91 | 3.86 | "28.61" | 10.16 | 14.62 | N | 26 | |
| | | | | | 7.27 | 245.38 | 38.32 | 3.91 | "29.01" | 10.78 | 14.64 | N | 33 | |
| | | | | | **7.36** | **238.60** | **43.21** | **4.71** | **"22.35"** | **11.68** | **14.65** | **N** | **39** | 3 well volumes removed |
| BH06A | 14 | 23/04/2018 | 13:34 | 2.64 | 7.50 | 176.00 | 34.30 | 3.24 | 3563 | 10.76 | 14.65 | N | 14 | |
| | | | | | 7.46 | 188.43 | 35.02 | 3.67 | 4356 | 10.68 | 14.64 | N | 21 | |
| | | | | | 7.43 | 236.40 | 36.80 | 4.11 | 6624 | 10.61 | 14.64 | N | 28 | |
| | | | | | 7.33 | 222.78 | 39.54 | 4.13 | 6721 | 10.78 | 14.65 | N | 35 | |
| | | | | | **7.21** | **218.10** | **43.20** | **4.77** | **6231** | **10.93** | **14.65** | **N** | **42** | 3 well volumes removed |
| BH07B | - | 23/04/2018 | 16:35 | 2.87 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH08 | 16 | 23/04/2018 | 13:08 | 2.51 | 7.81 | 184.00 | 31.20 | 3.19 | 2483 | 10.83 | 14.64 | N | 16 | |
| | | | | | 7.70 | 179.13 | 35.43 | 3.65 | 4528 | 10.82 | 14.64 | N | 24 | |
| Diver out 13:09 | | | | | 7.54 | 173.00 | 42.60 | 4.34 | 6423 | 10.81 | 14.64 | N | 32 | |
| Diver in 13:21 | | | | | 7.43 | 200.21 | 39.98 | 4.01 | 6892 | 10.89 | 14.65 | N | 40 | |
| | | | | | **7.32** | **241.30** | **38.30** | **3.64** | **7346** | **11.21** | **14.65** | **N** | **48** | 3 well volumes removed |
| BH09 | - | 23/04/2018 | 16:59 | 2.75 | - | - | - | - | - | - | - | - | - | No sampling required |
| BH10B | 14 | 23/04/2018 | 12:48 | 2.24 | 6.98 | 273.80 | 41.10 | 4.42 | 2060 | 10.78 | 14.65 | N | 14 | |
| | | | | (Gas - 1.87) | 6.97 | 234.98 | 38.90 | 3.92 | 4298 | 10.75 | 14.65 | N | 21 | |
| | | | | | 6.96 | 183.80 | 37.50 | 3.73 | 7619 | 10.12 | 14.65 | N | 28 | |
| | | | | | 7.01 | 153.82 | 35.05 | 3.51 | 7372 | 10.93 | 14.65 | N | 35 | |
| | | | | | **7.11** | **146.50** | **33.10** | **3.31** | **7165** | **10.97** | **14.65** | **N** | **42** | 3 well volumes removed |

## Groundwater Monitoring Results - SECOND Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential -ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH11 | 17 | 23/04/2018 | 13:00 | 1.82 | 7.30 | 303.20 | 28.20 | 3.18 | 8513 | 10.62 | 14.65 | N | 17 | |
| | | | | (Gas - 1.81) | 7.42 | 276.34 | 31.30 | 3.76 | 7721 | 10.59 | 14.64 | N | 26 | |
| | | | | | 7.30 | 192.30 | 35.30 | 4.23 | 6534 | 10.56 | 14.64 | N | 34 | |
| | | | | | 7.55 | 155.38 | 34.90 | 3.92 | 6933 | 10.87 | 14.65 | N | 43 | |
| | | | | | **7.60** | **123.80** | **34.60** | **3.86** | **7328** | **11.23** | **14.65** | **N** | **51** | 3 well volumes removed |
| BH14 | 24 | 24/04/2018 | 09:00 | 1.96 | 9.08 | 211.00 | 75.50 | 8.21 | "271" | 10.62 | 14.49 | N | 24 | |
| | | | | | 9.24 | 217.12 | 74.48 | 8.15 | "302" | 10.63 | 14.50 | N | 36 | |
| | | | | | 9.42 | 224.70 | 73.80 | 8.10 | "294" | 10.64 | 14.52 | N | 48 | |
| | | | | | 8.88 | 234.34 | 75.10 | 8.17 | "291" | 10.29 | 14.51 | N | 60 | |
| | | | | | **8.63** | **243.80** | **76.20** | **8.24** | **"306"** | **10.18** | **14.52** | **N** | **72** | 3 well volumes removed |
| BH15D | 22 | 24/04/2018 | 10:00 | 1.82 | 7.88 | 285.50 | 36.40 | 3.82 | 3464 | 11.90 | 14.53 | N | 22 | |
| | | | | | 7.67 | 287.12 | 39.11 | 3.92 | 4012 | 11.56 | 14.52 | N | 33 | |
| | | | | | 7.34 | 286.40 | 43.10 | 3.94 | 4658 | 11.23 | 14.52 | N | 44 | |
| | | | | | 7.30 | 288.86 | 37.78 | 3.85 | 4232 | 11.43 | 14.53 | N | 55 | |
| | | | | | **7.28** | **294.30** | **34.30** | **3.72** | **3851** | **11.64** | **14.54** | **N** | **66** | 3 well volumes removed |
| BH17 | 14 | 23/04/2018 | 16:20 | 2.81 | 9.4 | 172.20 | 33.30 | 2.61 | "34.04" | 11.01 | 14.61 | N | 14 | |
| | | | | | 9.32 | 170.13 | 35.42 | 2.97 | "28.43" | 11.15 | 14.63 | N | 21 | |
| | | | | | 9.21 | 168.30 | 38.20 | 3.00 | "22.63" | 11.35 | 14.65 | N | 28 | |
| | | | | | 8.17 | 148.92 | 42.35 | 3.42 | "23.11" | 11.38 | 14.63 | N | 35 | |
| | | | | | **8.35** | **134.60** | **46.21** | **3.84** | **"24.51"** | **11.41** | **14.63** | **N** | **42** | 3 well volumes removed |
| BH18 | 13 | 23/04/2018 | 14:39 | 2.84 | 9.20 | 174.60 | 36.30 | 3.34 | "16.83" | 11.02 | 14.61 | N | 13 | |
| | | | | | 9.45 | 205.34 | 33.32 | 3.03 | "19.22" | 11.17 | 14.63 | N | 20 | |
| Diver out 16:40 | | | | | 9.34 | 234.40 | 31.80 | 2.82 | "22.45" | 11.31 | 14.67 | N | 26 | |
| Diver in 16:55 | | | | | 8.30 | 228.94 | 37.19 | 3.76 | "22.02" | 11.65 | 14.66 | N | 33 | |
| | | | | | **7.21** | **226.30** | **39.70** | **4.11** | **"21.68"** | **11.81** | **14.65** | **N** | **39** | 3 well volumes removed |
| BH19 | 14 | 23/04/2018 | 17:02 | 1.42 | 13.61 | -82.40 | 45.60 | 4.65 | "22.03" | 9.80 | 14.63 | N | 14 | |
| | | | | (Gas - 1.25) | 13.54 | -78.45 | 44.29 | 4.38 | "21.98" | 9.76 | 14.63 | N | 21 | |
| | | | | | 13.43 | -73.10 | 43.10 | 4.24 | "21.71" | 9.73 | 14.63 | N | 28 | |
| | | | | | 13.12 | -84.28 | 40.65 | 4.08 | "20.28" | 9.70 | 14.63 | N | 35 | |
| | | | | | **13.21** | **-98.40** | **38.60** | **3.89** | **"18.42"** | **9.68** | **14.64** | **N** | **42** | 3 well volumes removed |
| BH20 | 14 | 23/04/2018 | 13:42 | 2.64 | 7.09 | 220.00 | 28.20 | 2.60 | "16.52" | 10.88 | 14.63 | N | 14 | |
| | | | | | 6.91 | 161.76 | 26.14 | 2.45 | "17.11" | 10.87 | 14.63 | N | 21 | |
| Diver out 13:42 | | | | | 6.79 | 138.50 | 4.80 | 0.48 | "17.96" | 10.85 | 14.63 | N | 28 | |
| Diver in 14:05 | | | | | 6.88 | 144.29 | 32.66 | 2.89 | "18.52" | 10.82 | 14.63 | N | 35 | |
| | | | | | **7.20** | **146.30** | **36.20** | **3.26** | **"18.92"** | **10.83** | **14.62** | **N** | **42** | 3 well volumes removed |

## Groundwater Monitoring Results - SECOND Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential -ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| SW1 (LW) | - | 24/04/2018 | 11:00 | - | 8.24 | 256.50 | 78.20 | 7.10 | "49.70" | 9.48 | 14.57 | - | - | |
| SW1 (HW) | - | 24/04/2018 | 16:45 | - | 8.31 | 257.30 | 77.30 | 7.28 | "49.31" | 9.61 | 14.57 | - | - | |
| SW2 (LW) | - | 24/04/2018 | 11:15 | - | 8.25 | 236.20 | 77.30 | 7.05 | "49.67" | 9.21 | 14.58 | - | - | |
| SW2 (HW) | - | 24/04/2018 | 17:00 | - | 8.34 | 252.60 | 77.80 | 7.24 | "49.34" | 9.25 | 14.63 | - | - | |
| SW3 (LW) | - | 24/04/2018 | 11:30 | - | 8.23 | 242.30 | 64.30 | 7.80 | "49.93" | 9.32 | 14.56 | - | - | |
| SW3 (HW) | - | 24/04/2018 | 17:15 | - | 8.24 | 244.30 | 74.30 | 6.91 | "49.86" | 9.82 | 14.58 | - | - | |
| SW4 (LW) | - | 24/04/2018 | 11:45 | - | 9.50 | 170.60 | 73.80 | 8.08 | "669" | 10.28 | 14.54 | - | - | |
| SW4 (HW) | - | 24/04/2018 | 17:30 | - | 9.61 | 178.40 | 78.40 | 9.10 | "856" | 10.38 | 14.56 | - | - | |
| SW5 (LW) | - | 24/04/2018 | 11:55 | - | 9.38 | 222.40 | 73.60 | 8.64 | "241" | 10.26 | 14.50 | - | - | |
| SW5 (HW) | - | 24/04/2018 | 17:40 | - | 9.64 | 210.30 | 70.40 | 9.10 | "214" | 10.81 | 14.51 | - | - | |
| SW6 (LW) | - | 24/04/2018 | 12:05 | - | 9.24 | 156.40 | 73.20 | 8.64 | "752" | 10.45 | 14.56 | - | - | |
| SW6 (HW) | - | 24/04/2018 | 17:50 | - | 9.31 | 158.40 | 78.30 | 7.13 | "405" | 10.61 | 14.57 | - | - | |
| SW7 (LW) | - | 24/04/2018 | 12:15 | - | 9.21 | 183.6 | 81.2 | 8.72 | "660" | 10.34 | 14.56 | - | - | |
| SW7 (HW) | - | 24/04/2018 | 18:00 | - | 9.34 | 172.1 | 83.4 | 7.82 | "745" | 10.21 | 14.56 | - | - | |
| SW8 (LW) | - | 24/04/2018 | 12:25 | - | 9.31 | 200.30 | 75.50 | 8.32 | "278" | 10.20 | 14.50 | - | - | |
| SW8 (HW) | - | 24/04/2018 | 18:10 | - | 9.24 | 208.40 | 74.30 | 9.26 | "263" | 10.51 | 14.50 | - | - | |

## Groundwater Monitoring Results - THIRD Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential - ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH01 | 10 | 08/05/2018 | 11:20 | 4.33 | 12.52 | -12.30 | 73.50 | 7.05 | "28.67" | 12.55 | 14.76 | N | 10 | |
| | | | | | 12.65 | -37.10 | 63.90 | 6.12 | "28.65" | 12.59 | 14.79 | N | 15 | |
| | | | | | 12.66 | -27.60 | 79.60 | 7.79 | "27.89" | 11.80 | 14.80 | N | 20 | |
| | | | | | 12.73 | -44.00 | 66.40 | 6.49 | "27.91" | 11.84 | 14.79 | N | 25 | |
| | | | | | **12.79** | **-18.40** | **100.80** | **10.17** | **"22.87"** | **11.59** | **14.78** | **N** | **30** | 3 well volumes removed |
| BH02C | 8 | 08/05/2018 | 11:45 | 5.13 | 12.82 | -17.80 | 93.50 | 9.23 | "24.82" | 12.17 | 14.85 | N | 8 | |
| | | | | | 12.91 | -52.10 | 81.50 | 7.99 | "24.75" | 12.43 | 14.84 | N | 12 | |
| Diver out 11:31 | | | | | 12.85 | -20.60 | 98.60 | 9.66 | "18.80" | 13.26 | 14.87 | N | 16 | |
| (07.05.2018) | | | | | 12.88 | -33.70 | 91.50 | 9.02 | "18.78" | 13.35 | 14.88 | N | 20 | |
| | | | | | **12.84** | **-36.30** | **98.30** | **9.46** | **"20.75"** | **14.12** | **14.89** | **N** | **24** | 3 well volumes removed |
| BH03 | 10 | 08/05/2018 | 11:00 | 4.25 | 12.46 | -84.20 | 89.40 | 9.46 | "12.82" | 10.48 | 14.60 | N | 10 | Well spoiled by fencing crew |
| | | | | | 12.58 | -50.00 | 82.40 | 8.71 | "12.83" | 10.48 | 14.62 | N | 15 | Upright cover now flush with ground |
| Diver out 11:37 | | | | | 12.62 | -49.70 | 80.10 | 8.69 | "12.84" | 10.48 | 14.62 | N | 20 | |
| (07.05.2018) | | | | | 12.60 | -41.80 | 82.30 | 8.59 | "12.87" | 10.51 | 14.63 | N | 25 | |
| | | | | | **12.60** | **-37.60** | **81.30** | **8.55** | **"12.87"** | **10.54** | **14.64** | **N** | **30** | 3 well volumes removed |
| BH04 | 16 | 08/05/2018 | 12:20 | 2.63 | 8.32 | 55.60 | 71.60 | 7.27 | "18.93" | 11.70 | 14.79 | N | 16 | |
| | | | | | 7.74 | 59.30 | 59.60 | 6.12 | "19.00" | 11.76 | 14.96 | N | 24 | |
| | | | | | 7.72 | 54.70 | 73.00 | 7.58 | "18.82" | 11.61 | 15.09 | N | 32 | |
| | | | | | 7.46 | 69.00 | 58.00 | 6.10 | "18.76" | 11.77 | 15.31 | N | 40 | |
| | | | | | **7.59** | **83.90** | **74.90** | **7.99** | **"17.40"** | **11.63** | **15.34** | **N** | **48** | 3 well volumes removed |
| BH05 | 13 | 08/05/2018 | 10:45 | 2.84 | 6.89 | 44.70 | 61.90 | 6.21 | "23.98" | 10.70 | 14.57 | N | 13 | Well spoiled by fencing crew |
| | | | | | 6.96 | 31.20 | 53.60 | 5.38 | "23.96" | 10.70 | 14.58 | N | 20 | Upright cover now flush with ground |
| | | | | | 6.90 | 36.70 | 66.30 | 6.69 | "23.83" | 10.52 | 14.58 | N | 26 | |
| | | | | | 6.85 | 22.10 | 52.40 | 5.25 | "23.82" | 10.52 | 14.59 | N | 33 | |
| | | | | | **6.90** | **32.00** | **62.00** | **6.19** | **"22.89"** | **10.52** | **14.59** | **N** | **39** | 3 well volumes removed |
| BH06A | 15 | 08/05/2018 | 14:10 | 2.65 | 7.13 | 104.30 | 63.00 | 6.41 | "18.56" | 11.44 | 14.77 | N | 15 | |
| | | | | | 7.13 | 63.30 | 52.90 | 5.41 | "18.56" | 11.44 | 14.80 | N | 22.5 | |
| | | | | | 7.13 | 99.90 | 59.30 | 6.18 | "17.12" | 11.05 | 14.85 | N | 30 | |
| | | | | | 7.13 | 83.10 | 50.60 | 5.27 | "17.09" | 11.13 | 14.88 | N | 37.5 | |
| | | | | | **7.13** | **112.10** | **61.30** | **6.47** | **"13.47"** | **11.06** | **14.90** | **N** | **45** | 3 well volumes removed |
| BH07B | 16 | 08/05/2018 | 09:20 | 2.75 | 7.33 | 191.50 | 62.80 | 6.08 | "32.18" | 10.10 | 14.55 | N | 16 | |
| | | | | | 7.36 | 161.50 | 56.50 | 5.46 | "32.20" | 10.70 | 14.56 | N | 24 | |
| | | | | | 7.39 | 150.70 | 63.60 | 6.27 | "30.97" | 10.61 | 14.56 | N | 32 | |
| | | | | | 7.39 | 131.10 | 55.30 | 5.39 | "30.95" | 10.60 | 14.56 | N | 40 | |
| | | | | | **7.41** | **140.20** | **62.20** | **6.22** | **"25.71"** | **10.54** | **14.56** | **N** | **48** | 3 well volumes removed |

## Groundwater Monitoring Results - THIRD Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential - ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH08 | 16 | 08/05/2018 | 14:50 | 2.62 | 7.52 | 168.10 | 68.50 | 7.01 | "17.19" | 12.09 | 14.86 | N | 16 | |
| | | | | | 7.47 | 166.20 | 56.80 | 5.76 | "17.10" | 12.26 | 14.92 | N | 24 | |
| Diver out 11:25 | | | | | 7.60 | 168.40 | 66.30 | 7.04 | "11.49" | 11.46 | 15.06 | N | 32 | |
| (07.05.2018) | | | | | 7.51 | 166.40 | 53.00 | 5.68 | "11.44" | 11.46 | 15.11 | N | 40 | |
| | | | | | **7.61** | **171.50** | **65.00** | **6.94** | **9172** | **11.41** | **15.20** | **N** | **48** | 3 well volumes removed |
| BH09 | 16 | 08/05/2018 | 08:25 | 2.18 | 7.87 | 28.60 | 57.10 | 5.54 | "27.48" | 11.12 | 14.51 | N | 16 | |
| | | | | | 7.74 | 43.50 | 50.20 | 4.88 | "27.51" | 11.11 | 14.51 | N | 24 | |
| | | | | | 7.60 | 48.00 | 53.80 | 5.23 | "28.03" | 11.11 | 14.51 | N | 32 | |
| | | | | | 7.55 | 31.00 | 42.30 | 4.11 | "28.00" | 11.11 | 14.51 | N | 40 | |
| | | | | | **7.49** | **76.50** | **54.50** | **5.40** | **"23.95"** | **11.06** | **14.51** | **N** | **48** | 3 well volumes removed |
| BH10B | 15 | 08/05/2018 | 16:30 | 2.44 | 7.3 | 97.00 | 68.10 | 6.73 | "14.19" | 12.85 | 14.61 | N | 15 | |
| | | | | (Gas - 1.82) | 7.12 | 46.00 | 58.80 | 5.86 | "14.21" | 12.74 | 14.61 | N | 22.5 | |
| | | | | | 7.23 | 41.60 | 62.70 | 6.39 | 8322 | 11.50 | 14.61 | N | 30 | |
| | | | | | 7.07 | 40.50 | 50.10 | 5.25 | 8260 | 11.48 | 14.61 | N | 37.5 | |
| | | | | | **7.19** | **45.60** | **63.60** | **6.50** | **7209** | **11.32** | **14.61** | **N** | **45** | 3 well volumes removed |
| BH11 | 17 | 08/05/2018 | 15:25 | 1.80 | 7.37 | 185.20 | 67.00 | 6.81 | "14.32" | 12.28 | 14.87 | N | 17 | |
| | | | | (Gas - 1.90) | 7.22 | 152.20 | 54.00 | 5.52 | "14.32" | 12.27 | 14.81 | N | 26 | |
| | | | | | 7.28 | 125.00 | 63.70 | 6.56 | "10.66" | 11.76 | 14.76 | N | 34 | |
| | | | | | 7.15 | 86.00 | 53.60 | 5.57 | "10.64" | 11.80 | 14.73 | N | 43 | |
| | | | | | **7.21** | **77.00** | **64.30** | **6.55** | **9109** | **11.66** | **14.68** | **N** | **51** | 3 well volumes removed |
| BH14 | 24 | 07/05/2018 | 11:05 | 2.07 | 7.26 | 114.10 | 58.20 | 6.11 | 4283 | 12.39 | 14.80 | N | 24 | |
| | | | | | 7.29 | 115.70 | 57.40 | 6.01 | 4014 | 12.32 | 14.79 | N | 36 | |
| | | | | | 7.34 | 117.40 | 56.90 | 5.83 | 3868 | 12.21 | 14.79 | N | 48 | |
| | | | | | 7.38 | 134.30 | 57.50 | 6.03 | 3769 | 12.17 | 14.78 | N | 60 | |
| | | | | | **7.44** | **171.00** | **58.00** | **6.01** | **3733** | **12.14** | **14.77** | **N** | **72** | 3 well volumes removed |
| BH15D | 26 | 07/05/2018 | 10:40 | 2.18 | 7.16 | 277.90 | 59.60 | 6.04 | 2049 | 13.16 | 14.73 | N | 26 | |
| | | | | | 7.22 | 276.20 | 57.10 | 5.81 | 1912 | 12.88 | 14.73 | N | 39 | |
| | | | | | 7.33 | 275.00 | 55.00 | 5.64 | 1700 | 12.60 | 14.74 | N | 52 | |
| | | | | | 7.38 | 273.70 | 55.20 | 5.74 | 1699 | 12.57 | 14.74 | N | 65 | |
| | | | | | **7.40** | **272.20** | **56.80** | **5.88** | **1694** | **12.56** | **14.75** | **N** | **78** | 3 well volumes removed |
| BH17 | ?? | 08/05/2018 | 10:20 | ??? | **7.87** | **216.30** | **90.90** | **9.75** | **2417** | **11.29** | **14.57** | **N** | **1** | Well spoiled by fencing crew |
| | | | | | - | - | - | - | - | - | - | - | - | Upright cover now flush with ground |
| | | | | | - | - | - | - | - | - | - | - | - | Sample tube is 600mm below surface |
| | | | | | - | - | - | - | - | - | - | - | - | Small bailer was used to sample |
| | | | | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | No dip possible |

## Groundwater Monitoring Results - THIRD Round

**Job No: 17-1455** **Job Name: Arklow WwTW Land GI**

| Borehole ID | Well Volume (l) | Date | Time | Standing Water Level (mbgl) | pH | Redox Potential - ORP (mV) | Dissovled Oxygen (DO) | | Electrical Conductivity- EC (µS/"mS") | Temperature (°C) | Pressure (psi) | Sample Stabilized | Volume removed (l) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % | mg/l | | | | | | |
| BH18 | 16 | 08/05/2018 | 08:55 | 2.60 | 7.30 | 196.50 | 61.30 | 6.51 | "10.35" | 10.47 | 14.52 | N | 16 | |
| | | | | | 7.16 | 193.10 | 55.20 | 5.85 | "10.34" | 10.50 | 14.52 | N | 24 | |
| Diver out 11:47 | | | | | 7.19 | 196.70 | 64.40 | 6.82 | 9877 | 10.26 | 14.51 | N | 32 | |
| (07.05.2018) | | | | | 7.08 | 199.30 | 54.60 | 5.83 | 9842 | 10.26 | 14.53 | N | 40 | |
| | | | | | **7.16** | **206.30** | **58.70** | **6.14** | **9553** | **10.23** | **14.54** | **N** | **48** | 3 well volumes removed |
| BH19 | 16 | 08/05/2018 | 08:00 | 1.40 | 11.06 | 108.40 | 62.60 | 6.43 | "12.58" | 11.17 | 14.52 | N | 16 | |
| | | | | (Gas - DRY) | 11.13 | 85.90 | 51.20 | 5.30 | "12.48" | 11.18 | 14.52 | N | 24 | |
| | | | | | 9.22 | 62.90 | 57.30 | 5.97 | 8499 | 10.89 | 14.53 | N | 32 | |
| | | | | | 8.82 | 82.00 | 44.30 | 4.69 | 8467 | 10.90 | 14.53 | N | 40 | |
| | | | | | **8.73** | **28.10** | **60.80** | **6.40** | **7784** | **10.85** | **14.53** | **N** | **48** | 3 well volumes removed |
| BH20 | 14 | 08/05/2018 | 12:50 | 2.60 | 7.42 | 22.80 | 62.30 | 6.51 | "18.05" | 11.77 | 15.07 | N | 14 | |
| | | | | | 7.37 | 7.00 | 52.50 | 5.48 | "18.12" | 11.49 | 15.04 | N | 21 | |
| Diver out 11:52 | | | | | 7.40 | 17.70 | 63.90 | 6.74 | "17.04" | 11.10 | 15.00 | N | 28 | |
| (07.05.2018) | | | | | 7.33 | -2.10 | 49.20 | 5.17 | "16.99" | 11.13 | 14.97 | N | 35 | |
| | | | | | **7.36** | **15.50** | **63.60** | **6.76** | **"15.39"** | **11.07** | **14.93** | **N** | **42** | 3 well volumes removed |
| SW1 (LW) | - | 07/05/2018 | 09:10 | - | 8.46 | 207.40 | 117.50 | 10.85 | "42.70" | 11.38 | 14.71 | - | - | |
| SW1 (HW) | - | 07/05/2018 | 17:26 | - | 8.51 | 217.20 | 105.40 | 9.67 | "42.79" | 11.32 | 14.70 | - | - | |
| SW2 (LW) | - | 07/05/2018 | 09:25 | - | 8.61 | 211.30 | 112.40 | 10.45 | "42.53" | 11.21 | 14.81 | - | - | |
| SW2 (HW) | - | 07/05/2018 | 17:50 | - | 8.46 | 228.10 | 109.40 | 10.09 | "42.65" | 11.26 | 14.70 | - | - | |
| SW3 (LW) | - | 07/05/2018 | 09:40 | - | 8.83 | 218.40 | 109.30 | 10.15 | "42.41" | 11.14 | 14.85 | - | - | |
| SW3 (HW) | - | 07/05/2018 | 18:10 | - | 8.39 | 231.60 | 115.70 | 10.71 | "42.54" | 11.04 | 14.71 | - | - | |
| SW4 (LW) | - | 07/05/2018 | 10:55 | - | 7.98 | 234.60 | 89.60 | 9.26 | 1053 | 13.39 | 14.75 | - | - | |
| SW4 (HW) | - | 07/05/2018 | 18:20 | - | 9.59 | 153.10 | 96.90 | 9.66 | 1001 | 15.32 | 14.70 | - | - | |
| SW5 (LW) | - | 07/05/2018 | 09:55 | - | 7.12 | 261.4 | 91.4 | 9.36 | 2444 | 13.08 | 14.807 | - | - | |
| SW5 (HW) | - | 07/05/2018 | 18:45 | - | 9.43 | 175.4 | 95.1 | 9.5 | 866 | 15.22 | 14.704 | - | - | |
| SW6 (LW) | - | 07/05/2018 | 10:05 | - | 7.37 | 236.4 | 61.4 | 6.72 | 838 | 13.57 | 14.788 | - | - | |
| SW6 (HW) | - | 07/05/2018 | 18:55 | - | 9.29 | 181.8 | 99.7 | 9.98 | 1116 | 15.19 | 14.694 | - | - | |
| SW7 (LW) | - | 07/05/2018 | 10:26 | - | 7.39 | 253.6 | 92.7 | 9.66 | 388 | 13.38 | 14.752 | - | - | |
| SW7 (HW) | - | 07/05/2018 | 18:30 | - | 9.51 | 171.6 | 95.1 | 9.46 | 787 | 15.35 | 14.704 | - | - | |
| SW8 (LW) | - | 07/05/2018 | 10:15 | - | 7.97 | 219.7 | 94.7 | 10.01 | 100 | 13.08 | 14.762 | - | - | |
| SW8 (HW) | - | 07/05/2018 | 19:10 | - | 9.59 | 166.1 | 96.3 | 9.66 | 134 | 14.98 | 14.685 | - | - | |

CAUSEWAY GEOTECH

# APPENDIX I

## Ground Gas Monitoring Results



| Landfill gas monitoring pro-forma | | | |
|---|---|---|---|
| | Start | End | Arklow WwTW Land Ground Investigation<br>Round 1 - Ground Gas Monitoring<br>09/04/2018<br><br>Neil Haggan<br>Causeway Geotech Ltd<br><br>GA5000 |
| Time | 11:15 | 16:00 | |
| Atmospheric pressure | 1006 mb | 1001 mb | |
| Temperature | 10.0 °C | 10.1 °C | |
| Precipitation | 0.00 mm | 0.00 mm | |
| Ground condition | Dry | Dry | |
| Cloud cover | 12% | 20% | |
| Wind direction | South | South-South-East | |
| Wind speed | 4 mph | 12 mph | |

| Borehole name | Differential pressure | Methane | | Carbon Dioxide | | Oxygen | | Borehole flow | | Water level | Borehole depth | Comment / odours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | | | |
| | mb | % by vol | % by vol | % by vol | % by vol | % by vol | % by vol | l/hr | l/hr | mbgl | mbgl | |
| BH10B | -0.02 | 0.2 | 0.2 | 0.2 | 1.1 | 21.2 | 20.1 | -0.1 | 0.1 | 1.60 | 2.20 | N/A |
| BH11 | -0.02 | 0.2 | 0.2 | 0.1 | 1.5 | 21.1 | 19.4 | 0.0 | 0.0 | 1.65 | 2.35 | N/A |
| BH19 | -0.02 | 0.2 | 0.2 | 0.1 | 1.4 | 21.0 | 19.3 | -0.1 | 0.0 | DRY | 1.10 | N/A |

| Landfill gas monitoring pro-forma | | | |
|---|---|---|---|
| | Start | End | Arklow WwTW Land Ground Investigation<br>Round 2 - Ground Gas Monitoring<br>23/04/2018<br><br>Sean Toomey<br>Causeway Geotech Ltd<br><br>GA5000 |
| Time | 12:48 | 17:12 | |
| Atmospheric pressure | 1013 mb | 1012 mb | |
| Temperature | 10.9 °C | 9.2 °C | |
| Precipitation | 0.00 mm | 0.00 mm | |
| Ground condition | Dry | Dry | |
| Cloud cover | 66% | 40% | |
| Wind direction | South-South-West | West-South-West | |
| Wind speed | 15 mph | 15 mph | |

| Borehole name | Differential pressure | Methane | | Carbon Dioxide | | Oxygen | | Borehole flow | | Water level | Borehole depth | Comment / odours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | | | |
| | mb | % by vol | % by vol | % by vol | % by vol | % by vol | % by vol | l/hr | l/hr | mbgl | mbgl | |
| BH10B | -0.01 | 0.1 | 0.2 | 0.1 | 0.9 | 21.4 | 20.4 | 0.1 | 0.2 | 1.75 | 2.20 | N/A |
| BH11 | -0.02 | 0.2 | 0.2 | 0.1 | 1.2 | 21.3 | 19.7 | 0.0 | 0.1 | 1.82 | 2.35 | N/A |
| BH19 | -0.01 | 0.1 | 0.1 | 0.1 | 1.3 | 21.1 | 19.6 | -0.1 | 0.0 | DRY | 1.10 | N/A |

| Landfill gas monitoring pro-forma | | | |
|---|---|---|---|
| | Start | End | Arklow WwTW Land Ground<br>Investigation Round 3 - Ground Gas<br>Monitoring<br>08/05/2018<br><br>Neil Haggan<br>Causeway Geotech Ltd<br><br>GA5000 |
| Time | 15:15 | 16:15 | |
| Atmospheric pressure | 1010 mb | 1011 mb | |
| Temperature | 11.0 °C | 11.1 °C | |
| Precipitation | 0.10 mm | 0.00 mm | |
| Ground condition | Dry | Dry | |
| Cloud cover | 100% | 20% | |
| Wind direction | West | West | |
| Wind speed | 11 mph | 9 mph | |

| Borehole name | Differential pressure | Methane | | Carbon Dioxide | | Oxygen | | Borehole flow | | Water level | Borehole depth | Comment / odours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | | | |
| | mb | % by vol | % by vol | % by vol | % by vol | % by vol | % by vol | l/hr | l/hr | mbgl | mbgl | |
| BH10B | -0.01 | 0.1 | 0.2 | 0.1 | 1.1 | 20.9 | 20.1 | 0.0 | 0.1 | 1.82 | 2.20 | N/A |
| BH11 | -0.01 | 0.1 | 0.1 | 0.1 | 1.3 | 20.7 | 19.9 | 0.0 | 0.1 | 1.90 | 2.35 | N/A |
| BH19 | -0.02 | 0.1 | 0.2 | 0.2 | 0.9 | 20.1 | 19.6 | 0.1 | 0.2 | DRY | 1.10 | N/A |

CAUSEWAY GEOTECH

# APPENDIX J

## Geotechnical Laboratory Test Results



# LABORATORY REPORT

4043

**Contract Number: PSL18/1057**

Report Date: 29 March 2018

Client's Reference: 17-1455

Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co.Antrim
BT53 7QL

**For the attention of: Stephen Watson**

Contract Title: Arklow WWTP Land GI

Date Received: 5/3/2018
Date Commenced: 5/3/2018
Date Completed: 29/3/2018

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

| | | |
|---|---|---|
| R Gunson (Director) | A Watkins (Director) | R Berriman (Quality Manager) |
| L Knight (Senior Technician) | S Eyre (Senior Technician) | A Fry (Senior Technician) |



**5 – 7 Hexthorpe Road, Hexthorpe,**
**Doncaster DN4 0AR**
**tel: +44 (0)844 815 6641**
**fax: +44 (0)844 815 6642**
**e-mail: rgunson@prosoils.co.uk**
**awatkins@prosoils.co.uk**

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|---|---|---|---|---|---|
| TP02 | 1 | B | 0.50 | | Brown very gravelly asndy CLAY. |
| TP02 | 4 | B | 1.50 | | Brown gravelly slightly silty SAND. |
| TP04 | 1 | B | 0.50 | | MADE GROUND brown very sandy slightly silty gravel. |
| TP04 | 4 | B | 1.50 | | Brown very gravelly silty SAND. |
| TP05 | 4 | B | 1.00 | | Brown gravelly silty SAND. |
| TP05 | 7 | B | 2.00 | | Brown very gravelly silty SAND. |
| TP06 | 1 | B | 0.50 | | Brown very gravelly sandy CLAY. |
| TP06 | 3 | B | 1.50 | | Brown very gravelly slightly silty SAND. |
| TP07 | 1 | B | 0.50 | | Brown very sandy silty GRAVEL. |
| TP08 | 1 | B | 0.50 | | Brown very gravelly silty SAND. |
| TP08 | 3 | B | 1.00 | | Brown very sandy silty GRAVEL. |
| TP08 | 5 | B | 2.00 | | Brown very gravelly silty SAND. |
| TP09 | 1 | B | 0.50 | | Brown very gravelly SAND. |
| TP09 | 4 | B | 1.50 | | Brown gravelly silty SAND. |
| TP10 | 2 | D | 0.50 | | Brown very gravelly SAND. |
| TP10 | 4 | B | 1.50 | | Brown very gravelly silty SAND. |
| TP11 | 1 | B | 0.50 | | MADE GROUND brown very sandy silty gravel. |
| TP11 | 7 | B | 1.60 | | Brown mottled grey very sandy slightly clayey silty GRAVEL. |
| TP12 | 1 | B | 0.50 | | Brown very sandy silty GRAVEL. |

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | Arklow WWTP Land GI | Contract No: PSL18/1057 Client Ref: 17-1455 |

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|---|---|---|---|---|---|
| TP12 | 4 | B | 1.50 | | Brown gravelly SAND. |
| TP14 | 1 | B | 0.50 | | Brown very gravelly silty SAND. |
| TP14 | 4 | B | 1.50 | | Brown gravelly slightly silty SAND. |
| TP15 | 4 | B | 1.00 | | Brown gravelly SAND. |
| TP15 | 11 | D | 2.00 | | Brown very sandy GRAVEL. |
| TP16 | 4 | B | 1.00 | | Brown slightly silty SAND and GRAVEL. |
| TP16 | 7 | B | 2.00 | | Brown slightly gravelly SAND |
| TP17 | 1 | B | 0.50 | | Brown gravelly SAND. |
| TP17 | 4 | B | 1.50 | | Light brown gravelly slightly silty SAND. |
| TP18 | 1 | B | 0.50 | | Brown very gravelly SAND. |
| TP18 | 4 | B | 1.50 | | Light brown slightly gravelly slightly silty SAND. |
| TP19 | 1 | B | 0.50 | | Brown gravelly SAND. |
| TP19 | 4 | B | 1.50 | | Brown very gravelly silty SAND. |
| TP20 | 1 | B | 0.50 | | Brown gravelly SAND. |
| TP20 | 5 | D | 1.50 | | Brown slightly gravelly SAND |
| TP21 | 1 | B | 0.50 | | Reddish brown gravelly silty SAND. |
| TP21 | 4 | B | 1.50 | | Reddish brown gravelly silty SAND. |
| TP22 | 4 | B | 1.50 | | Brown mottled grey slightly gravelly slightly silty SAND. |
| TP23 | 1 | B | 0.50 | | Brown gravelly silty SAND. |

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|---|---|---|---|---|---|
| TP23 | 7 | B | 2.50 | | Brown mottled grey very gravelly silty SAND. |
| TP24 | 1 | B | 0.50 | | White very silty SAND & GRAVEL of CHALK. |
| TP24 | 4 | B | 1.40 | | Brown gravelly silty SAND. |
| TP25 | 7 | B | 2.30 | | Brown very silty SAND and GRAVEL. |
| TP26 | 4 | B | 1.50 | | Brown very gravelly slightly silty SAND. |
| TP27 | 4 | B | 1.00 | | Brown mottled grey very gravelly silty SAND. |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | Arklow WWTP Land GI | Contract No: PSL18/1057 Client Ref: 17-1455 |

# SUMMARY OF SOIL CLASSIFICATION TESTS

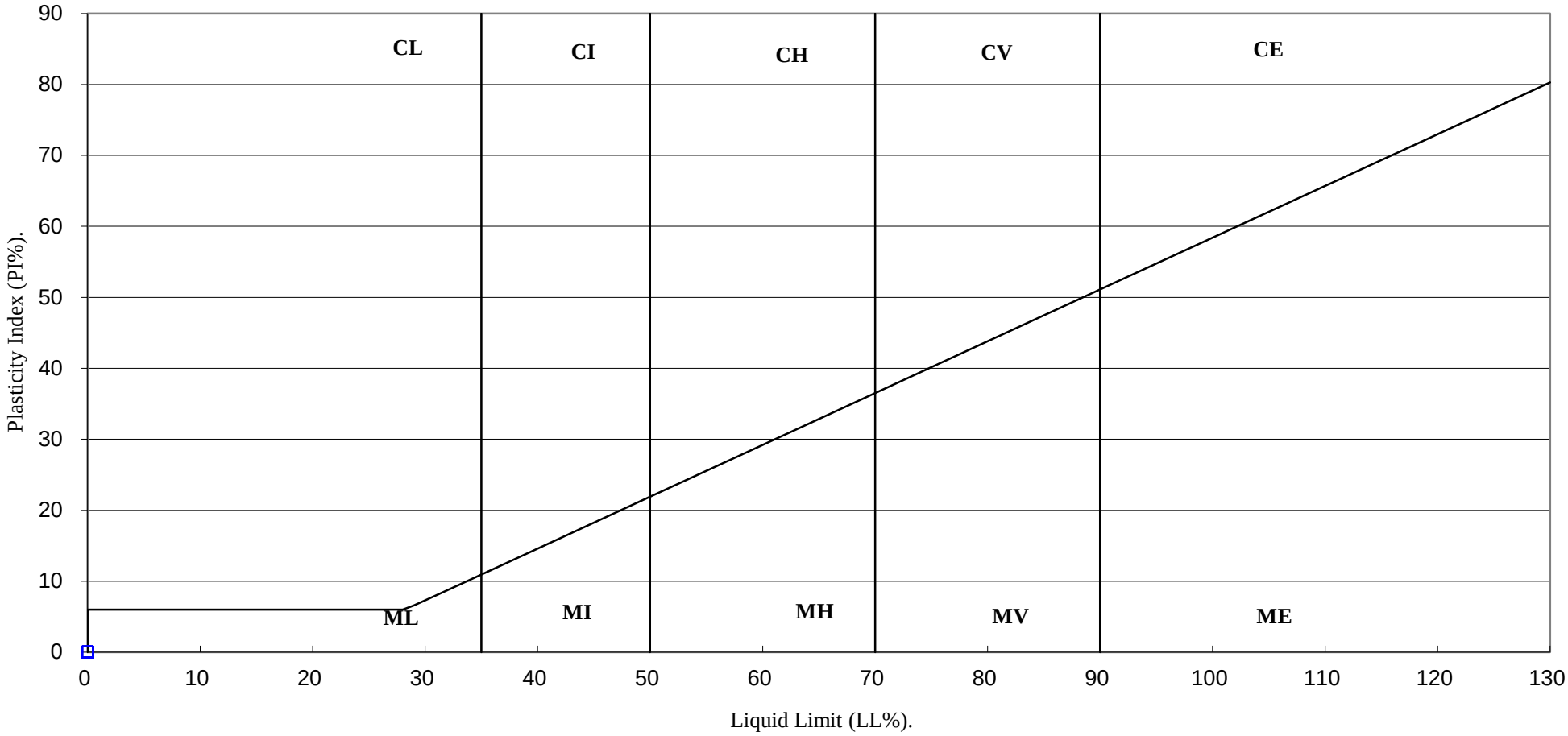
**(BS1377 : PART 2 : 1990)**

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % Clause 3.2 | Linear Shrinkage % Clause 6.5 | Particle Density Mg/m$^3$ Clause 8.2 | Liquid Limit % Clause 4.3/4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | Passing .425mm % | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP02 | 1 | B | 0.50 | | 22 | | | | | | | |
| TP02 | 4 | B | 1.50 | | 12 | | | | | | | |
| TP04 | 1 | B | 0.50 | | 13 | | | | | | | |
| TP04 | 4 | B | 1.50 | | 21 | | | | | | | |
| TP05 | 4 | B | 1.00 | | 27 | | | | | | | |
| TP05 | 7 | B | 2.00 | | 12 | | | | | | | |
| TP06 | 1 | B | 0.50 | | 17 | | | | | | | |
| TP06 | 3 | B | 1.50 | | 7.6 | | | | | | | |
| TP07 | 1 | B | 0.50 | | 7.3 | | | | | | | |
| TP08 | 1 | B | 0.50 | | 26 | | | | | | | |
| TP08 | 3 | B | 1.00 | | 18 | | | | | | | |
| TP08 | 5 | B | 2.00 | | 11 | | | | | | | |
| TP09 | 1 | B | 0.50 | | 9 | | | | | | | |
| TP09 | 4 | B | 1.50 | | 17 | | | | | | | |
| TP10 | 2 | D | 0.50 | | 11 | | | | | | | |
| TP10 | 4 | B | 1.50 | | 10 | | | | | | | |
| TP11 | 1 | B | 0.50 | | 12 | | | | | | | |
| TP11 | 7 | B | 1.60 | | 14 | | | | | | | |
| TP12 | 1 | B | 0.50 | | 9.4 | | | | | | | |

**SYMBOLS :** **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1057 **Client Ref:** 17-1455 |

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.




| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** |
| | | | **PSL18/1057** |
| | | | **Client Ref:** |
| | | | **17-1455** |

# SUMMARY OF SOIL CLASSIFICATION TESTS

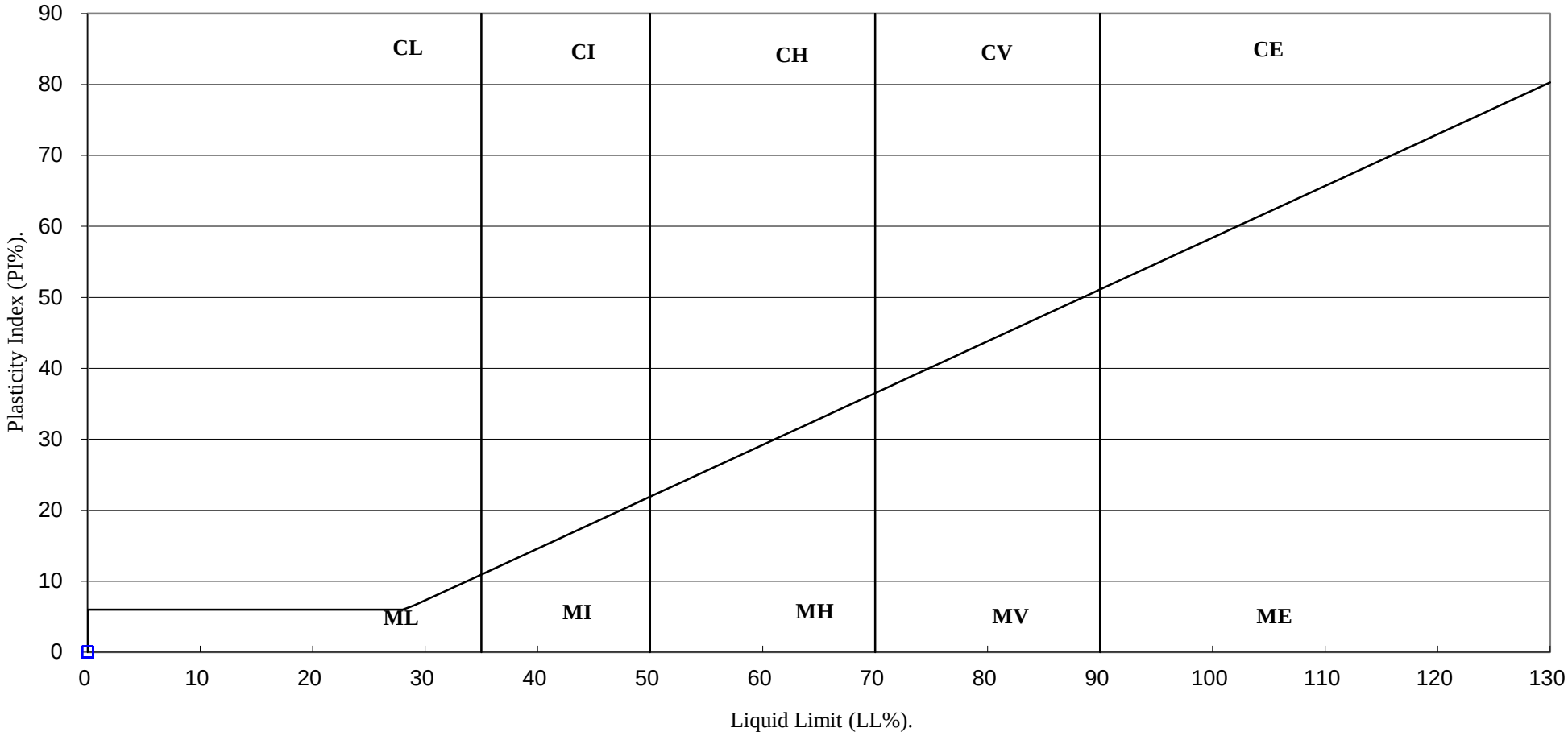
**(BS1377 : PART 2 : 1990)**

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % Clause 3.2 | Linear Shrinkage % Clause 6.5 | Particle Density $Mg/m^3$ Clause 8.2 | Liquid Limit % Clause 4.3/4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | Passing .425mm % | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP12 | 4 | B | 1.50 | | 27 | | | | | | | |
| TP14 | 1 | B | 0.50 | | 19 | | | | | | | |
| TP14 | 4 | B | 1.50 | | 12 | | | | | | | |
| TP15 | 4 | B | 1.00 | | 9.4 | | | | | | | |
| TP15 | 11 | D | 2.00 | | 3.2 | | | | | | | |
| TP16 | 4 | B | 1.00 | | 6.1 | | | | | | | |
| TP16 | 7 | B | 2.00 | | 4.9 | | | | | | | |
| TP17 | 1 | B | 0.50 | | 8.2 | | | | | | | |
| TP17 | 4 | B | 1.50 | | 8.4 | | | | | | | |
| TP18 | 1 | B | 0.50 | | 4.1 | | | | | | | |
| TP18 | 4 | B | 1.50 | | 6.3 | | | | | | | |
| TP19 | 1 | B | 0.50 | | 9.4 | | | | | | | |
| TP19 | 4 | B | 1.50 | | 8.4 | | | | | | | |
| TP20 | 1 | B | 0.50 | | 6.3 | | | | | | | |
| TP20 | 5 | D | 1.50 | | 7.9 | | | | | | | |
| TP21 | 1 | B | 0.50 | | 23 | | | | | | | |
| TP21 | 4 | B | 1.50 | | 16 | | | | | | | |
| TP22 | 4 | B | 1.50 | | 12 | | | | | | | |
| TP23 | 1 | B | 0.50 | | 16 | | | | | | | |

**SYMBOLS :** **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

| | | |
|---|---|---|
| UKAS TESTING 4043 / PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1057 |
| | | **Client Ref:** 17-1455 |

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.




| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** |
| | | | **PSL18/1057** |
| | | | **Client Ref:** |
| | | | **17-1455** |

# SUMMARY OF SOIL CLASSIFICATION TESTS

**(BS1377 : PART 2 : 1990)**

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % Clause 3.2 | Linear Shrinkage % Clause 6.5 | Particle Density $Mg/m^3$ Clause 8.2 | Liquid Limit % Clause 4.3/4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | Passing .425mm % | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP23 | 7 | B | 2.50 | | 13 | | | | | | | |
| TP24 | 1 | B | 0.50 | | 48 | | | | | | | |
| TP24 | 4 | B | 1.40 | | 11 | | | | | | | |
| TP25 | 7 | B | 2.30 | | 9.7 | | | | | | | |
| TP26 | 4 | B | 1.50 | | 20 | | | | | | | |
| TP27 | 4 | B | 1.00 | | 6.8 | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**SYMBOLS :** **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

**Arklow WWTP Land GI**

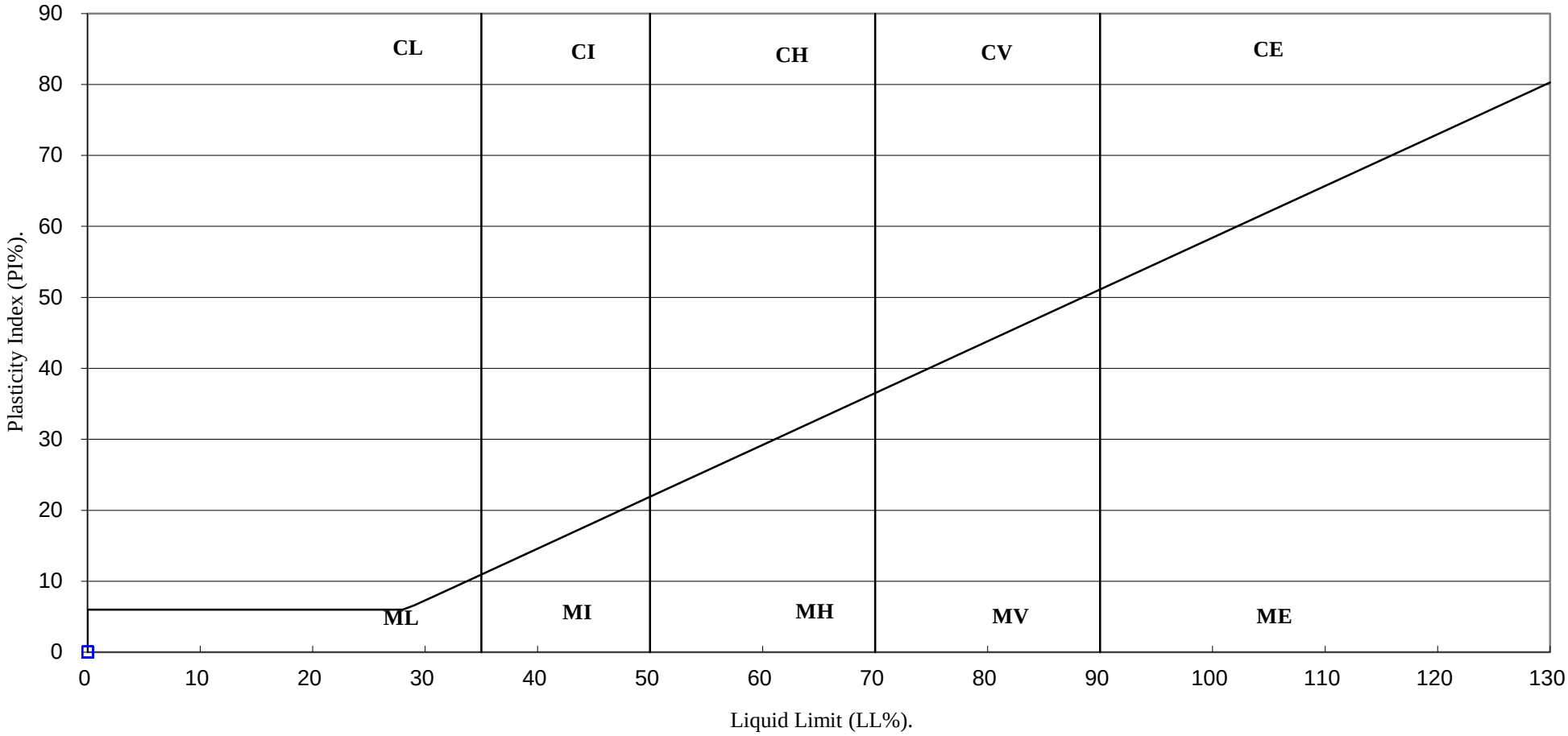
**Contract No:**

**PSL18/1057**

**Client Ref:**

**17-1455**

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.




| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** |
| | | | **PSL18/1057** |
| | | | **Client Ref:** |
| | | | **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

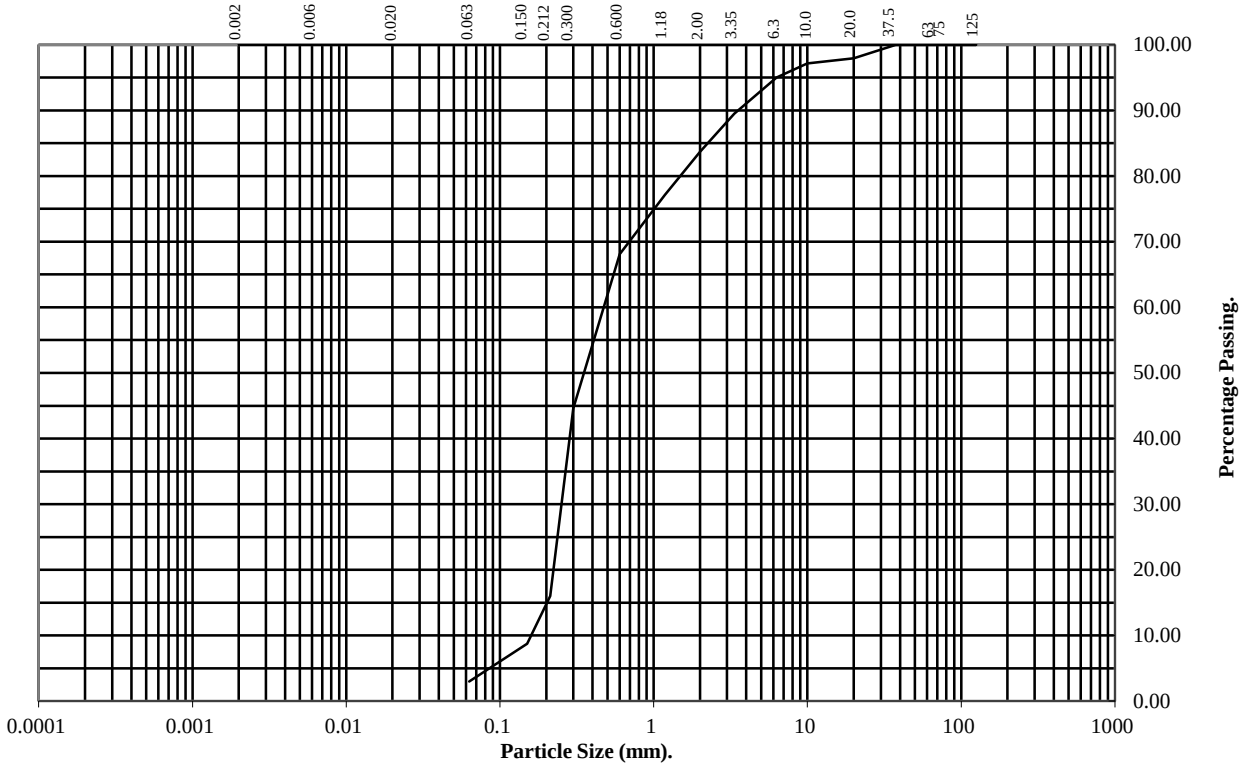
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP02** **Top Depth (m):** **1.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 98 |
| 10 | 97 |
| 6.3 | 95 |
| 3.35 | 90 |
| 2 | 84 |
| 1.18 | 77 |
| 0.6 | 68 |
| 0.3 | 45 |
| 0.212 | 16 |
| 0.15 | 9 |
| 0.063 | 3 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 16 |
| Sand | 81 |
| Silt/Clay | 3 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

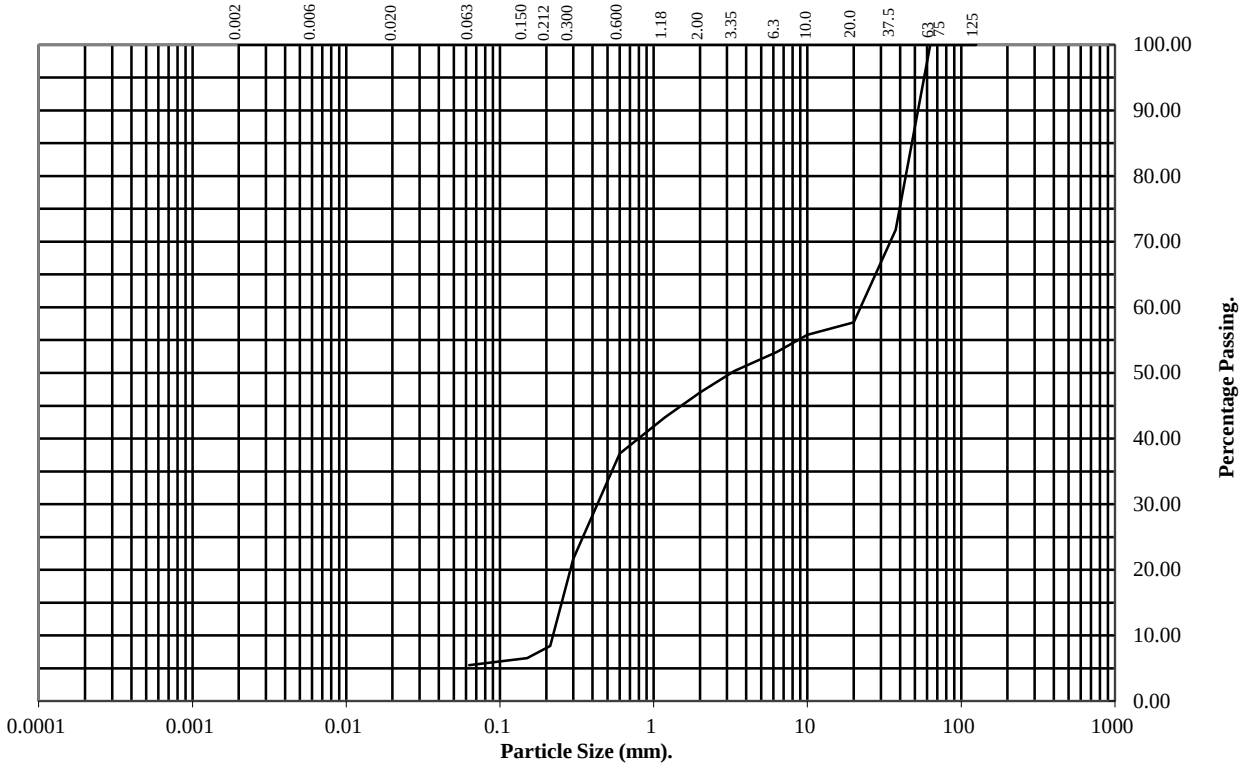
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP04** **Top Depth (m):** **0.50**

**Sample Number:** **1** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 72 |
| 20 | 58 |
| 10 | 56 |
| 6.3 | 53 |
| 3.35 | 50 |
| 2 | 47 |
| 1.18 | 43 |
| 0.6 | 38 |
| 0.3 | 22 |
| 0.212 | 8 |
| 0.15 | 7 |
| 0.063 | 5 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 53 |
| Sand | 42 |
| Silt/Clay | 5 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

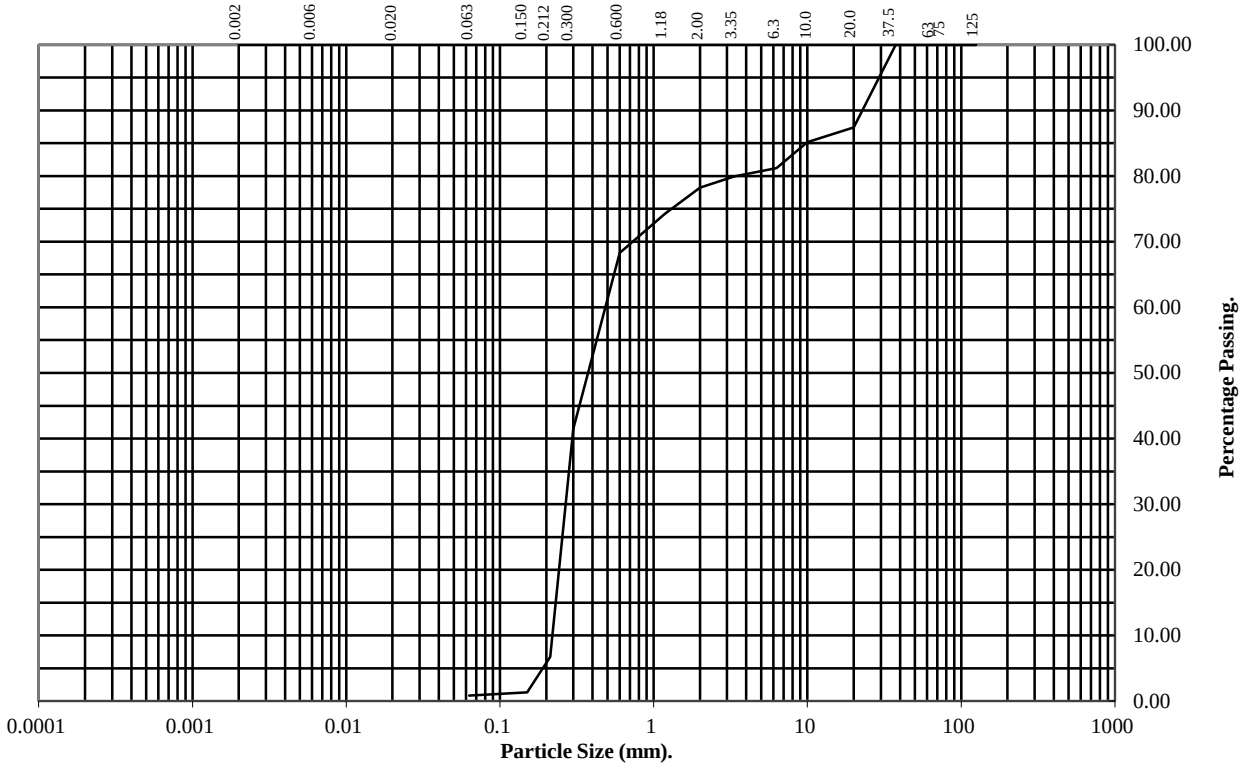
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP05** **Top Depth (m):** **2.00**

**Sample Number:** **7** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 87 |
| 10 | 85 |
| 6.3 | 81 |
| 3.35 | 80 |
| 2 | 78 |
| 1.18 | 74 |
| 0.6 | 68 |
| 0.3 | 41 |
| 0.212 | 7 |
| 0.15 | 1 |
| 0.063 | 1 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 22 |
| Sand | 77 |
| Silt/Clay | 1 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

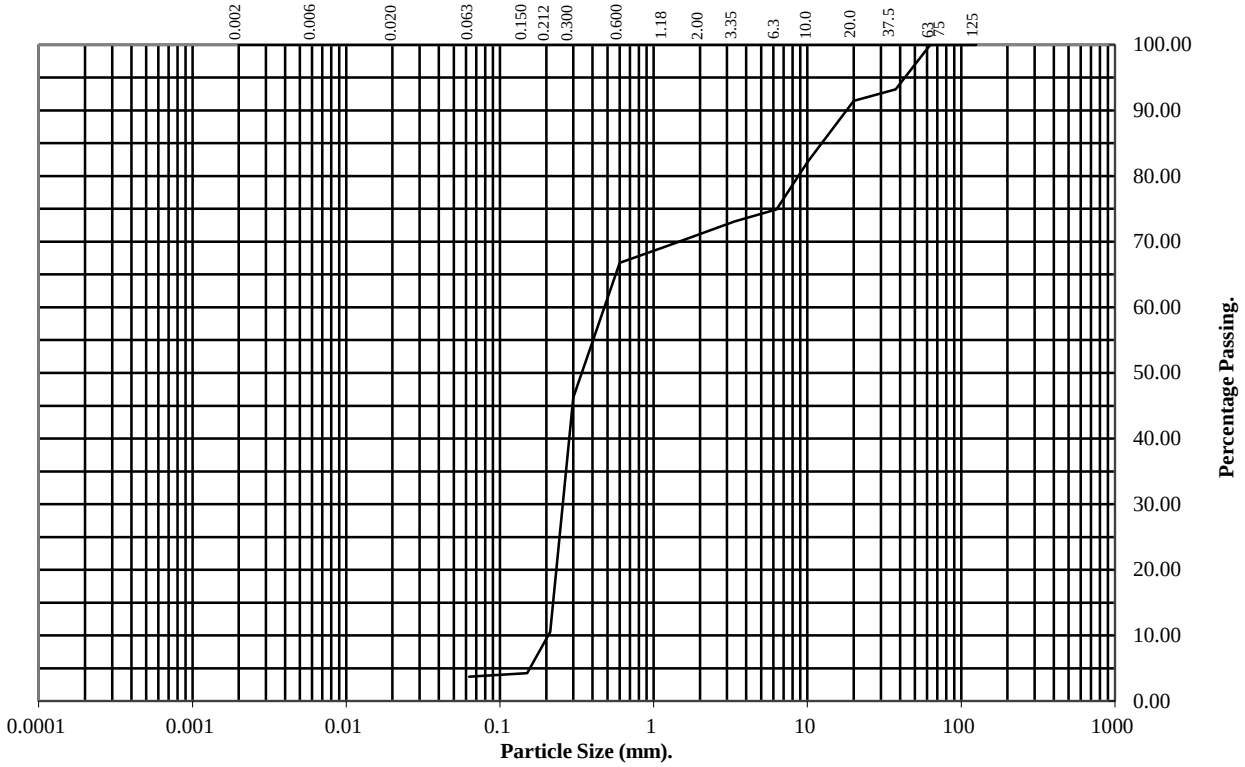
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP06** **Top Depth (m):** **1.50**

**Sample Number:** **3** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 93 |
| 20 | 91 |
| 10 | 82 |
| 6.3 | 75 |
| 3.35 | 73 |
| 2 | 71 |
| 1.18 | 69 |
| 0.6 | 67 |
| 0.3 | 46 |
| 0.212 | 11 |
| 0.15 | 4 |
| 0.063 | 4 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 29 |
| Sand | 67 |
| Silt/Clay | 4 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

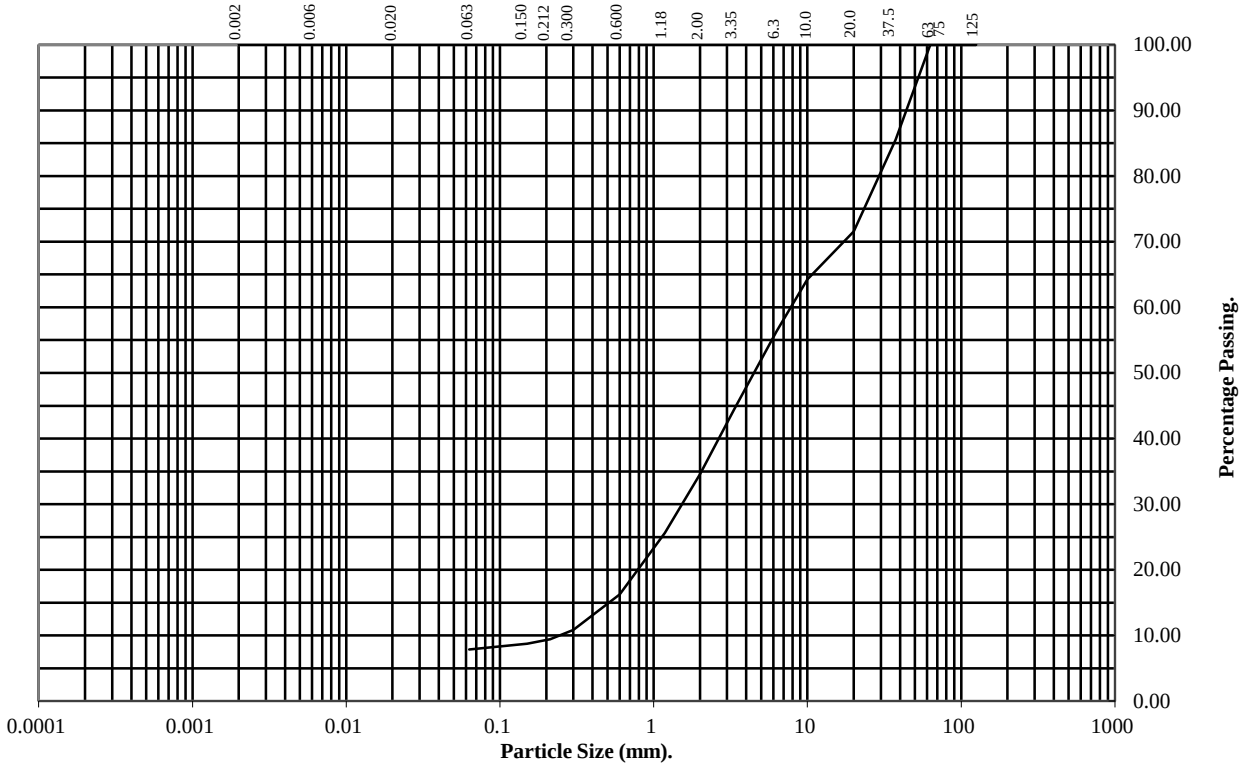
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP07** **Top Depth (m):** **0.50**

**Sample Number:** **1** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 86 |
| 20 | 72 |
| 10 | 64 |
| 6.3 | 56 |
| 3.35 | 44 |
| 2 | 35 |
| 1.18 | 26 |
| 0.6 | 16 |
| 0.3 | 11 |
| 0.212 | 9 |
| 0.15 | 9 |
| 0.063 | 8 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 65 |
| Sand | 27 |
| Silt/Clay | 8 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

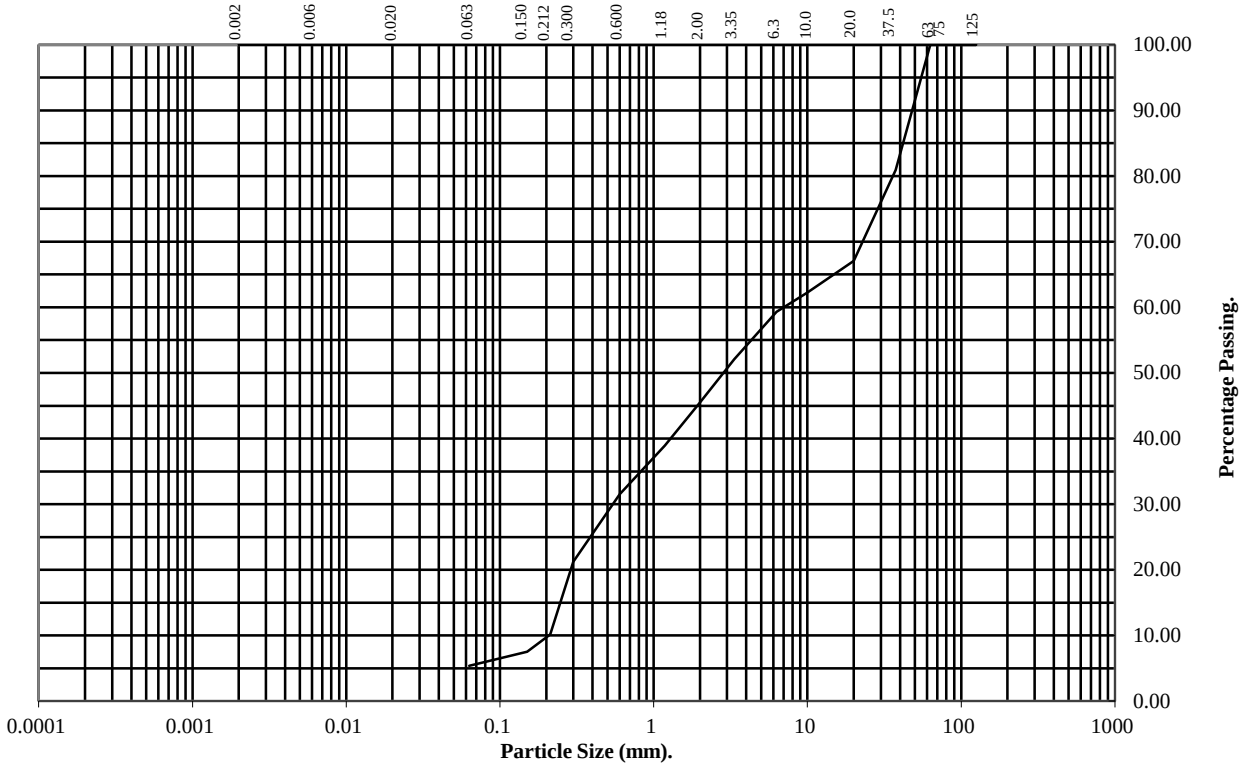
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP08** **Top Depth (m):** **1.00**

**Sample Number:** **3** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 81 |
| 20 | 67 |
| 10 | 62 |
| 6.3 | 59 |
| 3.35 | 52 |
| 2 | 46 |
| 1.18 | 39 |
| 0.6 | 32 |
| 0.3 | 21 |
| 0.212 | 10 |
| 0.15 | 8 |
| 0.063 | 5 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 54 |
| Sand | 41 |
| Silt/Clay | 5 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

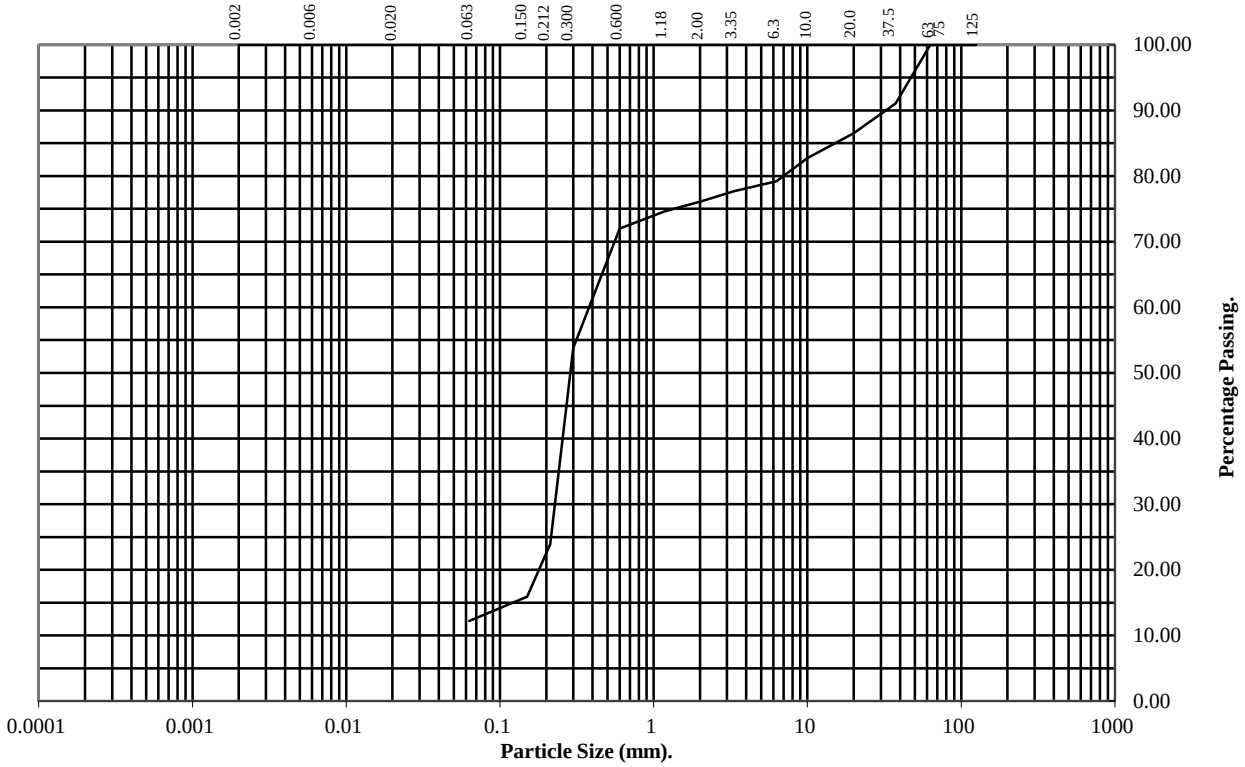
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP08** **Top Depth (m):** **2.00**

**Sample Number:** **5** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 91 |
| 20 | 87 |
| 10 | 83 |
| 6.3 | 79 |
| 3.35 | 78 |
| 2 | 76 |
| 1.18 | 75 |
| 0.6 | 72 |
| 0.3 | 54 |
| 0.212 | 24 |
| 0.15 | 16 |
| 0.063 | 12 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 24 |
| Sand | 64 |
| Silt/Clay | 12 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

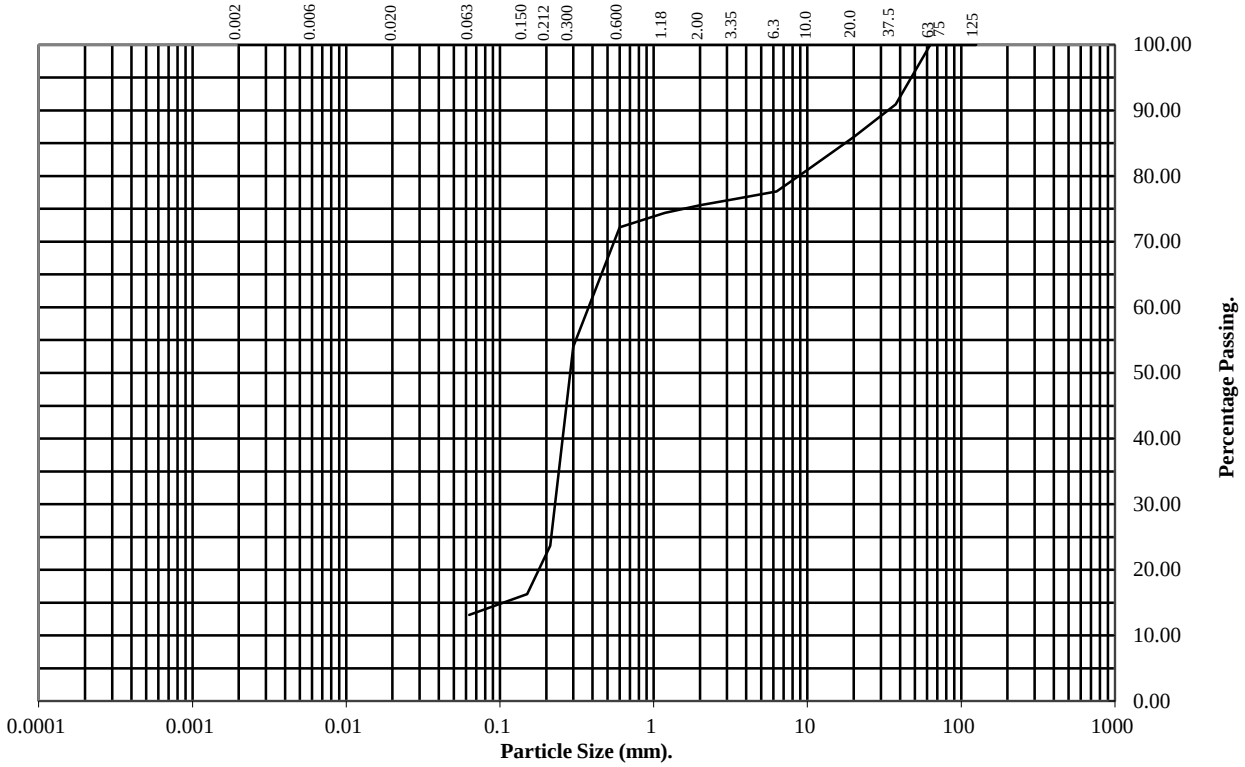
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP10** **Top Depth (m):** **1.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 91 |
| 20 | 86 |
| 10 | 81 |
| 6.3 | 78 |
| 3.35 | 76 |
| 2 | 76 |
| 1.18 | 74 |
| 0.6 | 72 |
| 0.3 | 54 |
| 0.212 | 24 |
| 0.15 | 16 |
| 0.063 | 13 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 24 |
| Sand | 63 |
| Silt/Clay | 13 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

**Contract No:** **PSL18/1057**

**Client Ref:** **17-1455**

# PARTICLE SIZE DISTRIBUTION TEST

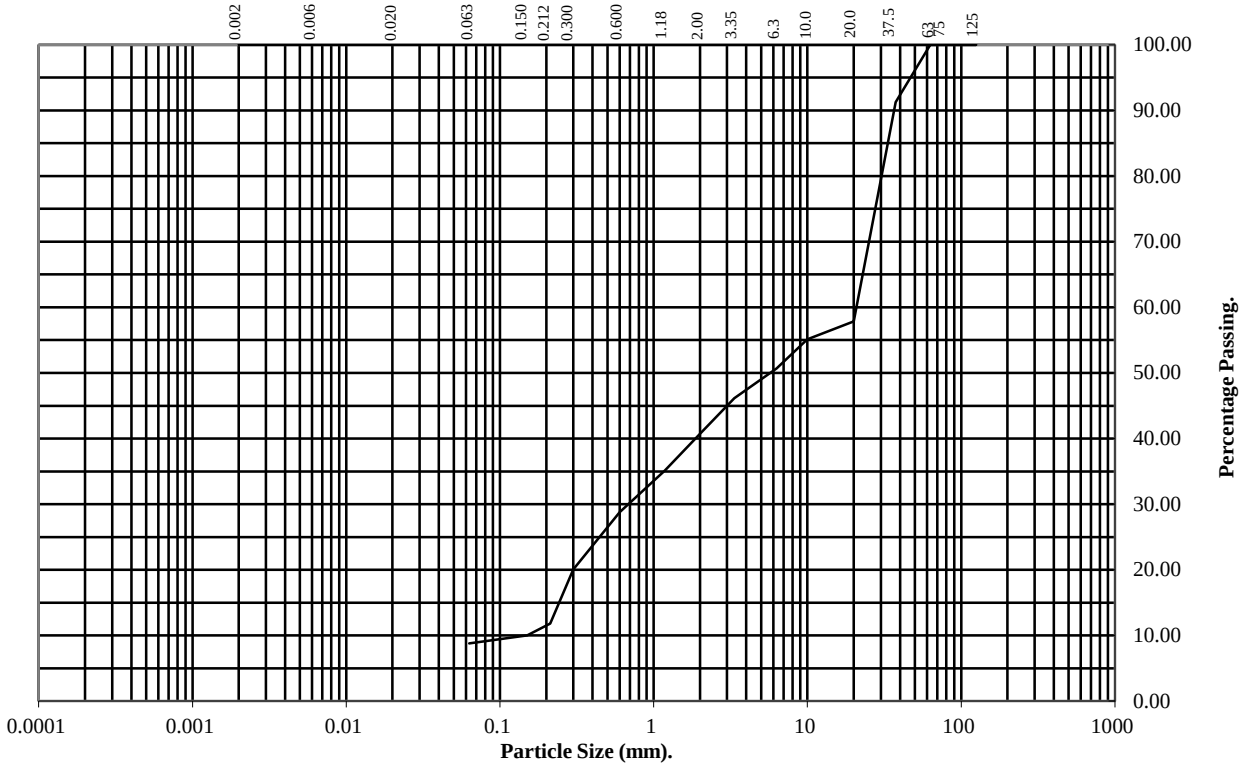
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP11** **Top Depth (m):** **0.50**

**Sample Number:** **1** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 91 |
| 20 | 58 |
| 10 | 55 |
| 6.3 | 51 |
| 3.35 | 46 |
| 2 | 41 |
| 1.18 | 35 |
| 0.6 | 29 |
| 0.3 | 20 |
| 0.212 | 12 |
| 0.15 | 10 |
| 0.063 | 9 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 59 |
| Sand | 32 |
| Silt/Clay | 9 |

**Remarks:**

See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

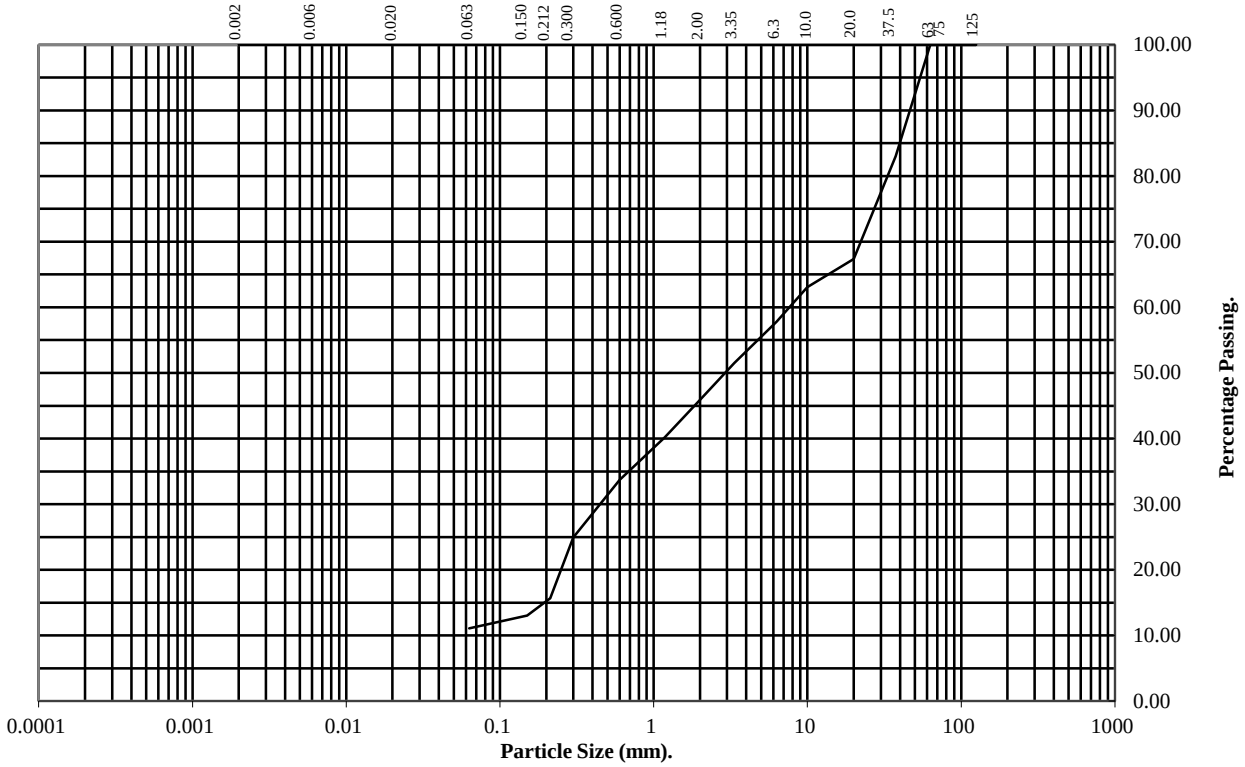
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP11** **Top Depth (m):** **1.60**

**Sample Number:** **7** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 83 |
| 20 | 67 |
| 10 | 63 |
| 6.3 | 58 |
| 3.35 | 52 |
| 2 | 46 |
| 1.18 | 40 |
| 0.6 | 34 |
| 0.3 | 25 |
| 0.212 | 16 |
| 0.15 | 13 |
| 0.063 | 11 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 54 |
| Sand | 35 |
| Silt/Clay | 11 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

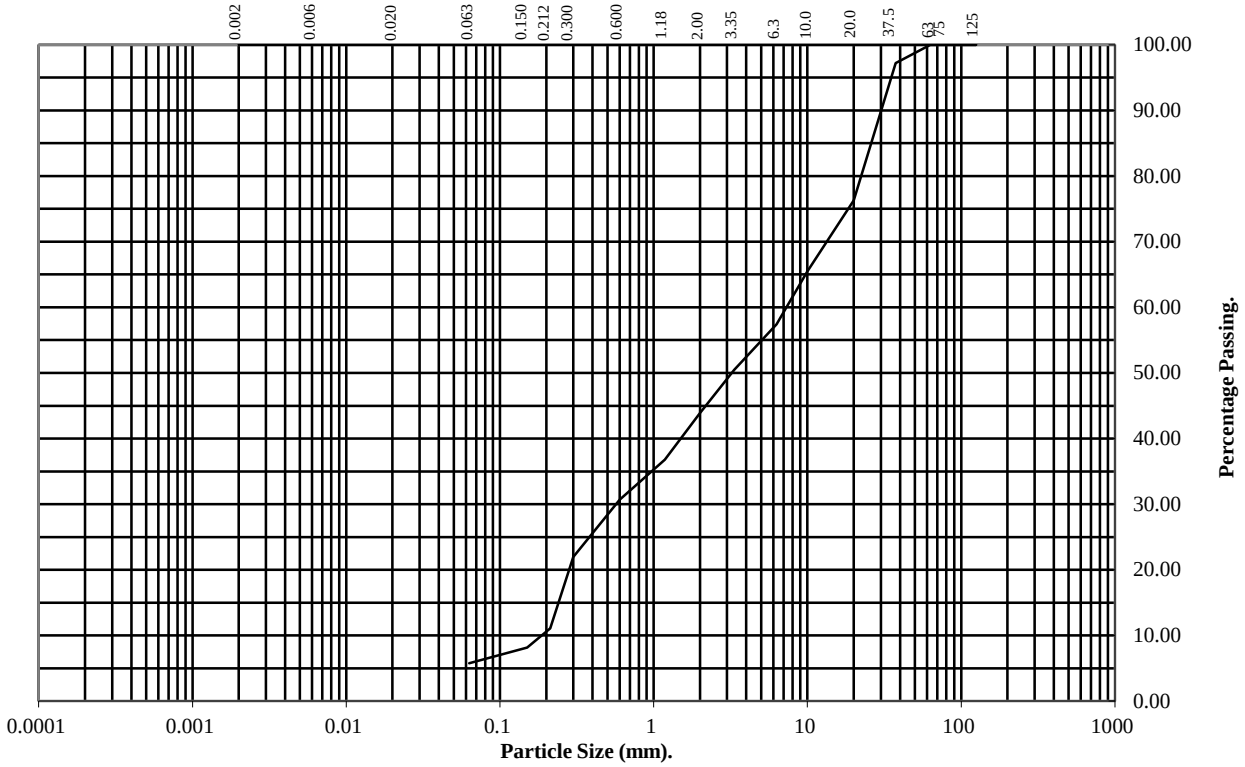
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP12** **Top Depth (m):** **0.50**

**Sample Number:** **1** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 97 |
| 20 | 76 |
| 10 | 65 |
| 6.3 | 57 |
| 3.35 | 51 |
| 2 | 44 |
| 1.18 | 37 |
| 0.6 | 31 |
| 0.3 | 22 |
| 0.212 | 11 |
| 0.15 | 8 |
| 0.063 | 6 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 56 |
| Sand | 38 |
| Silt/Clay | 6 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

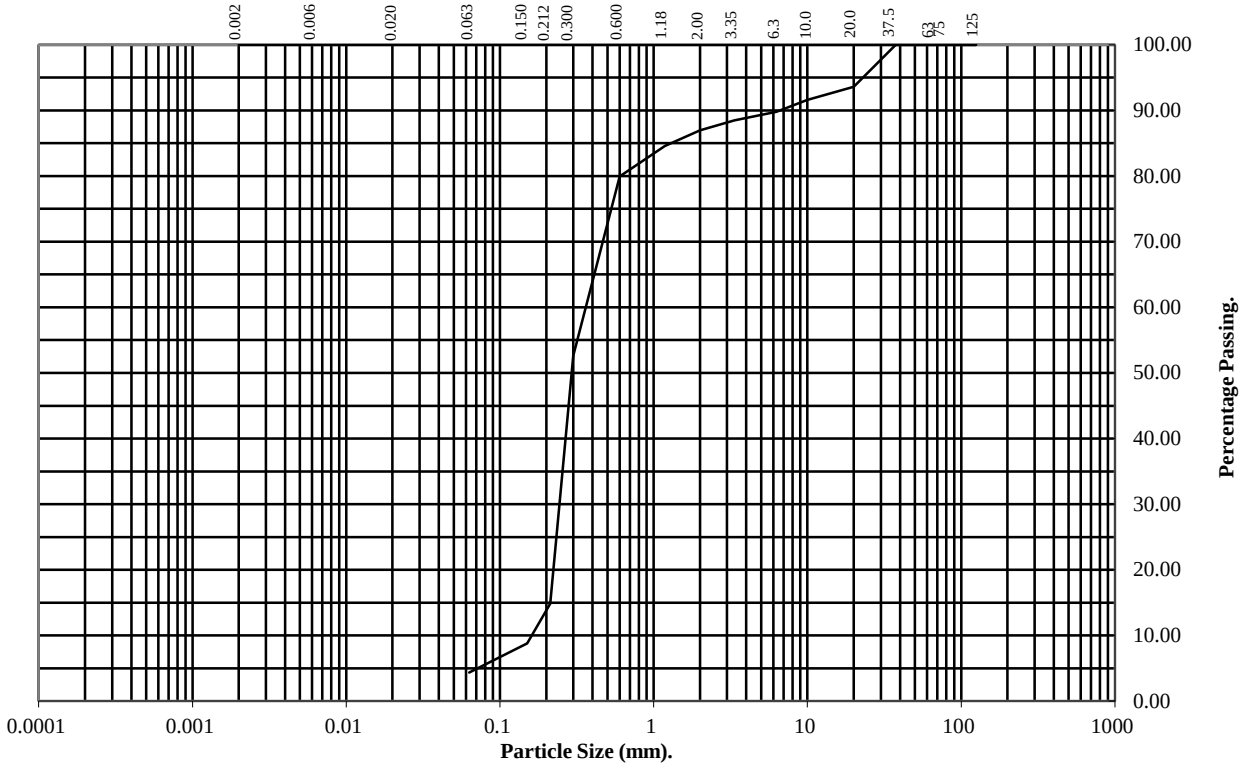
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP14** **Top Depth (m):** **1.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 94 |
| 10 | 92 |
| 6.3 | 90 |
| 3.35 | 88 |
| 2 | 87 |
| 1.18 | 85 |
| 0.6 | 80 |
| 0.3 | 53 |
| 0.212 | 15 |
| 0.15 | 9 |
| 0.063 | 4 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 13 |
| Sand | 83 |
| Silt/Clay | 4 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

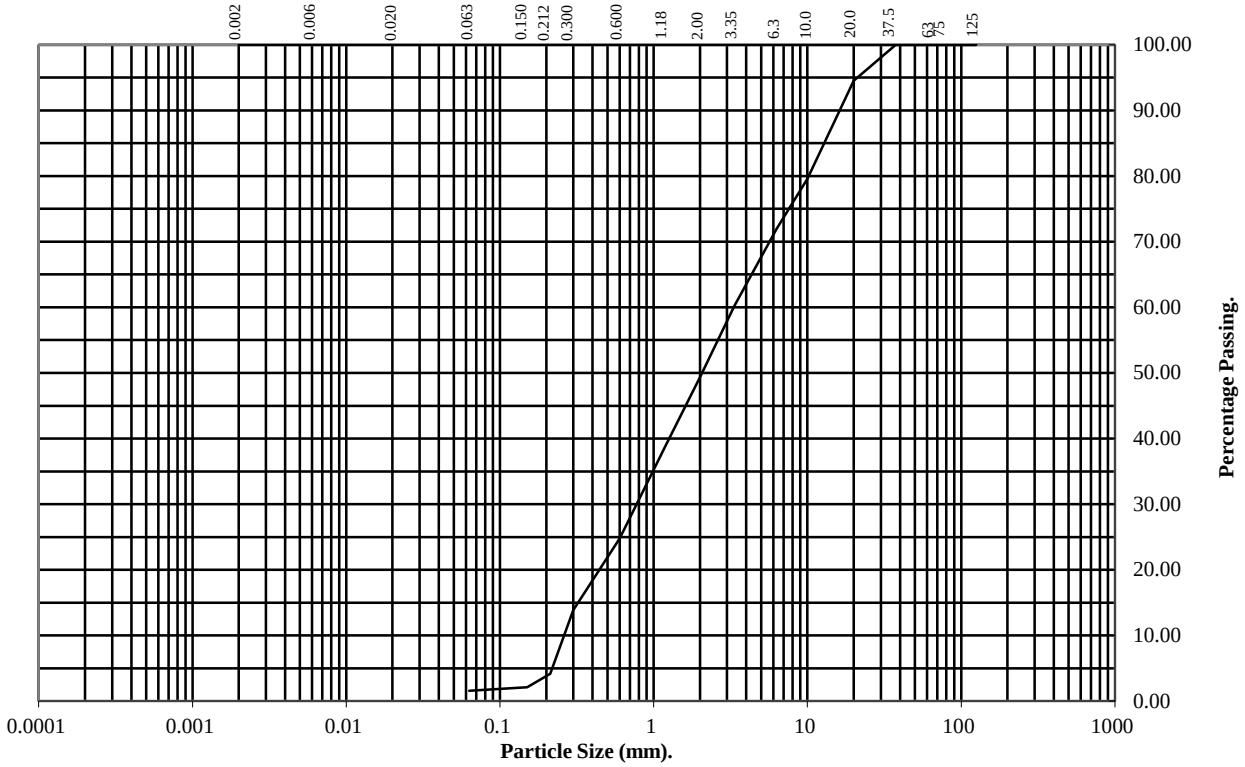
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP16** **Top Depth (m):** **1.00**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 95 |
| 10 | 80 |
| 6.3 | 72 |
| 3.35 | 60 |
| 2 | 49 |
| 1.18 | 39 |
| 0.6 | 25 |
| 0.3 | 14 |
| 0.212 | 4 |
| 0.15 | 2 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 51 |
| Sand | 47 |
| Silt/Clay | 2 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

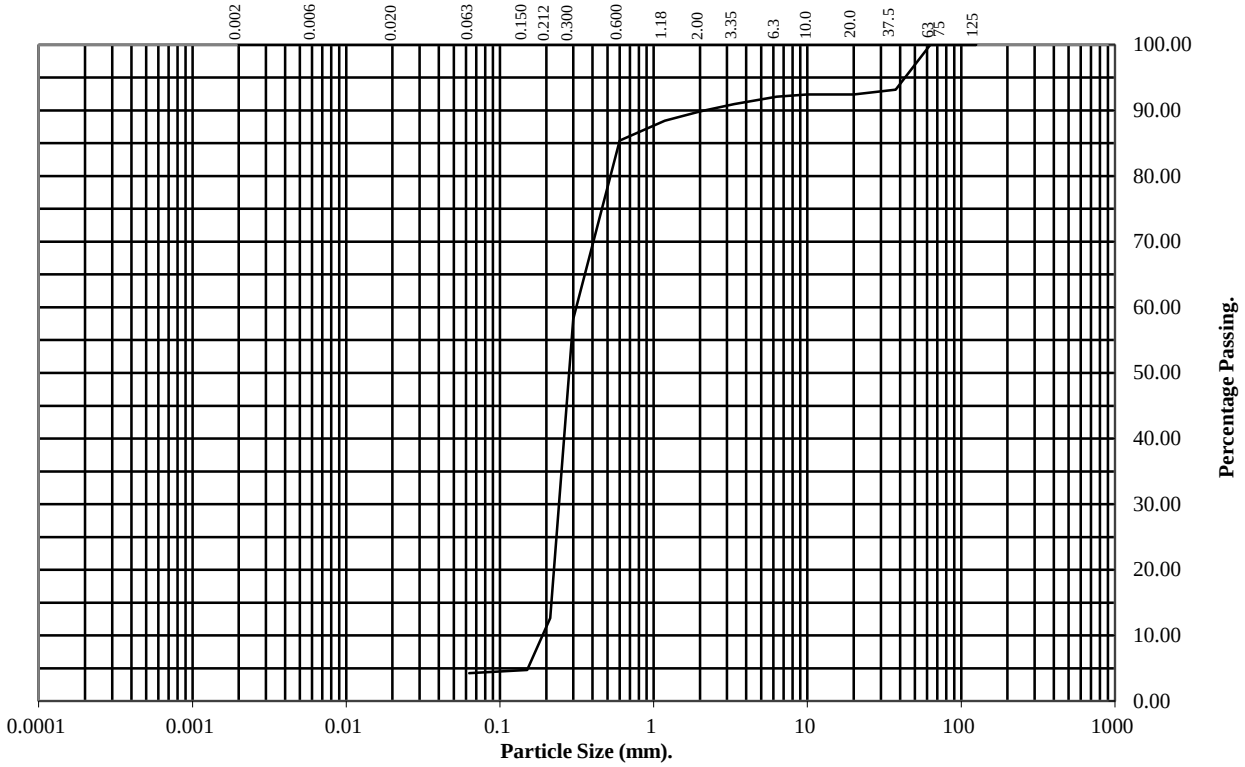
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP17** **Top Depth (m):** **1.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 93 |
| 20 | 92 |
| 10 | 92 |
| 6.3 | 92 |
| 3.35 | 91 |
| 2 | 90 |
| 1.18 | 88 |
| 0.6 | 85 |
| 0.3 | 58 |
| 0.212 | 13 |
| 0.15 | 5 |
| 0.063 | 4 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 10 |
| Sand | 86 |
| Silt/Clay | 4 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

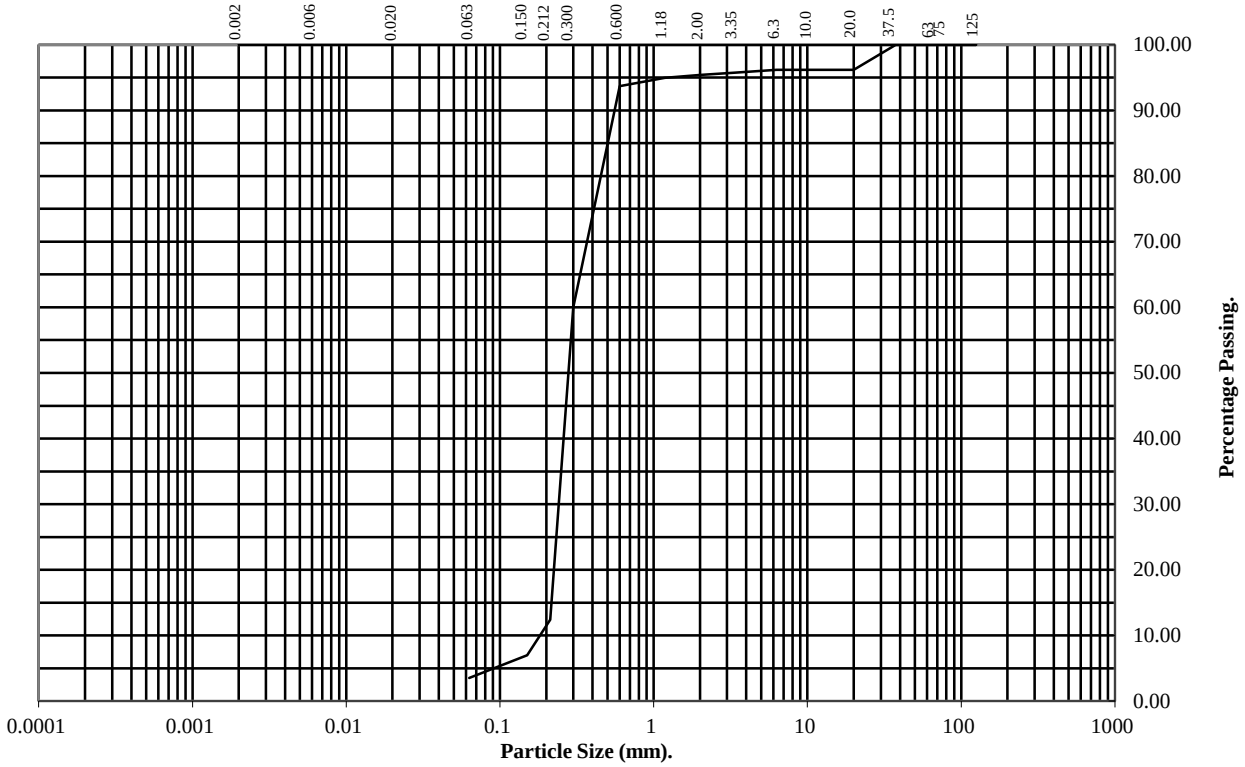
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP18** **Top Depth (m):** **1.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 96 |
| 10 | 96 |
| 6.3 | 96 |
| 3.35 | 96 |
| 2 | 95 |
| 1.18 | 95 |
| 0.6 | 94 |
| 0.3 | 60 |
| 0.212 | 12 |
| 0.15 | 7 |
| 0.063 | 4 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 5 |
| Sand | 91 |
| Silt/Clay | 4 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

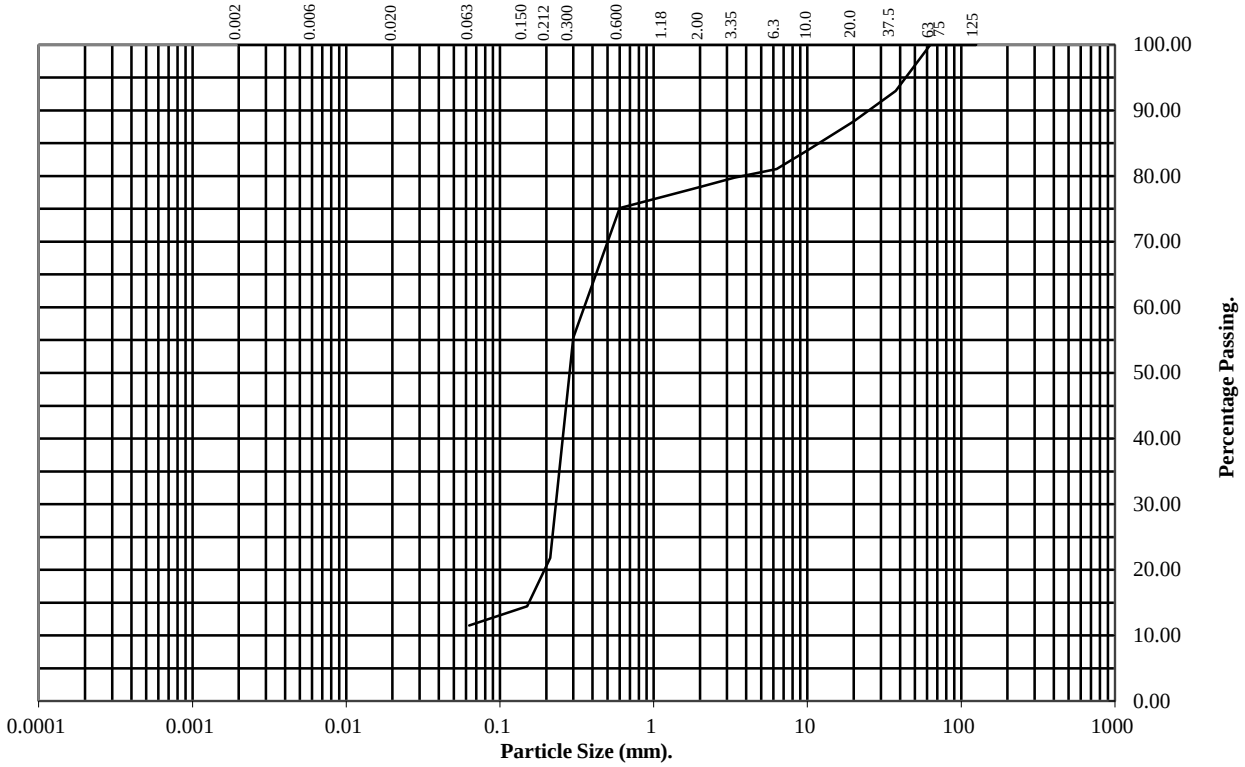
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** TP19 **Top Depth (m):** 1.50

**Sample Number:** 4 **Base Depth(m):**

**Sample Type:** B




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 93 |
| 20 | 88 |
| 10 | 84 |
| 6.3 | 81 |
| 3.35 | 80 |
| 2 | 78 |
| 1.18 | 77 |
| 0.6 | 75 |
| 0.3 | 55 |
| 0.212 | 22 |
| 0.15 | 14 |
| 0.063 | 12 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 22 |
| Sand | 66 |
| Silt/Clay | 12 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

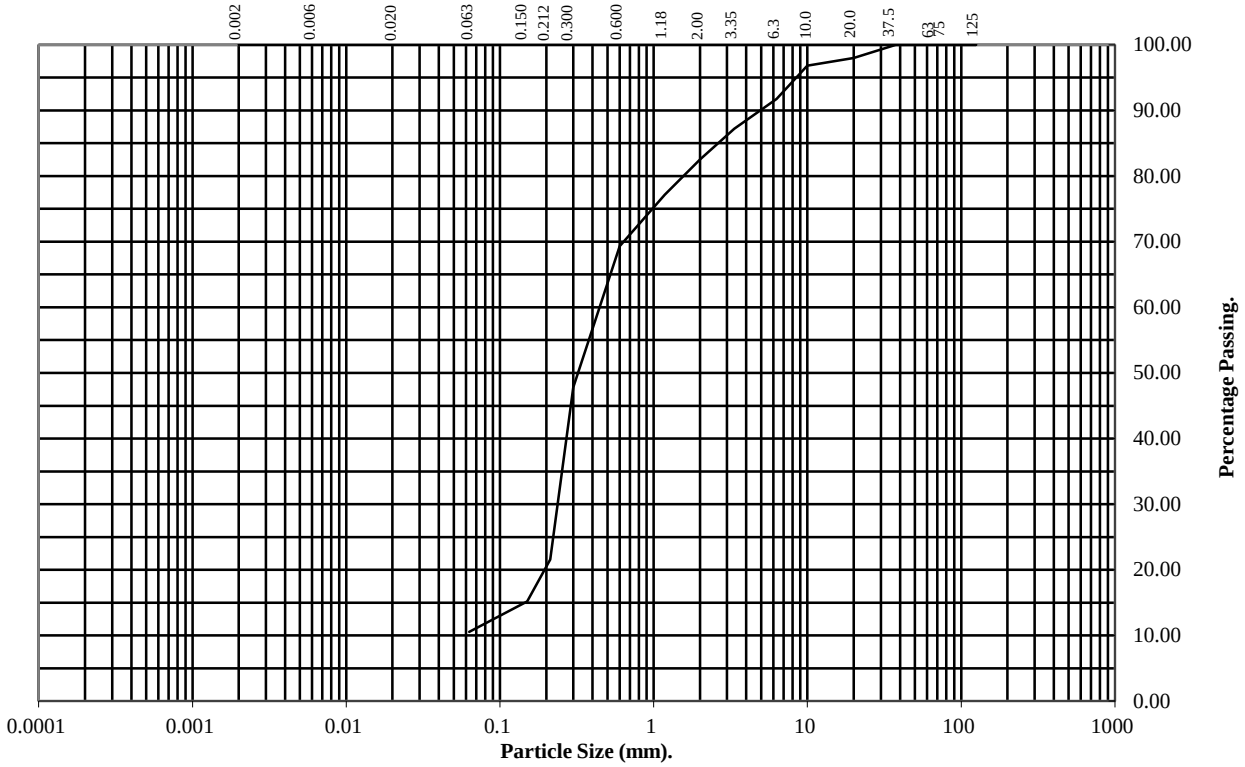
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** TP21 **Top Depth (m):** 0.50

**Sample Number:** 1 **Base Depth(m):**

**Sample Type:** B




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 98 |
| 10 | 97 |
| 6.3 | 92 |
| 3.35 | 87 |
| 2 | 83 |
| 1.18 | 77 |
| 0.6 | 69 |
| 0.3 | 48 |
| 0.212 | 22 |
| 0.15 | 15 |
| 0.063 | 11 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 17 |
| Sand | 72 |
| Silt/Clay | 11 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

**Contract No:** PSL18/1057

**Client Ref:** 17-1455

# PARTICLE SIZE DISTRIBUTION TEST

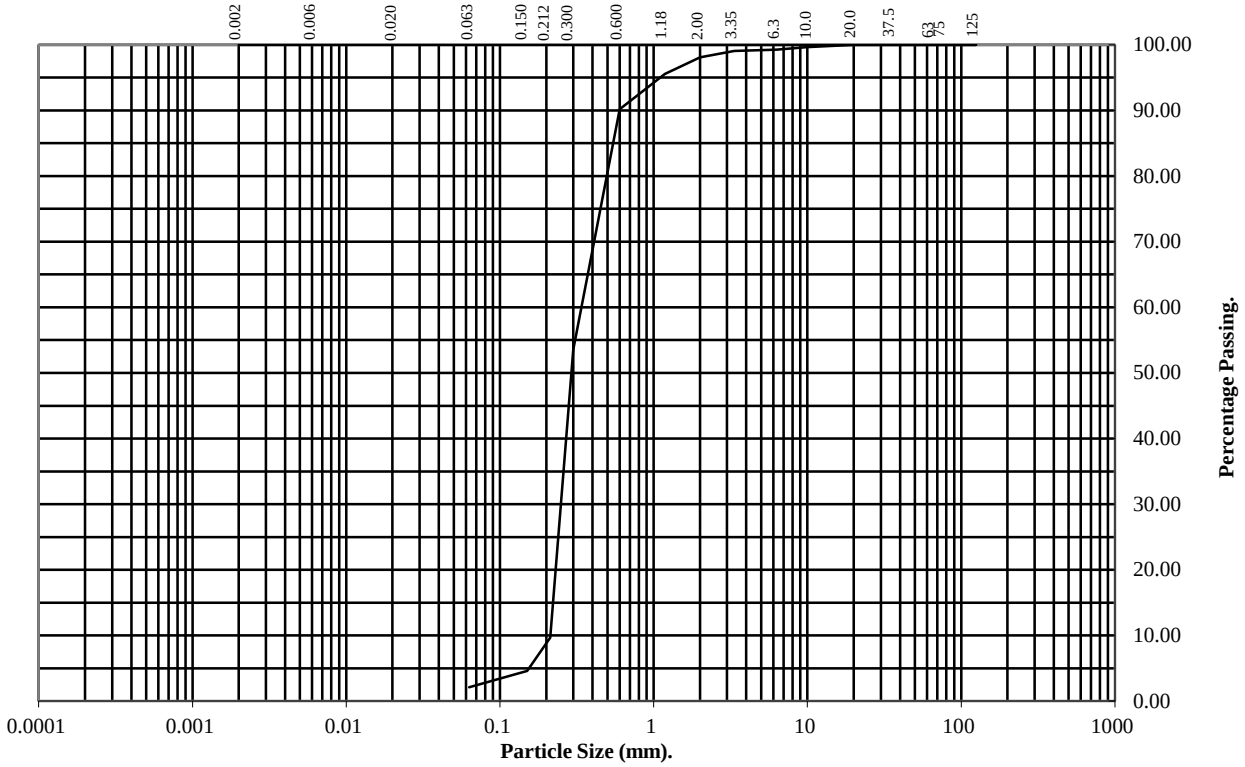
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP22** **Top Depth (m):** **1.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 100 |
| 10 | 100 |
| 6.3 | 99 |
| 3.35 | 99 |
| 2 | 98 |
| 1.18 | 96 |
| 0.6 | 90 |
| 0.3 | 54 |
| 0.212 | 10 |
| 0.15 | 5 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 2 |
| Sand | 96 |
| Silt/Clay | 2 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

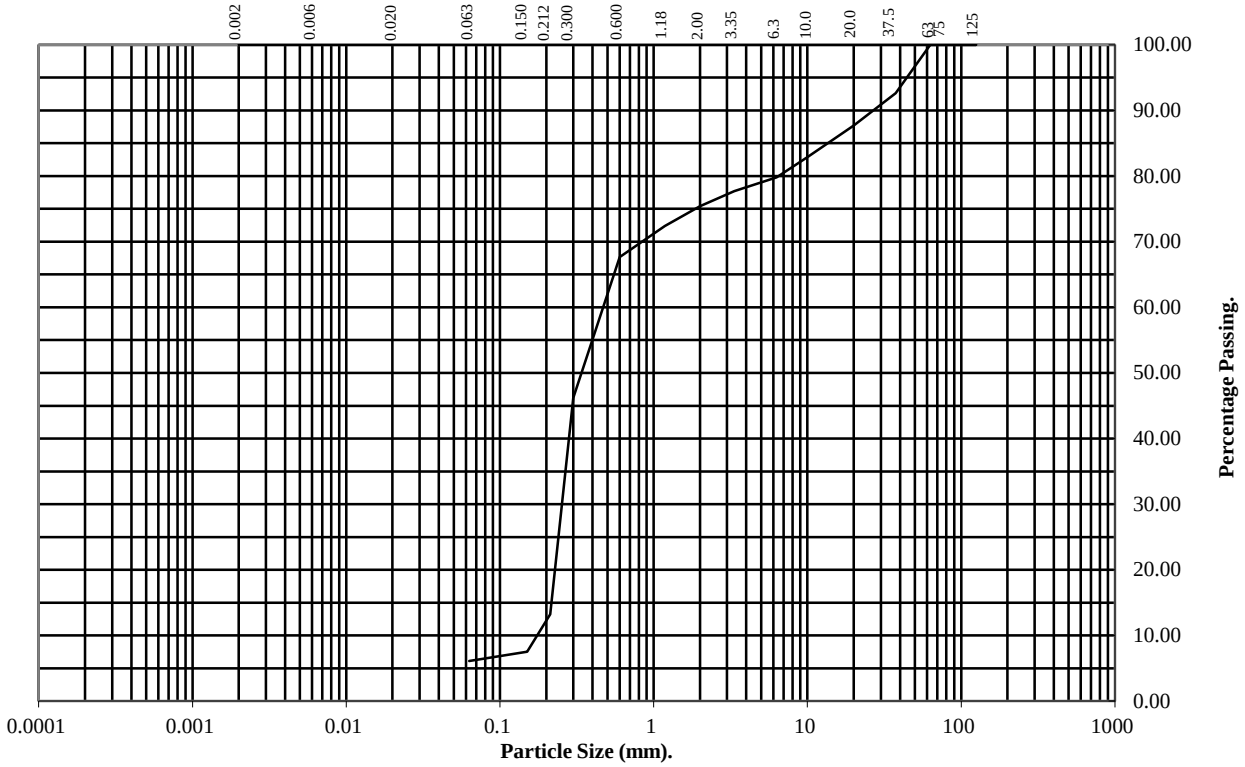
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** TP23 **Top Depth (m):** 2.50

**Sample Number:** 7 **Base Depth(m):**

**Sample Type:** B




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 93 |
| 20 | 88 |
| 10 | 83 |
| 6.3 | 80 |
| 3.35 | 78 |
| 2 | 75 |
| 1.18 | 72 |
| 0.6 | 68 |
| 0.3 | 46 |
| 0.212 | 13 |
| 0.15 | 8 |
| 0.063 | 6 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 25 |
| Sand | 69 |
| Silt/Clay | 6 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| Contract No: |
|---|
| PSL18/1057 |
| Client Ref: |
| 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

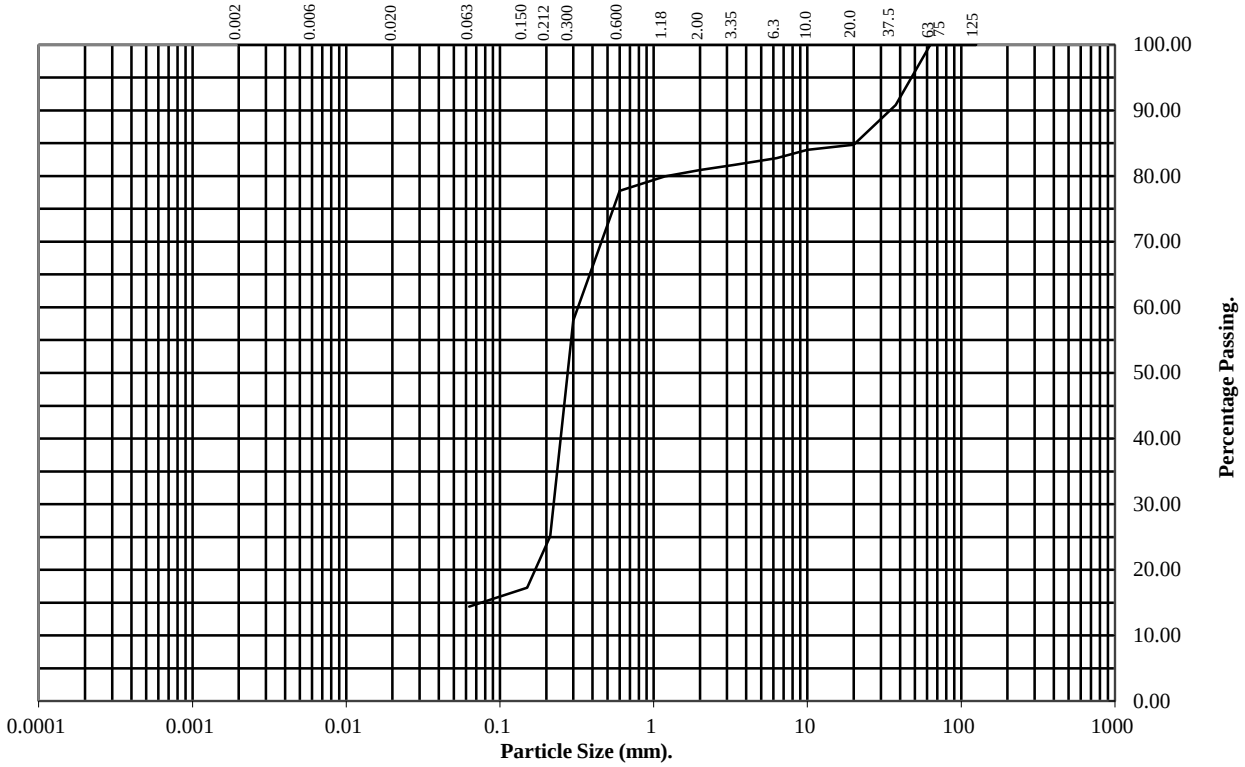
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP24** **Top Depth (m):** **1.40**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 91 |
| 20 | 85 |
| 10 | 84 |
| 6.3 | 83 |
| 3.35 | 82 |
| 2 | 81 |
| 1.18 | 80 |
| 0.6 | 78 |
| 0.3 | 58 |
| 0.212 | 25 |
| 0.15 | 17 |
| 0.063 | 14 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 19 |
| Sand | 67 |
| Silt/Clay | 14 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

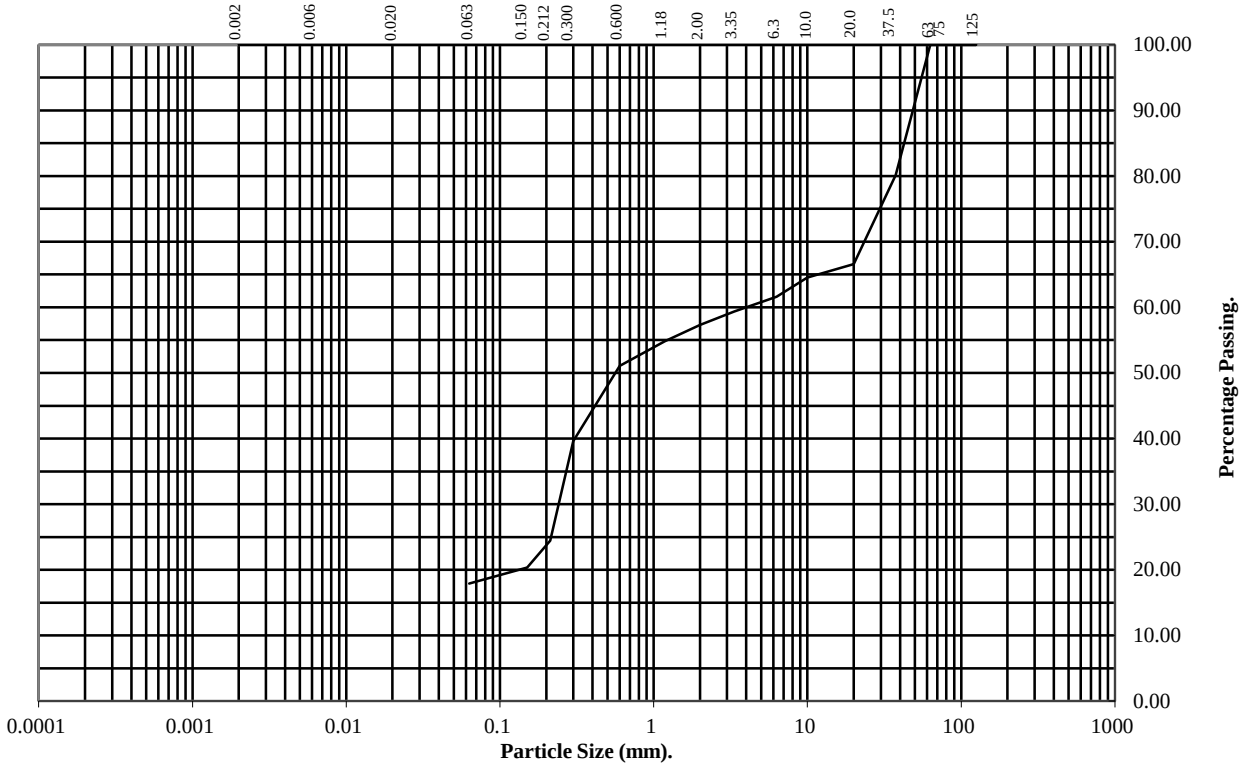
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** TP25 **Top Depth (m):** 2.30

**Sample Number:** 7 **Base Depth(m):**

**Sample Type:** B




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 80 |
| 20 | 67 |
| 10 | 65 |
| 6.3 | 62 |
| 3.35 | 59 |
| 2 | 57 |
| 1.18 | 55 |
| 0.6 | 51 |
| 0.3 | 40 |
| 0.212 | 24 |
| 0.15 | 20 |
| 0.063 | 18 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 43 |
| Sand | 39 |
| Silt/Clay | 18 |

**Remarks:**
See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

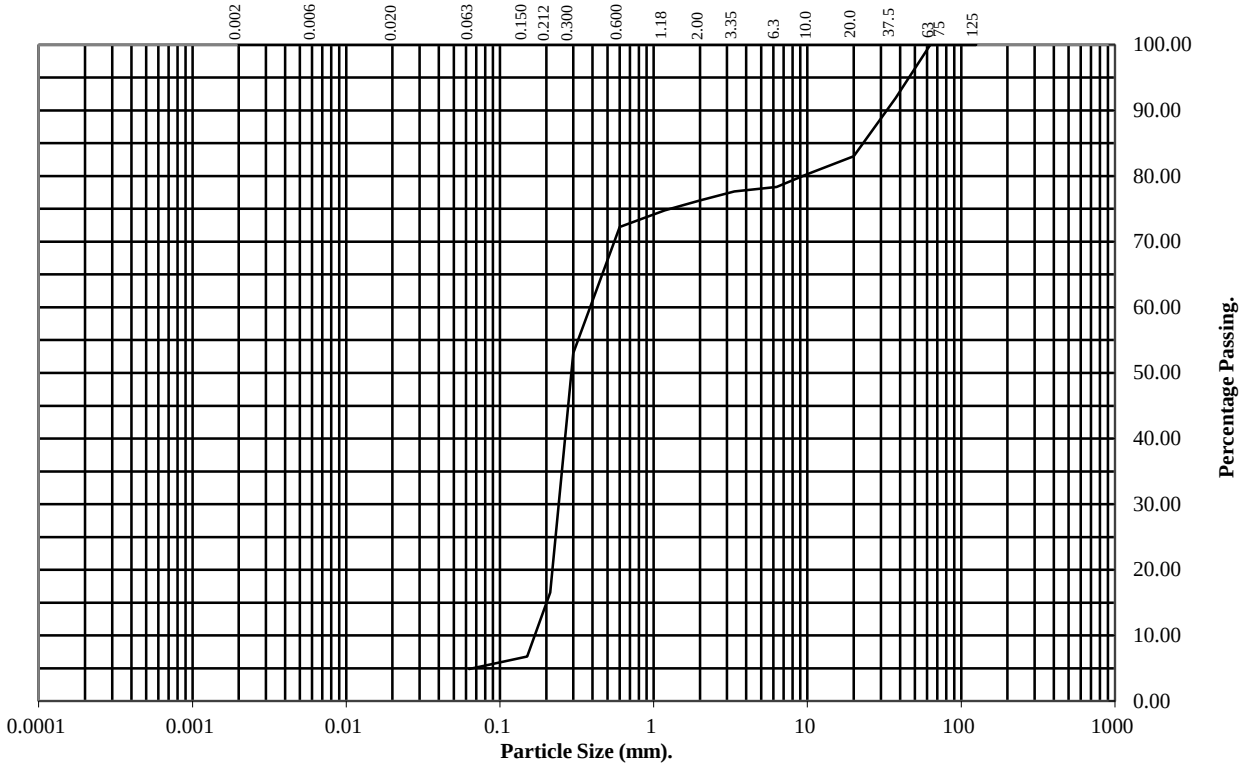
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **TP26** **Top Depth (m):** **1.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 92 |
| 20 | 83 |
| 10 | 80 |
| 6.3 | 78 |
| 3.35 | 78 |
| 2 | 76 |
| 1.18 | 75 |
| 0.6 | 72 |
| 0.3 | 53 |
| 0.212 | 17 |
| 0.15 | 7 |
| 0.063 | 5 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 24 |
| Sand | 71 |
| Silt/Clay | 5 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| **Contract No:** |
|---|
| **PSL18/1057** |
| **Client Ref:** |
| **17-1455** |

# PARTICLE SIZE DISTRIBUTION TEST

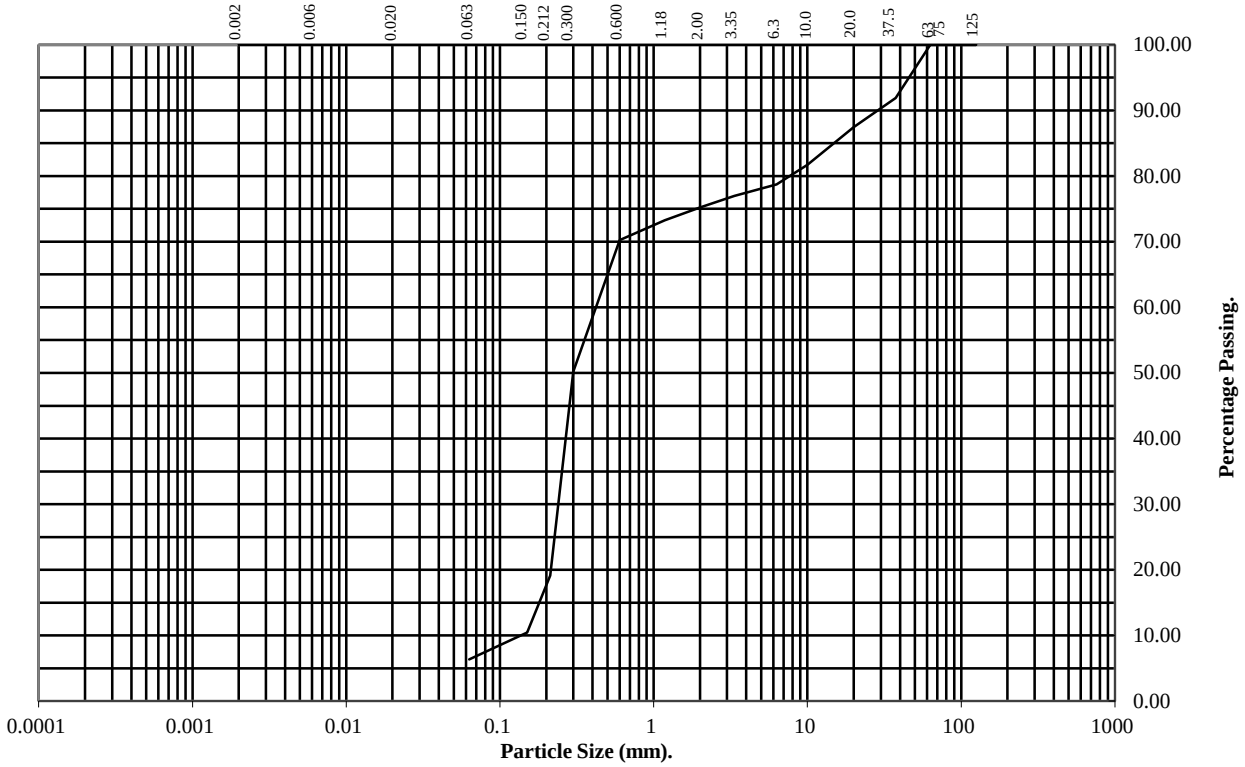
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** TP27 **Top Depth (m):** 1.00

**Sample Number:** 4 **Base Depth(m):**

**Sample Type:** B




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 92 |
| 20 | 87 |
| 10 | 82 |
| 6.3 | 79 |
| 3.35 | 77 |
| 2 | 75 |
| 1.18 | 73 |
| 0.6 | 70 |
| 0.3 | 50 |
| 0.212 | 19 |
| 0.15 | 10 |
| 0.063 | 6 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 25 |
| Sand | 69 |
| Silt/Clay | 6 |

**Remarks:**
See Summary of Soil Descriptions

4043

Professional Soils Laboratory

**Arklow WWTP Land GI**

| Contract No: |
|---|
| PSL18/1057 |
| Client Ref: |
| 17-1455 |

# Certificate of Analysis

*Certificate Number* 18-05528

14-Mar-18

*Client* Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

*Our Reference* 18-05528

*Client Reference* PSL18/1057

*Order No* (not supplied)

*Contract Title* Arklow WWTP Land

*Description* 5 Soil samples.

*Date Received* 09-Mar-18

*Date Started* 09-Mar-18

*Date Completed* 14-Mar-18

*Test Procedures* Identified by prefix DETSn (details on request).

*Notes* Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

*Approved By*

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 18-05528
*Client Ref* PSL18/1057
*Contract Title* Arklow WWTP Land

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **Lab No** | 1308213 | 1308214 | 1308215 | 1308216 | 1308217 |
| | | | **Sample ID** | TP02 | TP07 | TP10 | TP18 | TP19 |
| | | | **Depth** | 0.50 | 0.50 | 0.50 | 1.50 | 1.50 |
| | | | **Other ID** | 1 | 1 | 2 | 4 | 4 |
| | | | **Sample Type** | B | B | D | B | B |
| | | | **Sampling Date** | 08/03/18 | 08/03/18 | 08/03/18 | 08/03/18 | 08/03/18 |
| | | | **Sampling Time** | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | |
| **Inorganics** | | | | | | | | |
| pH | DETSC 2008# | | | 6.9 | 8.0 | 8.8 | 4.6 | 8.2 |
| Sulphate Aqueous Extract as SO4 | DETSC 2076# | 10 | mg/l | 1700 | 85 | 680 | 530 | 75 |

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Information in Support of the Analytical Results

*Our Ref* 18-05528
*Client Ref* PSL18/1057
*Contract* Arklow WWTP Land

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 1308213 | TP02 0.50 SOIL | 08/03/18 | PT 500ml | | |
| 1308214 | TP07 0.50 SOIL | 08/03/18 | PT 500ml | | |
| 1308215 | TP10 0.50 SOIL | 08/03/18 | PT 500ml | | |
| 1308216 | TP18 1.50 SOIL | 08/03/18 | PT 500ml | | |
| 1308217 | TP19 1.50 SOIL | 08/03/18 | PT 500ml | | |

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

## Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

## Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

# LABORATORY REPORT

4043

**Contract Number: PSL18/1055**

Report Date: 29 March 2018

Client's Reference: 17-1455

Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co.Antrim
BT53 7QL

**For the attention of: Stephen Watson**

Contract Title: Arklow WWTP Land GI

Date Received: 5/3/2018
Date Commenced: 5/3/2018
Date Completed: 29/3/2018

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

| | | |
|---|---|---|
| R Gunson<br>(Director) | A Watkins<br>(Director) | R Berriman<br>(Quality Manager) |
| L Knight<br>(Senior Technician) | C Marshall<br>(Laboratory Manager) | A Fry<br>(Senior Technician) |



**5 – 7 Hexthorpe Road, Hexthorpe,**
**Doncaster DN4 0AR**
**tel: +44 (0)844 815 6641**
**fax: +44 (0)844 815 6642**
**e-mail: rgunson@prosoils.co.uk**
**awatkins@prosoils.co.uk**

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|---|---|---|---|---|---|
| BH01 | 7 | B | 2.00 | | Brown slightly gravelly slightly silty SAND. |
| BH01 | 14 | B | 5.00 | | Brown gravelly SAND. |
| BH01 | 17 | D | 7.50 | | Brown slightly gravelly SAND. |
| BH01 | 23 | B | 9.00 | | Brown slightly gravelly SAND. |
| BH02C | 4 | B | 2.00 | | Brown gravelly silty SAND. |
| BH02C | 7 | B | 3.00 | | Brown slightly gravelly SAND. |
| BH02C | 11 | B | 5.00 | | Brown very sandy slightly silty GRAVEL. |
| BH02C | 13 | B | 6.00 | | Brown SAND. |
| BH02C | 15 | B | 7.00 | | Brown slightly gravelly slightly silty SAND. |
| BH02C | 17 | B | 9.00 | | Brown gravelly slightly silty SAND. |
| BH02C | 19 | B | 10.50 | | Brown SAND. |
| BH02C | 23 | B | 13.50 | | Brown very gravelly SAND. |
| BH02C | 31 | B | 18.20 | | Brown slightly gravelly sandy silty CLAY. |
| BH19 | 7 | B | 2.00 | | Brown gravelly SAND. |
| BH19 | 12 | B | 4.00 | | Brown very gravelly slightly silty SAND. |
| BH19 | 17 | B | 7.50 | | Brown SAND. |
| BH19 | 29 | B | 15.00 | | Brown slightly gravelly slightly sandy CLAY. |
| BH19 | 35 | D | 17.50 | | Brown very gravelly SAND. |
| BH03 | 4 | B | 0.50 | | Brown slightly silty SAND & GRAVEL. |

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | Arklow WWTP Land GI | Contract No: PSL18/1055 Client Ref: 17-1455 |

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|---|---|---|---|---|---|
| BH03 | 6 | B | 2.00 | | Brown gravelly SAND. |
| BH03 | 7 | B | 4.00 | | Brown very gravelly slightly silty SAND. |
| BH03 | 10 | B | 7.50 | | Brown very gravelly slightly silty SAND. |
| BH03 | 23 | D | 10.50 | | Brown slightly gravelly SAND. |
| BH03 | 27 | U | 14.50 | 14.95 | Soft grey sandy very silty CLAY. |
| BH03 | 26 | D | 15.30 | | Brown slightly sandy very silty CLAY. |
| BH04 | 5 | B | 3.00 | | Brown SAND. |
| BH04 | 7 | B | 5.00 | | Brown slightly silty SAND & GRAVEL. |
| BH04 | 10 | B | 9.00 | | Brown slightly gravelly slightly silty SAND. |
| BH05 | 7 | B | 2.00 | | Brown very gravelly SAND. |
| BH05 | 8 | B | 3.00 | | Brown slightly gravelly slightly silty SAND. |
| BH05 | 9 | B | 4.00 | | Brown very gravelly SAND. |
| BH05 | 11 | B | 6.00 | | Brown very sandy slightly silty GRAVEL. |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | Arklow WWTP Land GI | Contract No: PSL18/1055 Client Ref: 17-1455 |

# SUMMARY OF SOIL CLASSIFICATION TESTS

**(BS1377 : PART 2 : 1990)**

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % Clause 3.2 | Linear Shrinkage % Clause 6.5 | Particle Density Mg/m$^3$ Clause 8.2 | Liquid Limit % Clause 4.3/4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | Passing .425mm % | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH01 | 7 | B | 2.00 | | 15 | | | | | | | |
| BH01 | 14 | B | 5.00 | | 9.7 | | | | | | | |
| BH01 | 17 | D | 7.50 | | 15 | | | | | | | |
| BH01 | 23 | B | 9.00 | | 20 | | | | | | | |
| BH02C | 4 | B | 2.00 | | 16 | | | | | | | |
| BH02C | 7 | B | 3.00 | | 19 | | | | | | | |
| BH02C | 11 | B | 5.00 | | 6.4 | | | | | | | |
| BH02C | 13 | B | 6.00 | | 9.2 | | | | | | | |
| BH02C | 15 | B | 7.00 | | 18 | | | | | | | |
| BH02C | 17 | B | 9.00 | | 19 | | | | | | | |
| BH02C | 19 | B | 10.50 | | 21 | | | | | | | |
| BH02C | 23 | B | 13.50 | | 5.6 | | | | | | | |
| BH02C | 31 | B | 18.20 | | 16 | | | 32 | 16 | 16 | 95 | Low plasticity CL. |
| BH19 | 7 | B | 2.00 | | 16 | | | | | | | |
| BH19 | 12 | B | 4.00 | | 10 | | | | | | | |
| BH19 | 17 | B | 7.50 | | 16 | | | | | | | |
| BH19 | 29 | B | 15.00 | | 30 | | | 49 | 20 | 29 | 99 | Intermediate plasticity CI. |
| BH19 | 35 | D | 17.50 | | 2.1 | | | | | | | |
| BH03 | 4 | B | 0.50 | | 7.6 | | | | | | | |

**SYMBOLS :** **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

**Arklow WWTP Land GI**

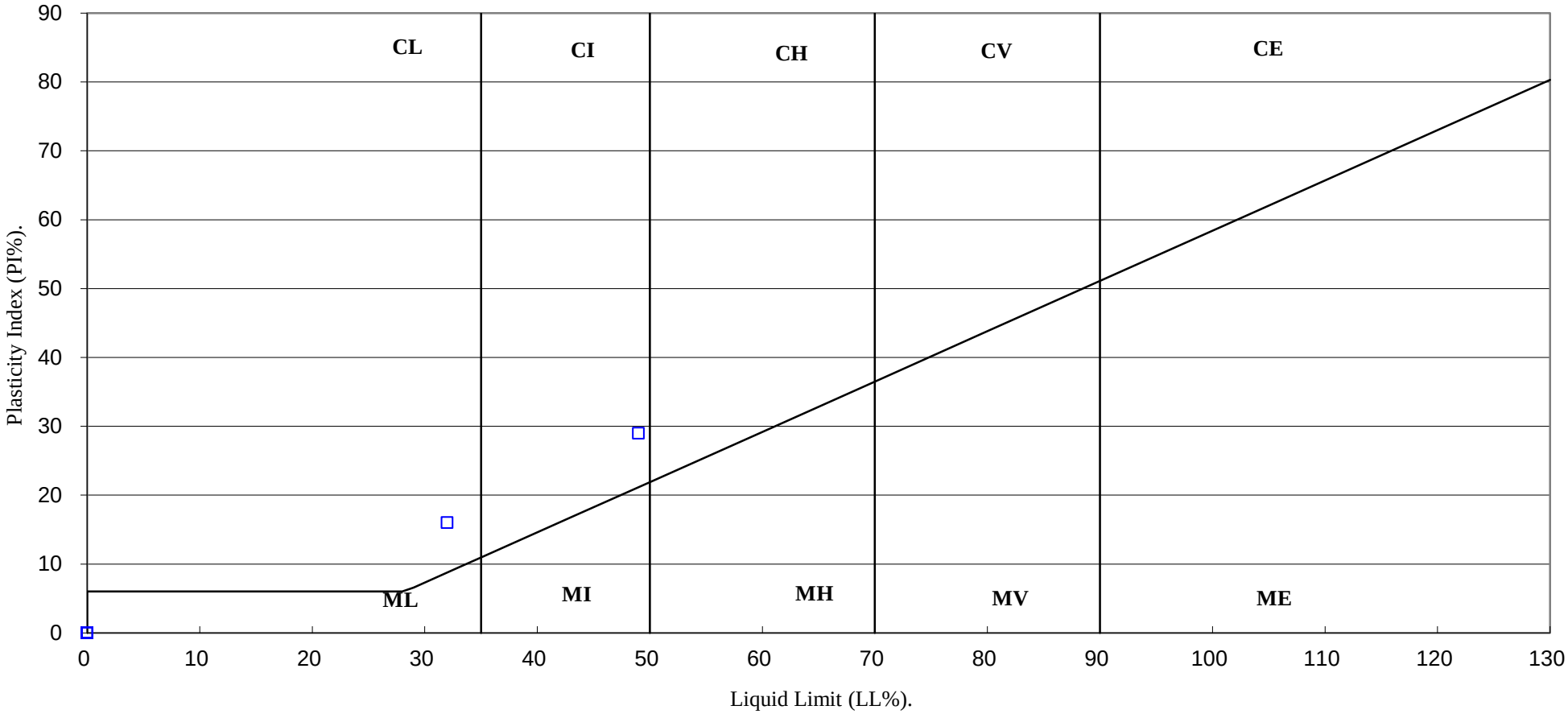
**Contract No:**

**PSL18/1055**

**Client Ref:**

**17-1455**

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.




| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | Arklow WWTP Land GI | Contract No: PSL18/1055 |
| | | | Client Ref: 17-1455 |

# SUMMARY OF SOIL CLASSIFICATION TESTS

**(BS1377 : PART 2 : 1990)**

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % Clause 3.2 | Linear Shrinkage % Clause 6.5 | Particle Density Mg/m$^3$ Clause 8.2 | Liquid Limit % Clause 4.3/4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | Passing .425mm % | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH03 | 6 | B | 2.00 | | 15 | | | | | | | |
| BH03 | 7 | B | 4.00 | | 15 | | | | | | | |
| BH03 | 10 | B | 7.50 | | 10 | | | | | | | |
| BH03 | 23 | D | 10.50 | | 7.5 | | | | | | | |
| BH03 | 26 | D | 15.30 | | 29 | | | 44 | 20 | 24 | 100 | Intermediate plasticity CI. |
| BH04 | 5 | B | 3.00 | | 15 | | | | | | | |
| BH04 | 7 | B | 5.00 | | 9.5 | | | | | | | |
| BH04 | 10 | B | 9.00 | | 21 | | | | | | | |
| BH05 | 7 | B | 2.00 | | 11 | | | | | | | |
| BH05 | 8 | B | 3.00 | | 16 | | | | | | | |
| BH05 | 9 | B | 4.00 | | 7.2 | | | | | | | |
| BH05 | 11 | B | 6.00 | | 8.7 | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**SYMBOLS :** **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

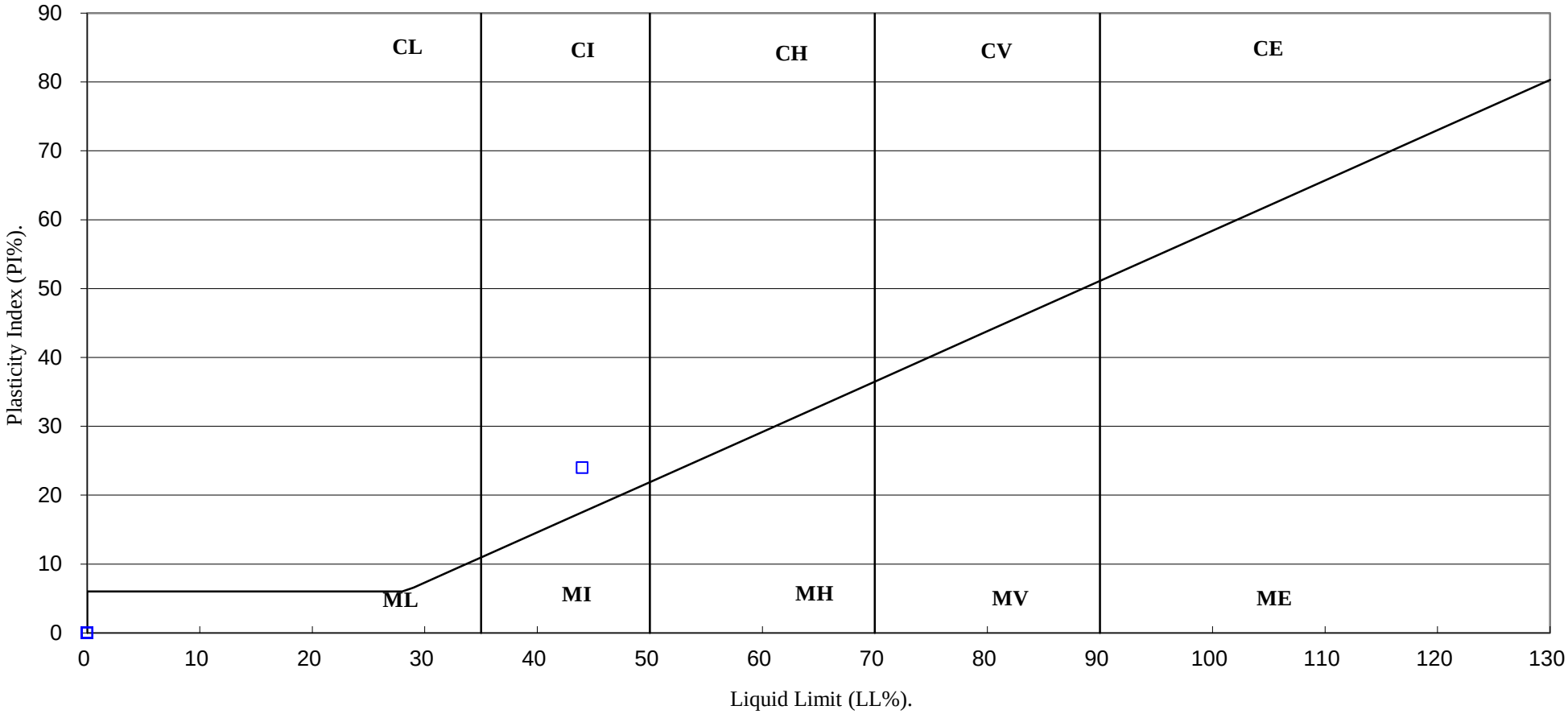
UKAS TESTING 4043

PSL Professional Soils Laboratory

**Arklow WWTP Land GI**

**Contract No:**
**PSL18/1055**
**Client Ref:**
**17-1455**

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.




| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | Arklow WWTP Land GI | Contract No: PSL18/1055 |
| | | | Client Ref: 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

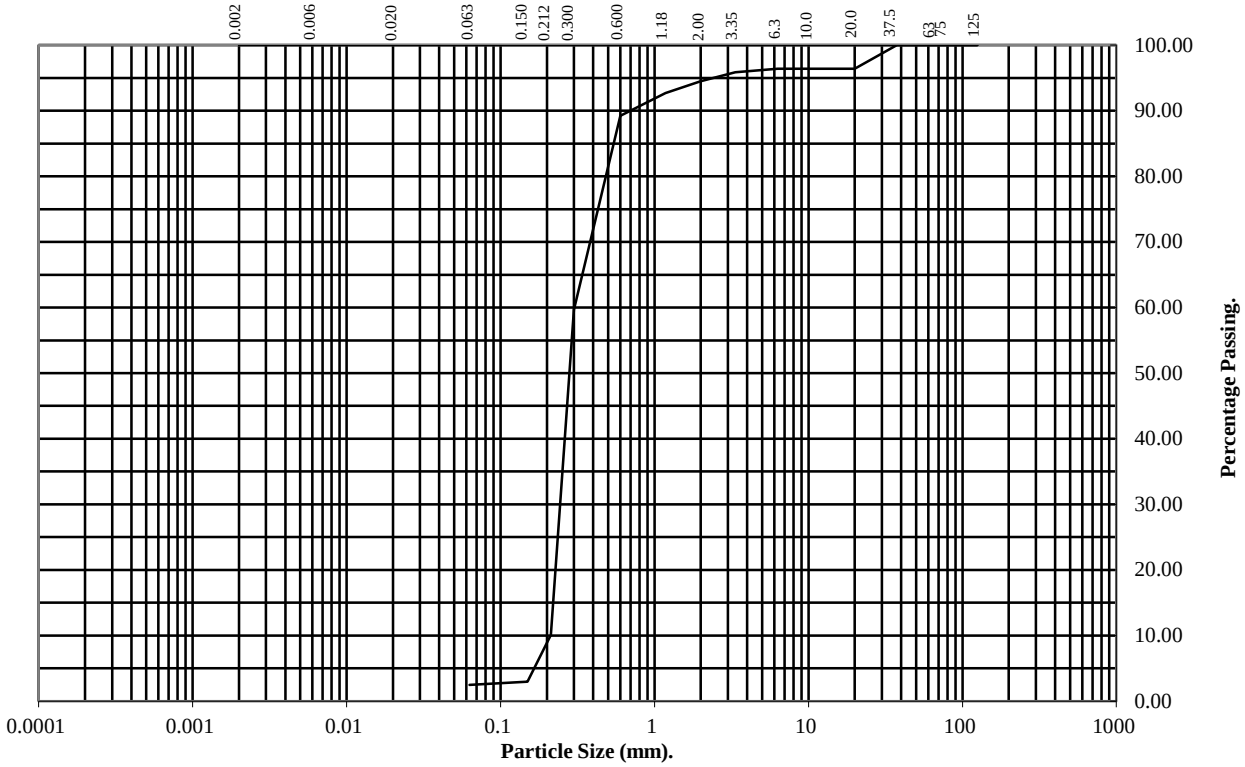
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH01** **Top Depth (m):** **2.00**

**Sample Number:** **7** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 96 |
| 10 | 96 |
| 6.3 | 96 |
| 3.35 | 96 |
| 2 | 94 |
| 1.18 | 93 |
| 0.6 | 89 |
| 0.3 | 60 |
| 0.212 | 10 |
| 0.15 | 3 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 6 |
| Sand | 92 |
| Silt/Clay | 2 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

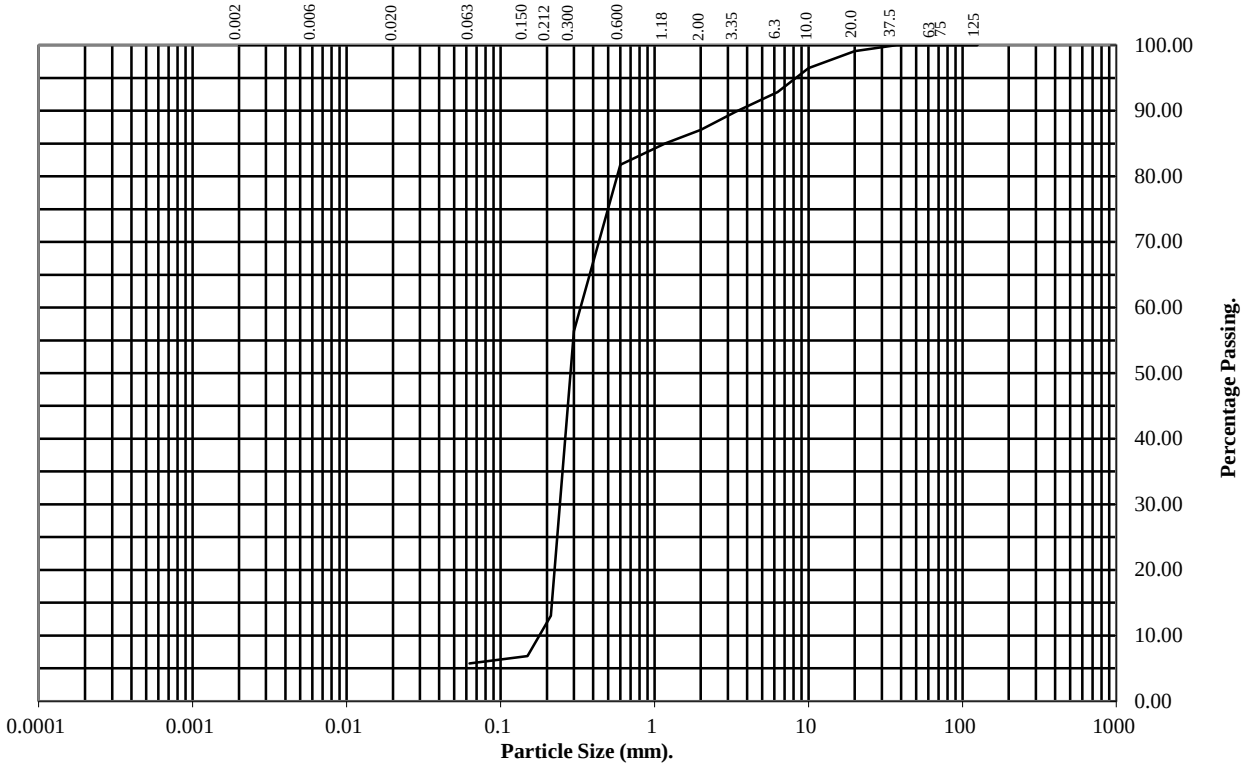
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH02C** **Top Depth (m):** **2.00**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 99 |
| 10 | 96 |
| 6.3 | 93 |
| 3.35 | 90 |
| 2 | 87 |
| 1.18 | 85 |
| 0.6 | 82 |
| 0.3 | 56 |
| 0.212 | 13 |
| 0.15 | 7 |
| 0.063 | 6 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 13 |
| Sand | 81 |
| Silt/Clay | 6 |

**Remarks:**

See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

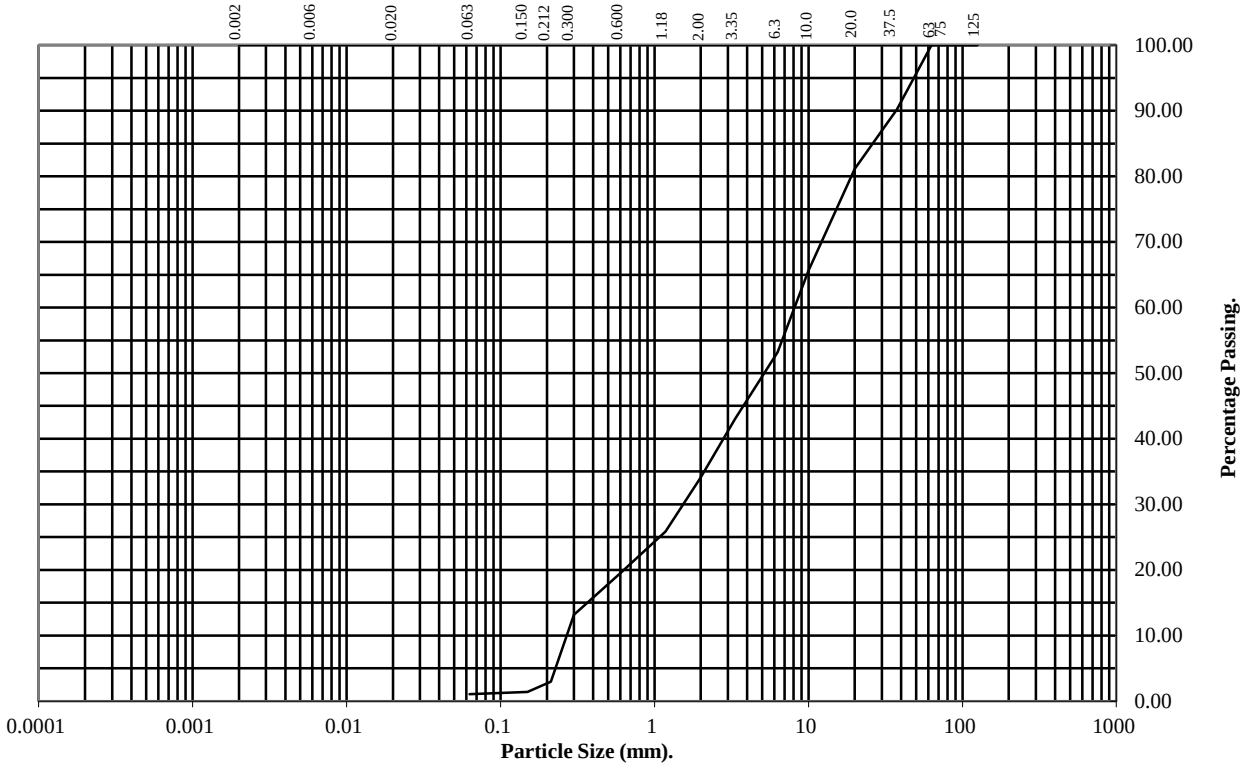
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH02C** **Top Depth (m):** **5.00**

**Sample Number:** **11** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 90 |
| 20 | 81 |
| 10 | 66 |
| 6.3 | 53 |
| 3.35 | 43 |
| 2 | 34 |
| 1.18 | 26 |
| 0.6 | 19 |
| 0.3 | 13 |
| 0.212 | 3 |
| 0.15 | 1 |
| 0.063 | 1 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 66 |
| Sand | 33 |
| Silt/Clay | 1 |

**Remarks:**

See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

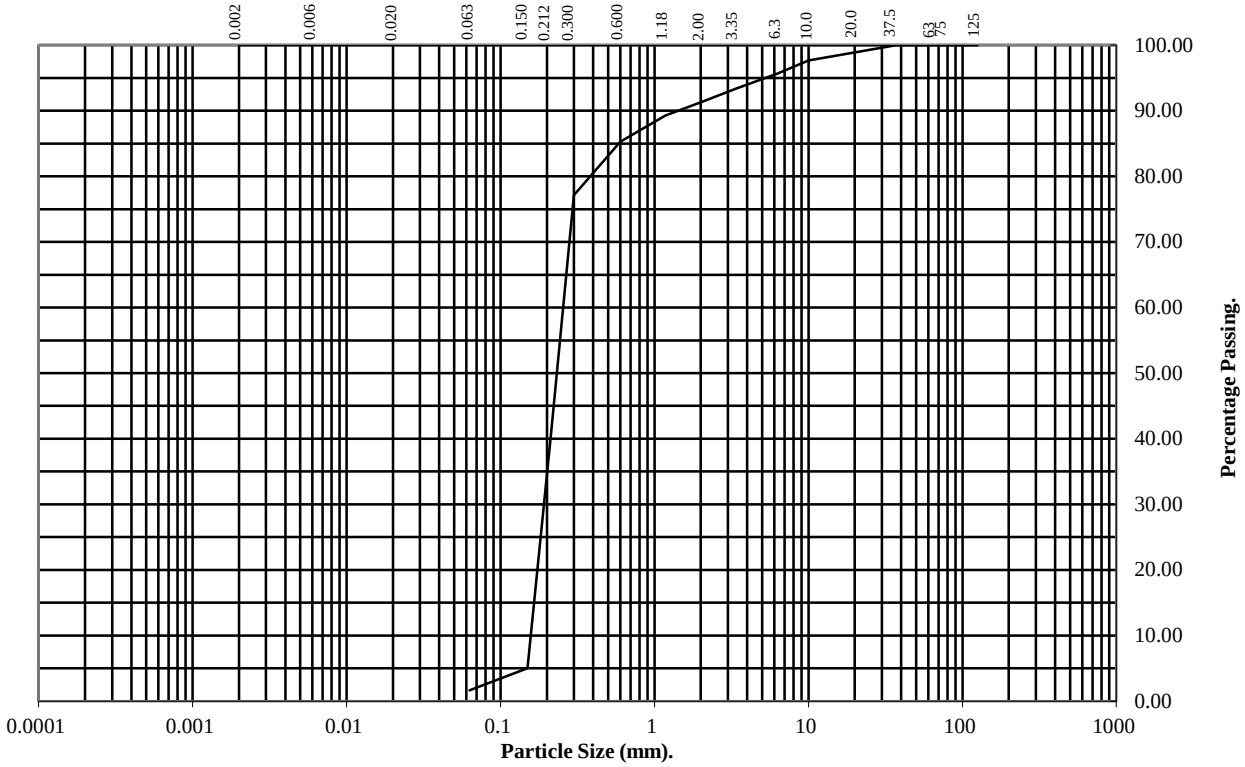
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH02C** **Top Depth (m):** **7.00**

**Sample Number:** **15** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 99 |
| 10 | 98 |
| 6.3 | 96 |
| 3.35 | 93 |
| 2 | 91 |
| 1.18 | 89 |
| 0.6 | 85 |
| 0.3 | 77 |
| 0.212 | 40 |
| 0.15 | 5 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 9 |
| Sand | 89 |
| Silt/Clay | 2 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

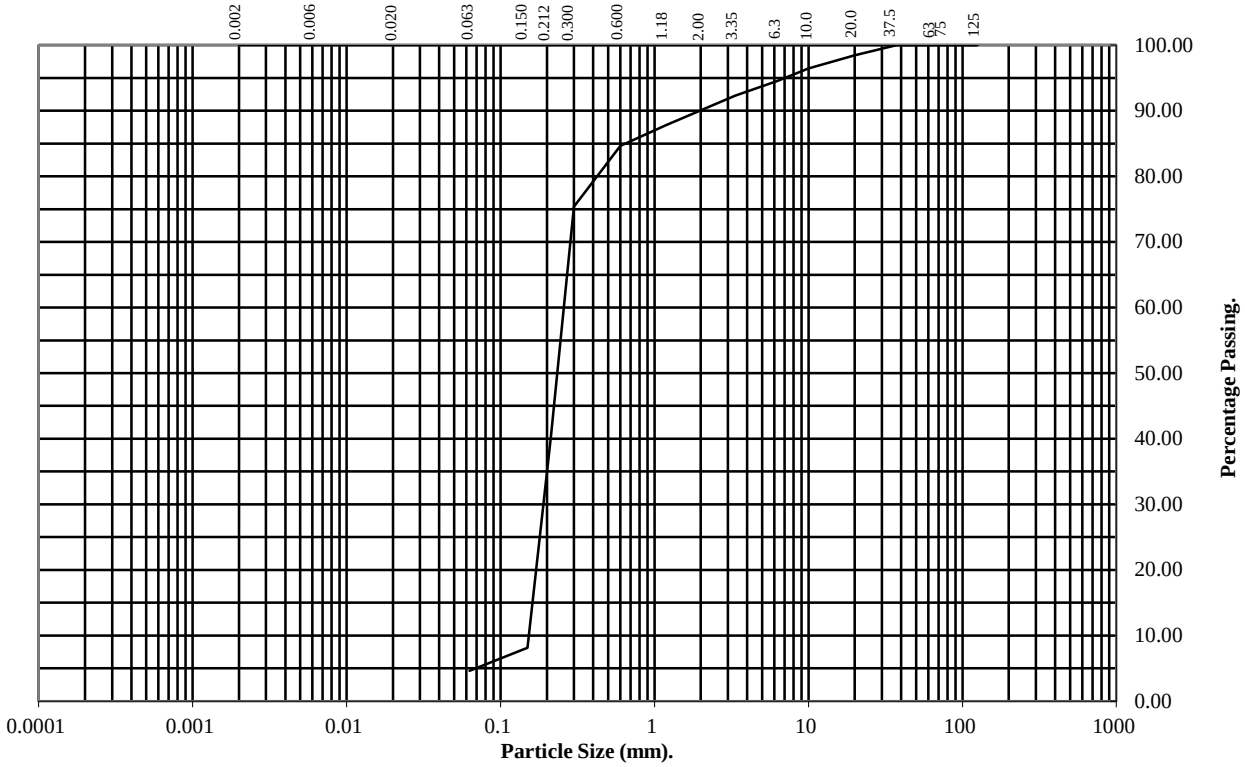
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH02C** **Top Depth (m):** **9.00**

**Sample Number:** **17** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 98 |
| 10 | 96 |
| 6.3 | 95 |
| 3.35 | 92 |
| 2 | 90 |
| 1.18 | 88 |
| 0.6 | 85 |
| 0.3 | 75 |
| 0.212 | 40 |
| 0.15 | 8 |
| 0.063 | 5 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 10 |
| Sand | 85 |
| Silt/Clay | 5 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

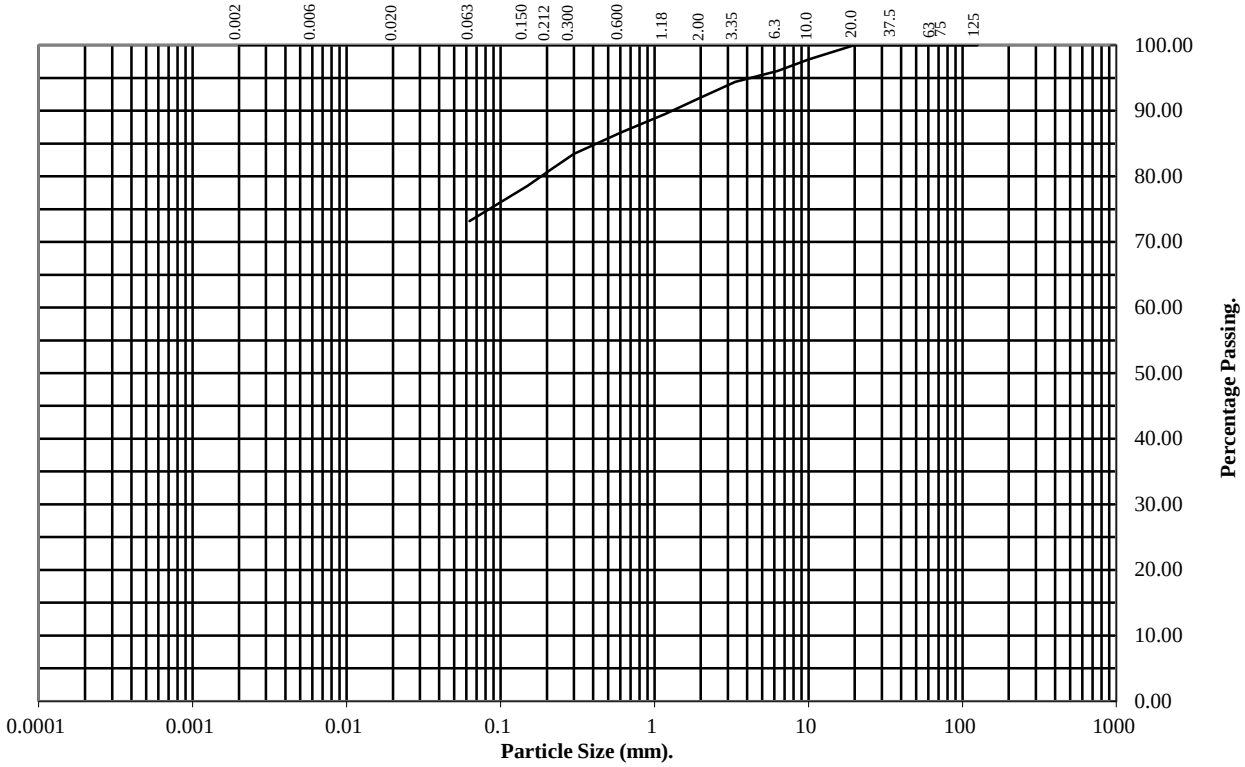
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH02C** **Top Depth (m):** **18.20**

**Sample Number:** **31** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 100 |
| 10 | 98 |
| 6.3 | 96 |
| 3.35 | 94 |
| 2 | 92 |
| 1.18 | 90 |
| 0.6 | 87 |
| 0.3 | 83 |
| 0.212 | 81 |
| 0.15 | 79 |
| 0.063 | 73 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 8 |
| Sand | 19 |
| Silt/Clay | 73 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

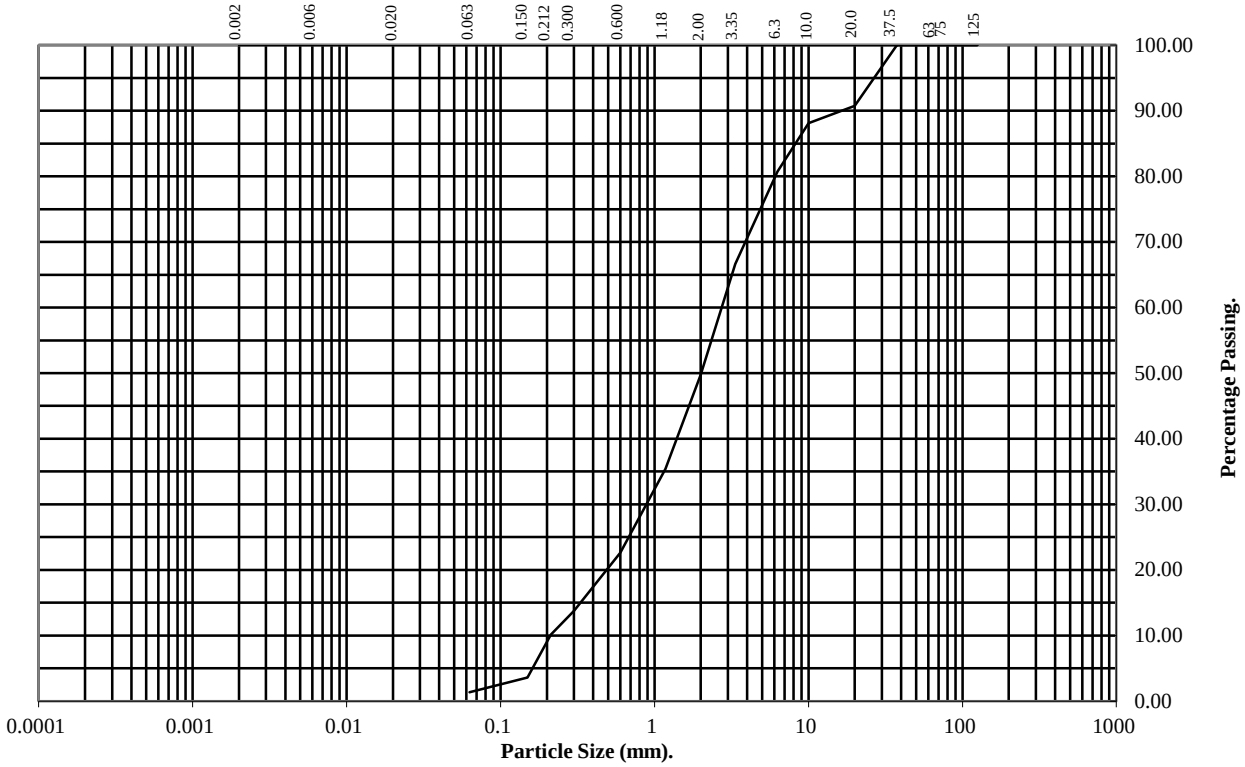
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH03** **Top Depth (m):** **0.50**

**Sample Number:** **4** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 91 |
| 10 | 88 |
| 6.3 | 81 |
| 3.35 | 67 |
| 2 | 50 |
| 1.18 | 35 |
| 0.6 | 23 |
| 0.3 | 14 |
| 0.212 | 10 |
| 0.15 | 4 |
| 0.063 | 1 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 50 |
| Sand | 49 |
| Silt/Clay | 1 |

**Remarks:**

See Summary of Soil Descriptions

# PARTICLE SIZE DISTRIBUTION TEST

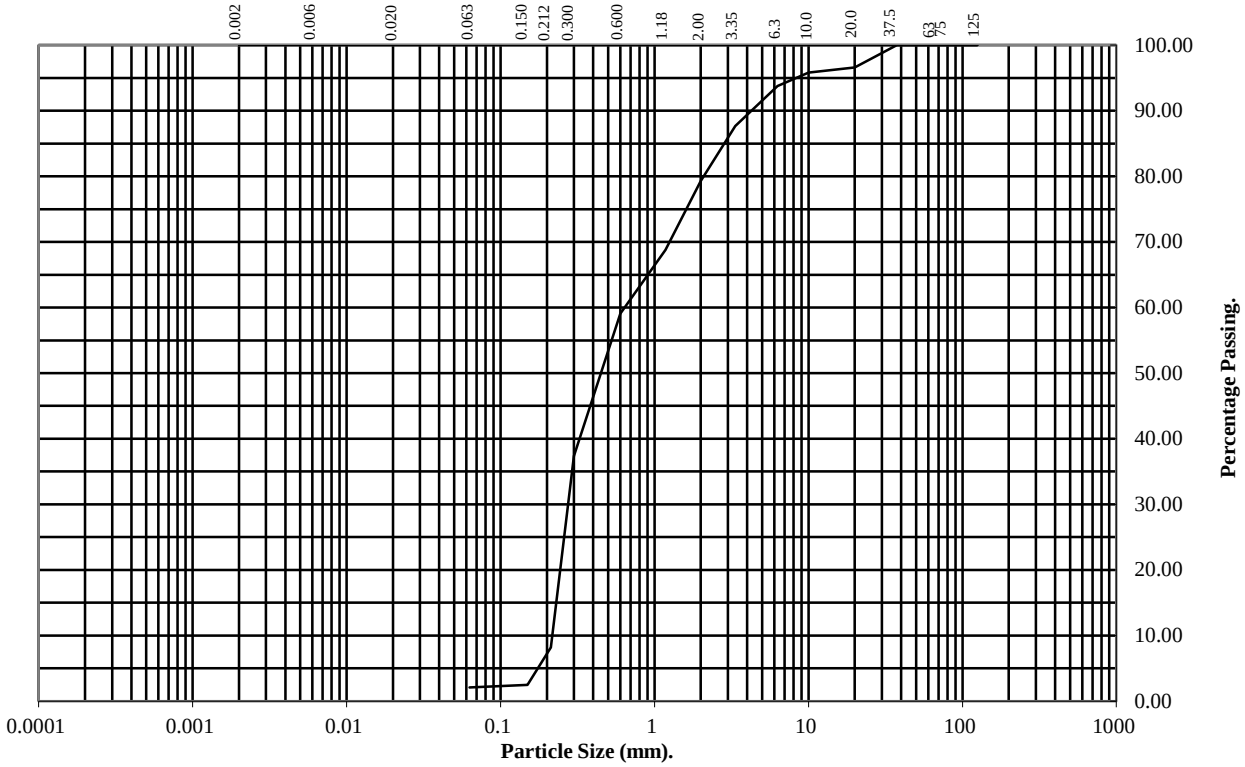
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH03** **Top Depth (m):** **4.00**

**Sample Number:** **7** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 97 |
| 10 | 96 |
| 6.3 | 94 |
| 3.35 | 88 |
| 2 | 79 |
| 1.18 | 69 |
| 0.6 | 59 |
| 0.3 | 37 |
| 0.212 | 8 |
| 0.15 | 2 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 21 |
| Sand | 77 |
| Silt/Clay | 2 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

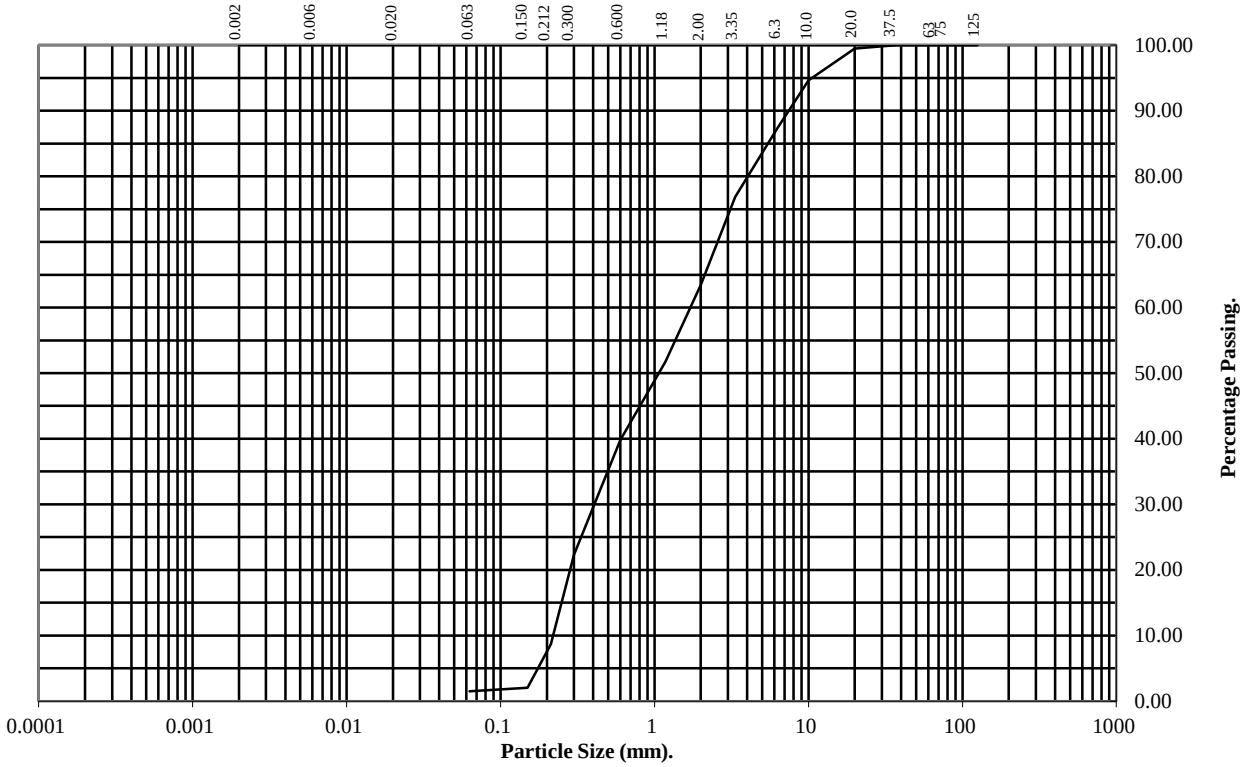
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH03** **Top Depth (m):** **7.50**

**Sample Number:** **10** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 99 |
| 10 | 95 |
| 6.3 | 87 |
| 3.35 | 77 |
| 2 | 63 |
| 1.18 | 52 |
| 0.6 | 40 |
| 0.3 | 22 |
| 0.212 | 9 |
| 0.15 | 2 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 37 |
| Sand | 61 |
| Silt/Clay | 2 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

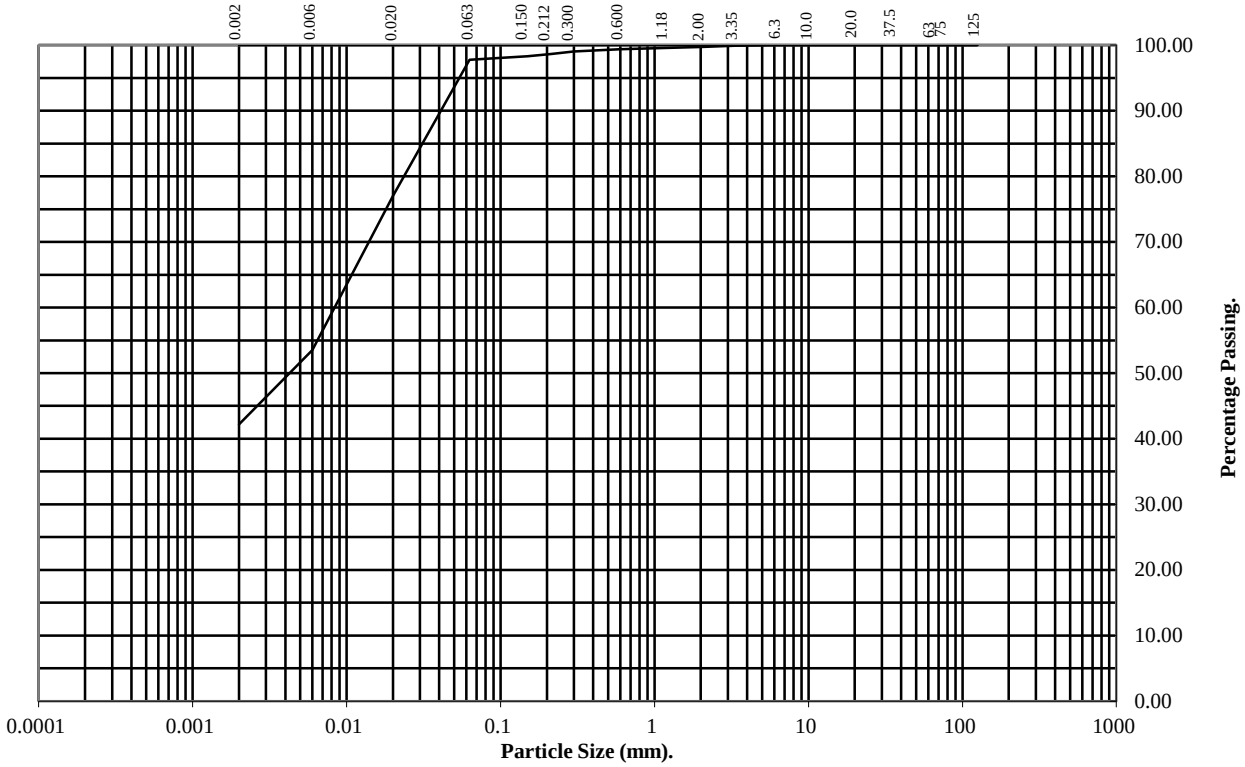
**BS1377 : Part 2 : 1990**

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

**Hole Number:** **BH03** **Top Depth (m):** **15.30**

**Sample Number:** **26** **Base Depth(m):**

**Sample Type:** **D**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 100 |
| 10 | 100 |
| 6.3 | 100 |
| 3.35 | 100 |
| 2 | 100 |
| 1.18 | 100 |
| 0.6 | 99 |
| 0.3 | 99 |
| 0.212 | 99 |
| 0.15 | 98 |
| 0.063 | 98 |

| Particle Diameter | Percentage Passing |
|---|---|
| 0.02 | 77 |
| 0.006 | 54 |
| 0.002 | 42 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 2 |
| Silt | 56 |
| Clay | 42 |

**Remarks:**
See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

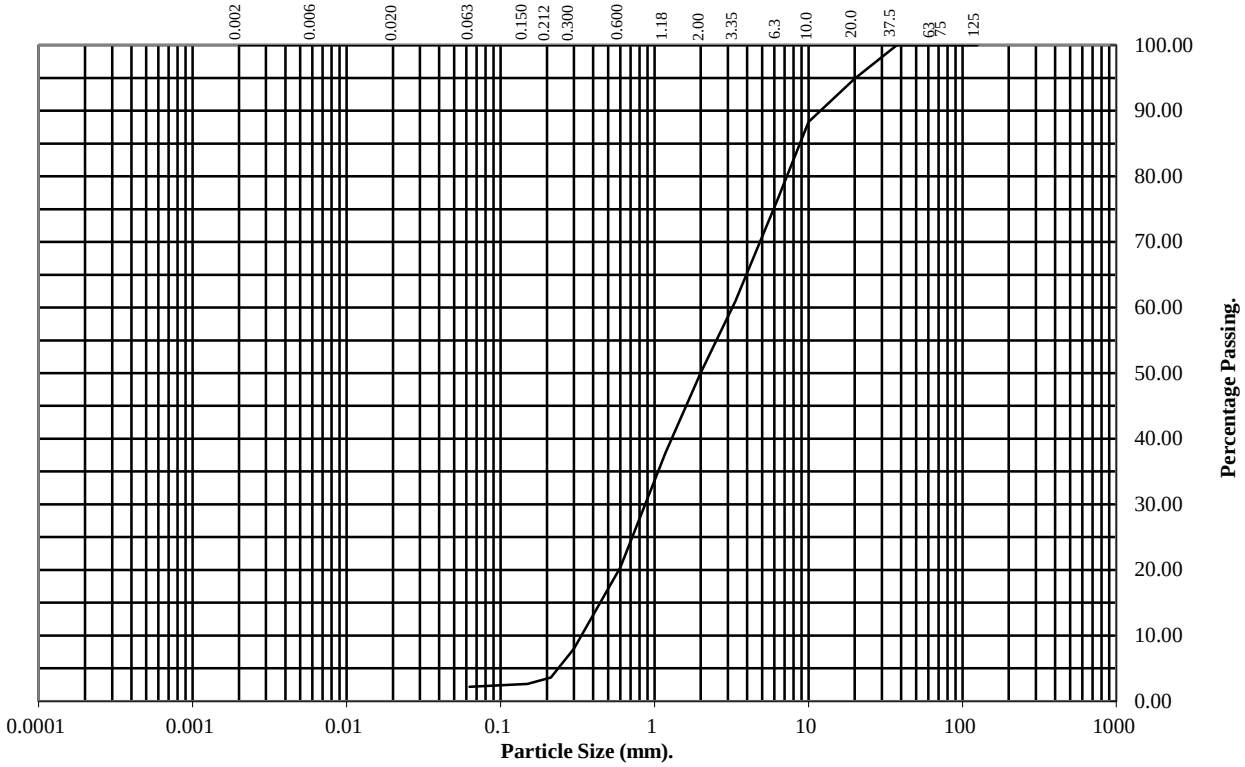
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH04** **Top Depth (m):** **5.00**

**Sample Number:** **7** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 95 |
| 10 | 88 |
| 6.3 | 76 |
| 3.35 | 61 |
| 2 | 50 |
| 1.18 | 38 |
| 0.6 | 20 |
| 0.3 | 8 |
| 0.212 | 4 |
| 0.15 | 3 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 50 |
| Sand | 48 |
| Silt/Clay | 2 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

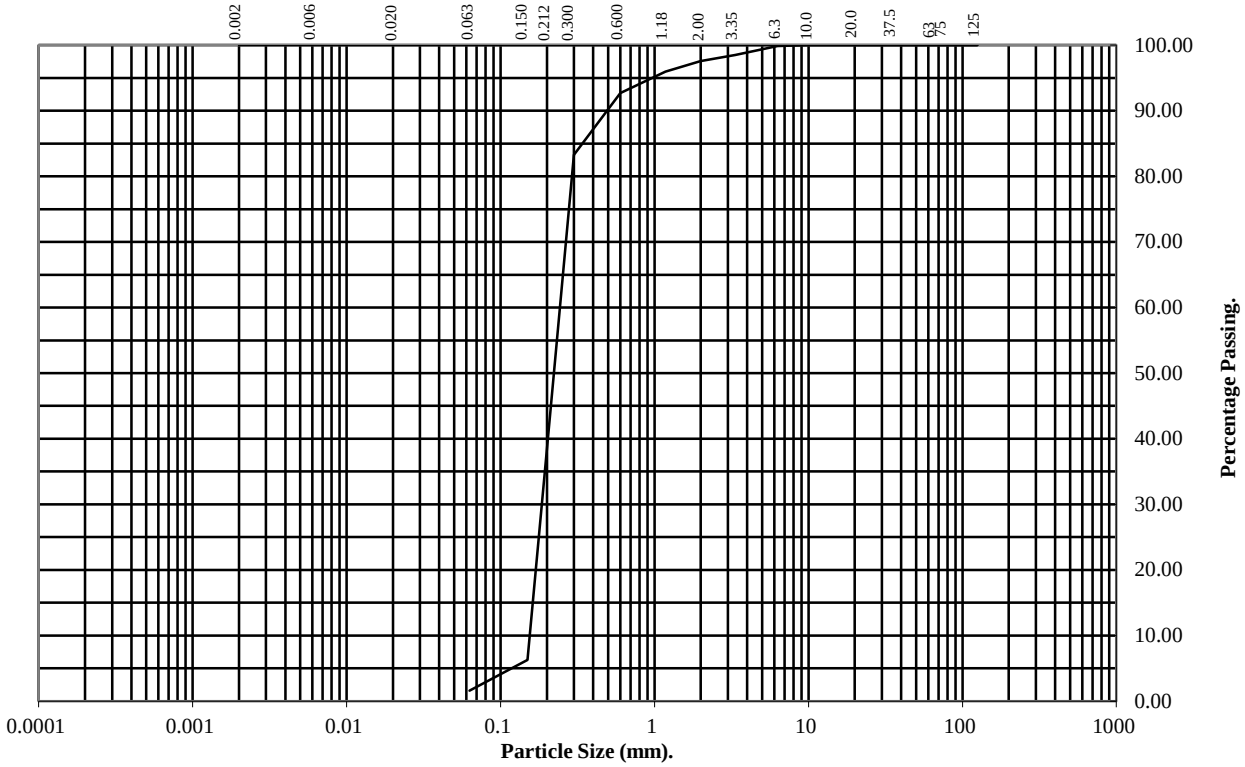
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH04** **Top Depth (m):** **9.00**

**Sample Number:** **10** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 100 |
| 10 | 100 |
| 6.3 | 100 |
| 3.35 | 99 |
| 2 | 98 |
| 1.18 | 96 |
| 0.6 | 93 |
| 0.3 | 83 |
| 0.212 | 45 |
| 0.15 | 6 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 2 |
| Sand | 96 |
| Silt/Clay | 2 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

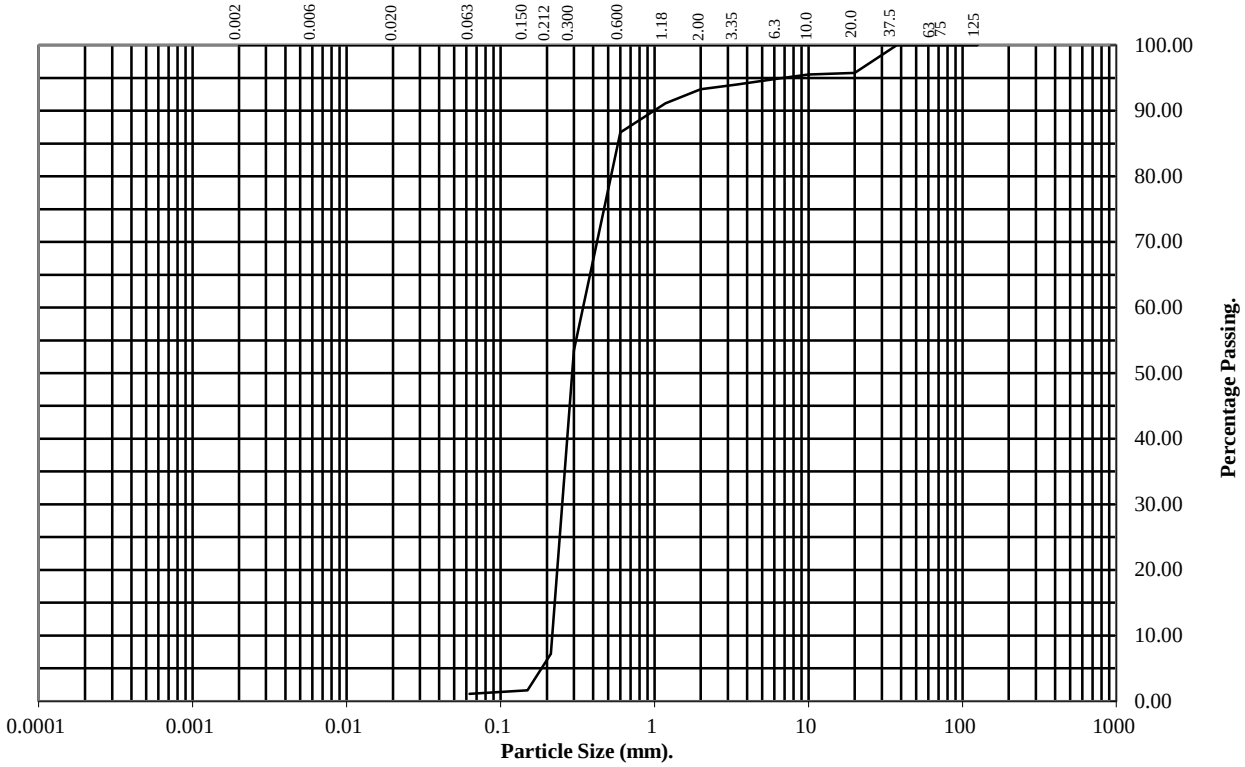
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH05** **Top Depth (m):** **3.00**

**Sample Number:** **8** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 96 |
| 10 | 96 |
| 6.3 | 95 |
| 3.35 | 94 |
| 2 | 93 |
| 1.18 | 91 |
| 0.6 | 87 |
| 0.3 | 53 |
| 0.212 | 7 |
| 0.15 | 2 |
| 0.063 | 1 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 7 |
| Sand | 92 |
| Silt/Clay | 1 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

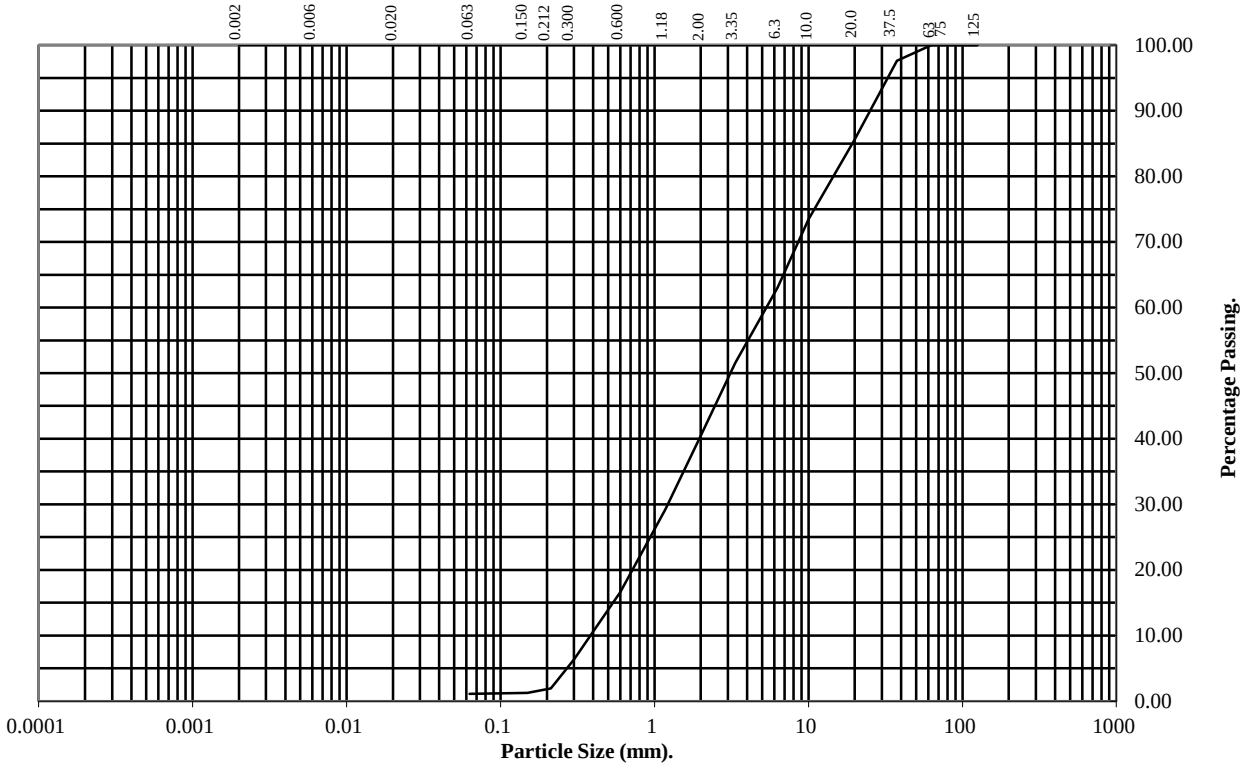
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH05** **Top Depth (m):** **6.00**

**Sample Number:** **11** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 98 |
| 20 | 86 |
| 10 | 73 |
| 6.3 | 63 |
| 3.35 | 52 |
| 2 | 40 |
| 1.18 | 29 |
| 0.6 | 17 |
| 0.3 | 6 |
| 0.212 | 2 |
| 0.15 | 1 |
| 0.063 | 1 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 60 |
| Sand | 39 |
| Silt/Clay | 1 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

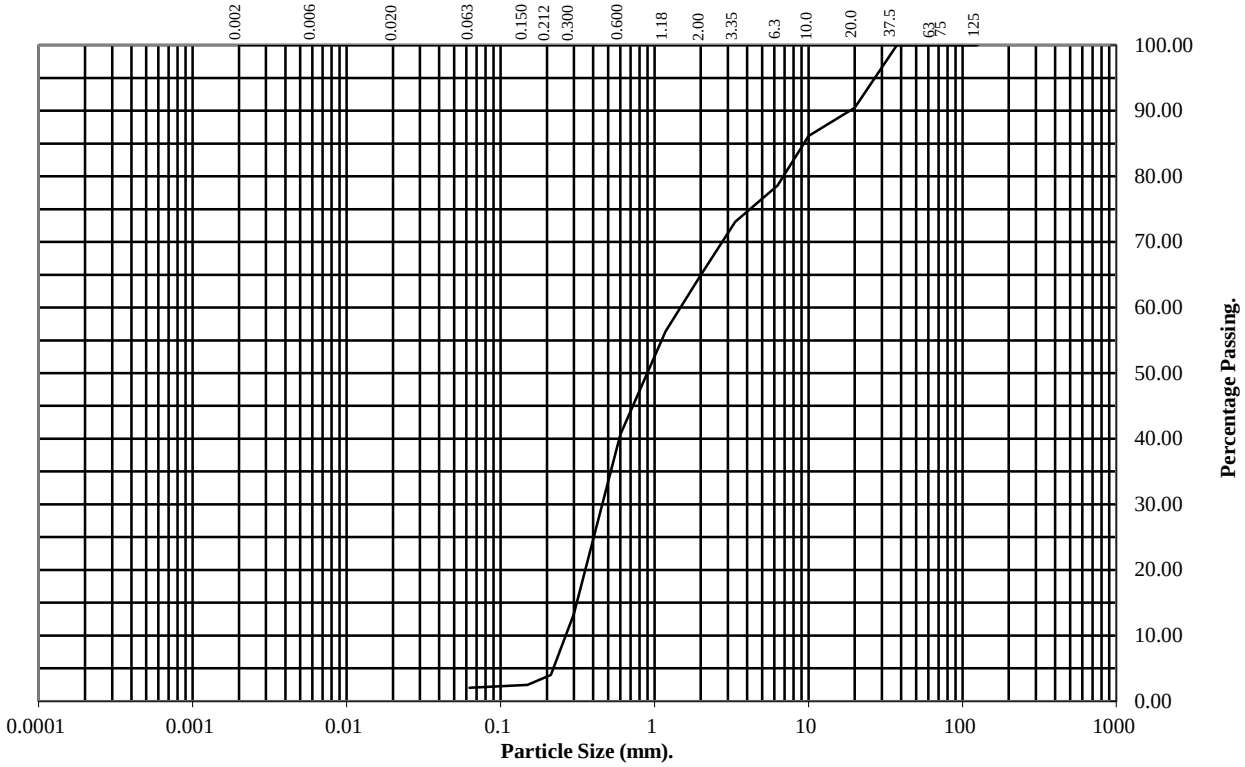
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH19** **Top Depth (m):** **4.00**

**Sample Number:** **12** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 90 |
| 10 | 86 |
| 6.3 | 79 |
| 3.35 | 73 |
| 2 | 65 |
| 1.18 | 56 |
| 0.6 | 41 |
| 0.3 | 13 |
| 0.212 | 4 |
| 0.15 | 2 |
| 0.063 | 2 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 35 |
| Sand | 63 |
| Silt/Clay | 2 |

**Remarks:**

See Summary of Soil Descriptions

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 **Client Ref:** 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

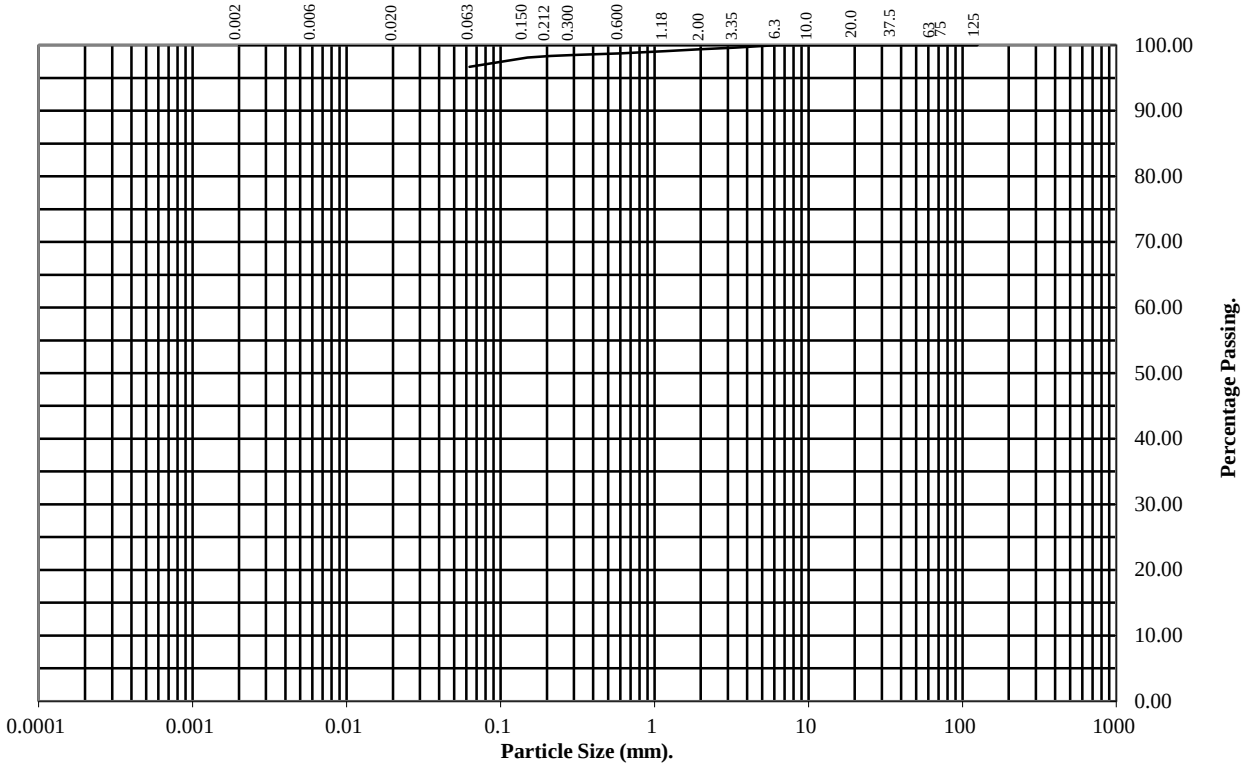
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH19** **Top Depth (m):** **15.00**

**Sample Number:** **29** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 100 |
| 10 | 100 |
| 6.3 | 100 |
| 3.35 | 100 |
| 2 | 99 |
| 1.18 | 99 |
| 0.6 | 99 |
| 0.3 | 99 |
| 0.212 | 98 |
| 0.15 | 98 |
| 0.063 | 97 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 2 |
| Silt/Clay | 97 |

**Remarks:**

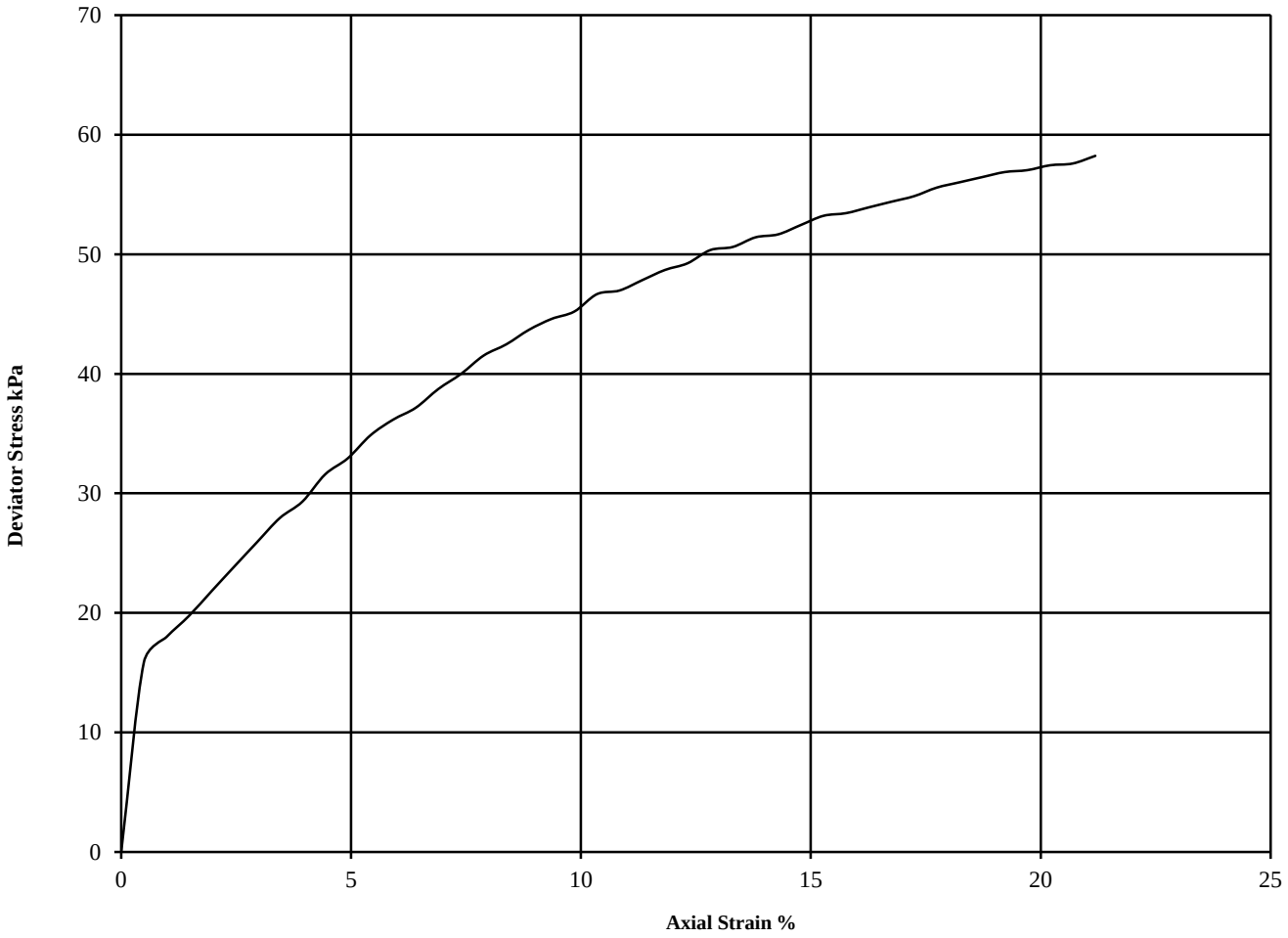
See Summary of Soil Descriptions

# UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

**WITHOUT MEASUREMENT OF PORE PRESSURE**

**BS1377 : Part7 : 1990: Clause 8**

| | | | |
|---|---|---|---|
| **Hole Number:** | **BH03** | **Top Depth (m):** | **14.50** |
| **Sample Number:** | **27** | **Base Depth (m):** | **14.95** |
| **Sample Type** | **U** | | |




| Diameter (mm): | | 102.0 | Height (mm): | | 207.0 | Test: | UU Single Stage | | Remarks: |
|---|---|---|---|---|---|---|---|---|---|
| Specimen | Moisture Content (%) | Bulk Density (Mg/m3) | Dry Density (Mg/m3) | Cell Pressure (kPa) $\theta_3$ | Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$ | Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$ | Failure Strain (%) | Mode of Failure | Undisturbed Sample<br>Sample taken from top of tube<br>Rate of strain = 2 %/min<br>Latex Membrane used 0.2 mm thick,<br>Correction applied 0.33 |
| 1 | 27 | 2.10 | 1.66 | 290 | 58 | 29 | 21.2 | Plastic | See summary of soil descriptions |

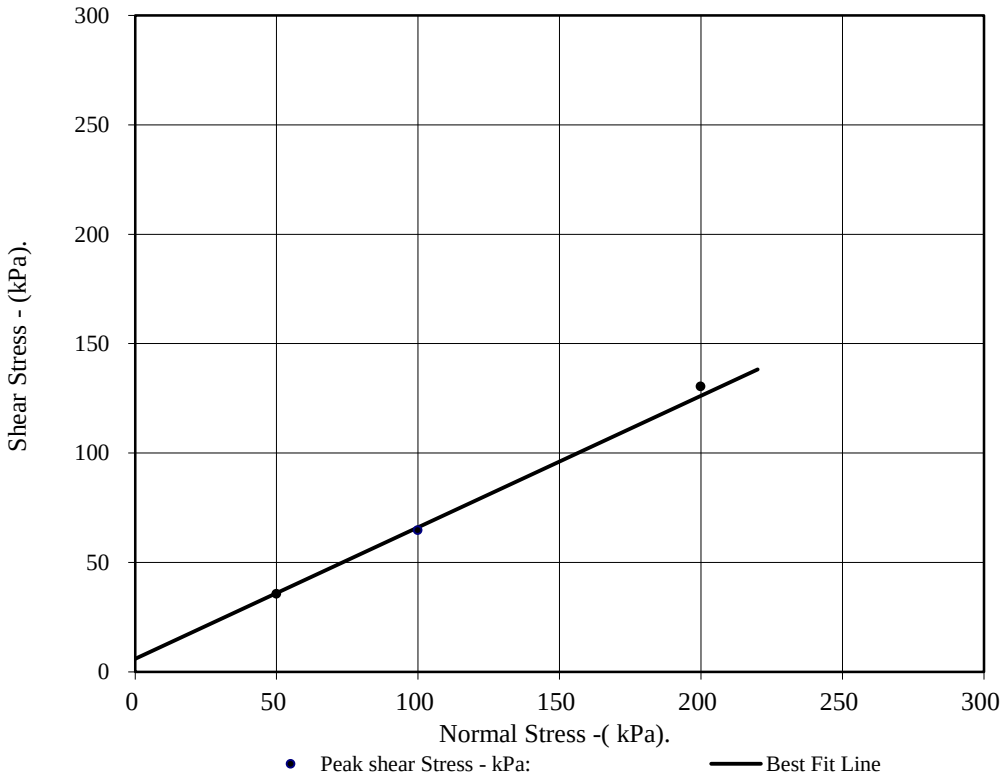
| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055<br>**Client Ref:** 17-1455 |

# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | | |
|---|---|---|---|---|
| Hole Number: | **BH02C** | | Top Depth: | **7.00** |
| Sample Number: | **15** | | Base Depth: | |
| Sample Conditions: | Submerged | | Sample Type | **B** |
| Particle Density - Mg/m3: | 2.65 | Assumed | **Remarks:** | |
| Sample Preparation: | Remoulded using 2.5kg effort.<br>Material tested passing 2mm sieve | | | |
| Sample Description: | **See summary of soil descriptions.** | | | |

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 19.54 | 19.54 | 19.54 |
| Length - mm: | 60.03 | 60.03 | 60.03 |
| Moisture Content - %: | 15 | 15 | 15 |
| Bulk Density - Mg/m3: | 1.81 | 1.81 | 1.81 |
| Dry Density - Mg/m3: | 1.57 | 1.56 | 1.57 |
| Voids Ratio: | 0.692 | 0.694 | 0.688 |
| Normal Pressure- kPa | 50 | 100 | 200 |
| **Consolidation Stage** | | | |
| Consolidated Height - mm: | 18.76 | 18.71 | 18.28 |
| **Shearing Stage** | | | |
| Rate of Strain (mm/min) | 0.600 | 0.600 | 0.600 |
| Displacement at peak shear stress (mm) | 2.50 | 3.00 | 4.00 |
| Peak shear Stress - kPa: | 36 | 65 | 130 |
| **Final Consolidated Conditions** | | | |
| Moisture Content - %: | 21 | 21 | 21 |
| Bulk Density - Mg/m3: | 1.88 | 1.89 | 1.94 |
| Dry Density - Mg/m3: | 1.56 | 1.56 | 1.60 |
| **Peak** | | | |
| Angle of Shearing Resistance:(~~θ~~) | **31** | | |
| Effective Cohesion - kPa: | **6** | | |

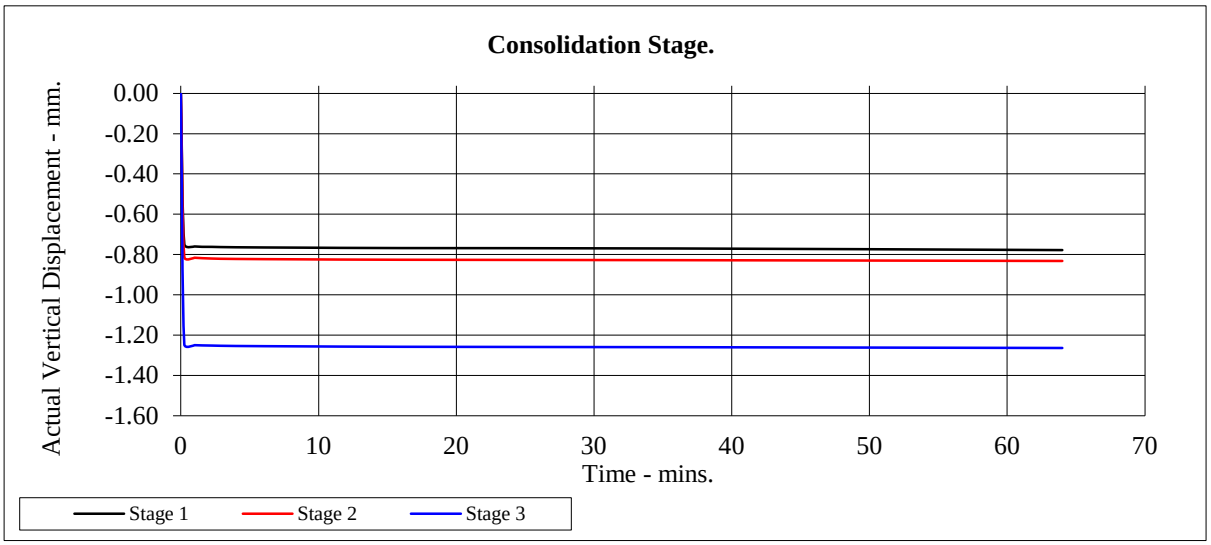


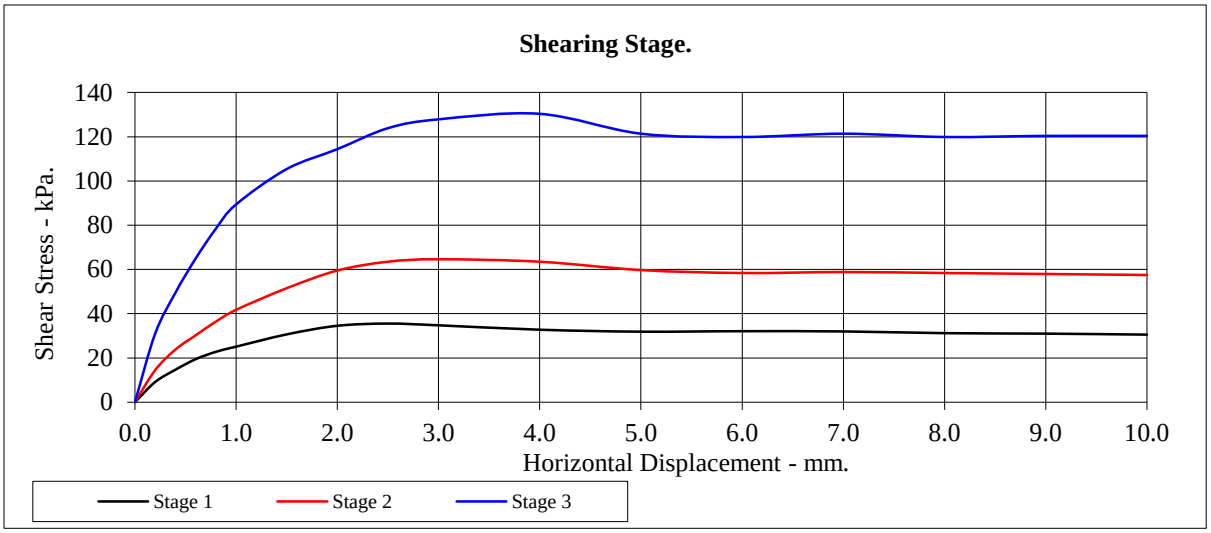

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055<br>**Client Ref:** 17-1455 |

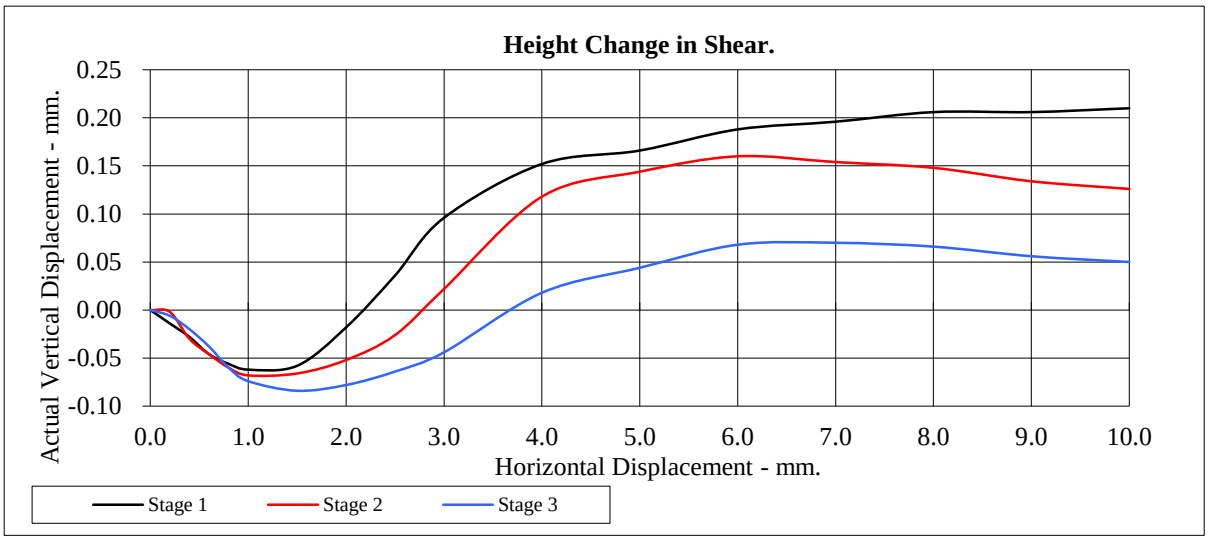
# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | |
|---|---|---|---|
| Hole Number: | **BH02C** | Top Depth: | **7.00** |
| Sample Number: | **15** | Base Depth: | |



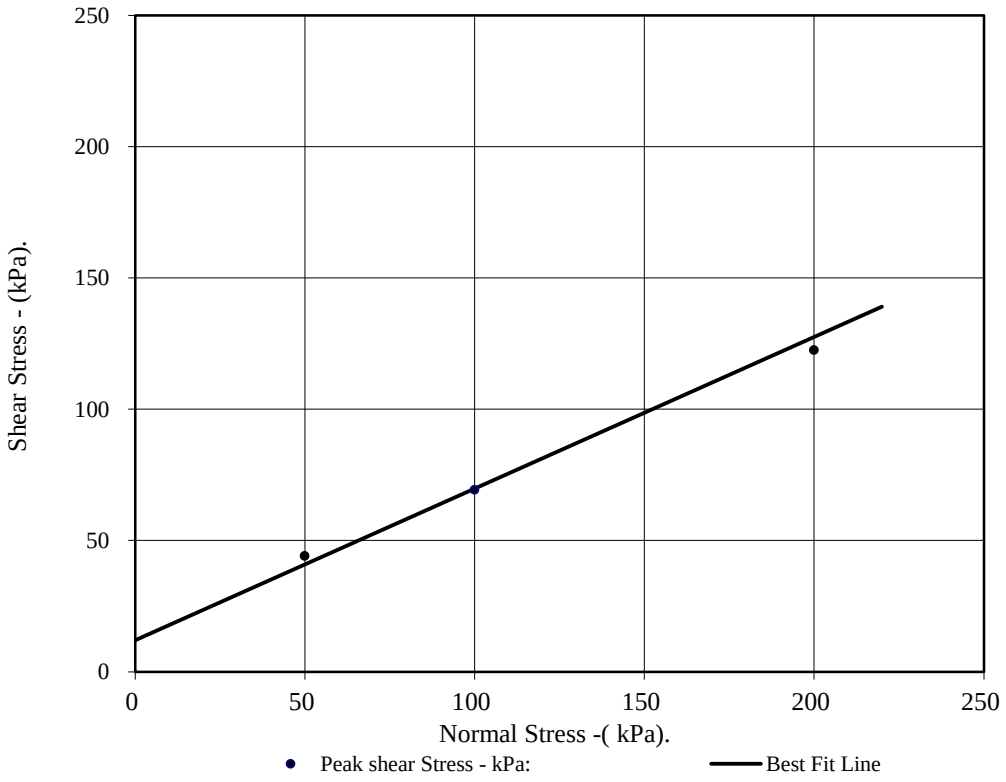

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No: PSL18/1055** |
| | | | **Client Ref: 17-1455** |

# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | | |
|---|---|---|---|---|
| Hole Number: | **BH02C** | | Top Depth: | **9.00** |
| Sample Number: | **17** | | Base Depth: | |
| Sample Conditions: | Submerged | | Sample Type | **B** |
| Particle Density - Mg/m3: | 2.65 | Assumed | **Remarks:** | |
| Sample Preparation: | Remoulded using 2.5kg effort.<br>Material tested passing 2mm sieve | | | |
| Sample Description: | **See summary of soil descriptions.** | | | |

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 19.54 | 19.54 | 19.54 |
| Length - mm: | 60.03 | 60.03 | 60.03 |
| Moisture Content - %: | 19 | 19 | 19 |
| Bulk Density - Mg/m3: | 1.81 | 1.81 | 1.81 |
| Dry Density - Mg/m3: | 1.52 | 1.52 | 1.53 |
| Voids Ratio: | 0.738 | 0.741 | 0.734 |
| Normal Pressure- kPa | 50 | 100 | 200 |
| **Consolidation Stage** | | | |
| Consolidated Height - mm: | 19.11 | 18.69 | 18.48 |
| **Shearing Stage** | | | |
| Rate of Strain (mm/min) | 0.600 | 0.600 | 0.600 |
| Displacement at peak shear stress (mm) | 2.50 | 2.50 | 3.00 |
| Peak shear Stress - kPa: | 44 | 69 | 122 |
| **Final Consolidated Conditions** | | | |
| Moisture Content - %: | 23 | 25 | 25 |
| Bulk Density - Mg/m3: | 1.85 | 1.89 | 1.92 |
| Dry Density - Mg/m3: | 1.50 | 1.52 | 1.54 |
| **Peak** | | | |
| Angle of Shearing Resistance:(~~θ~~) | **30** | | |
| Effective Cohesion - kPa: | **12** | | |

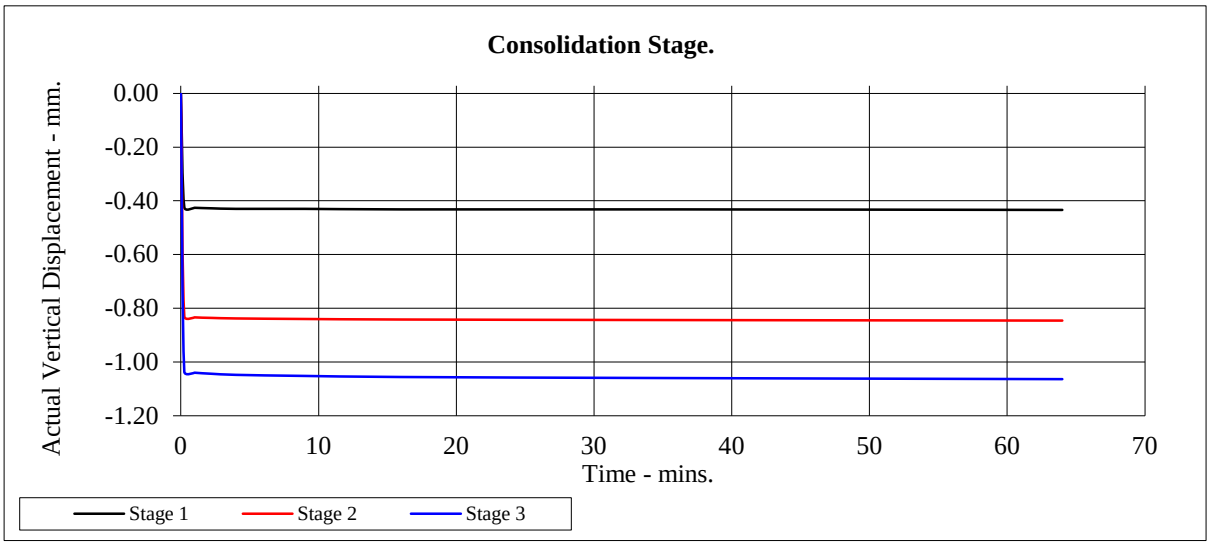


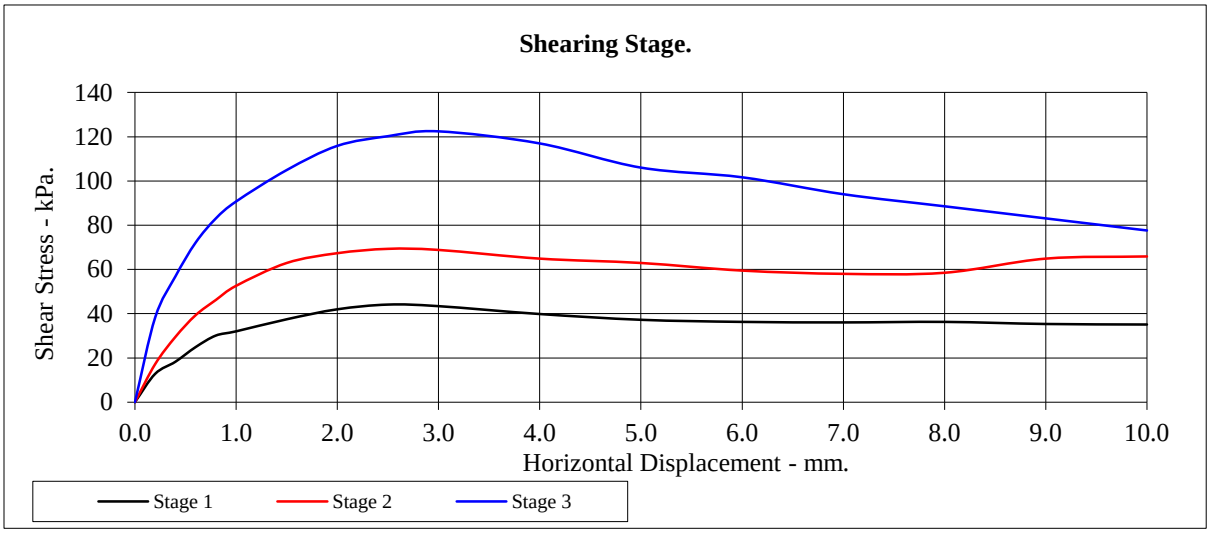

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055<br>**Client Ref:** 17-1455 |

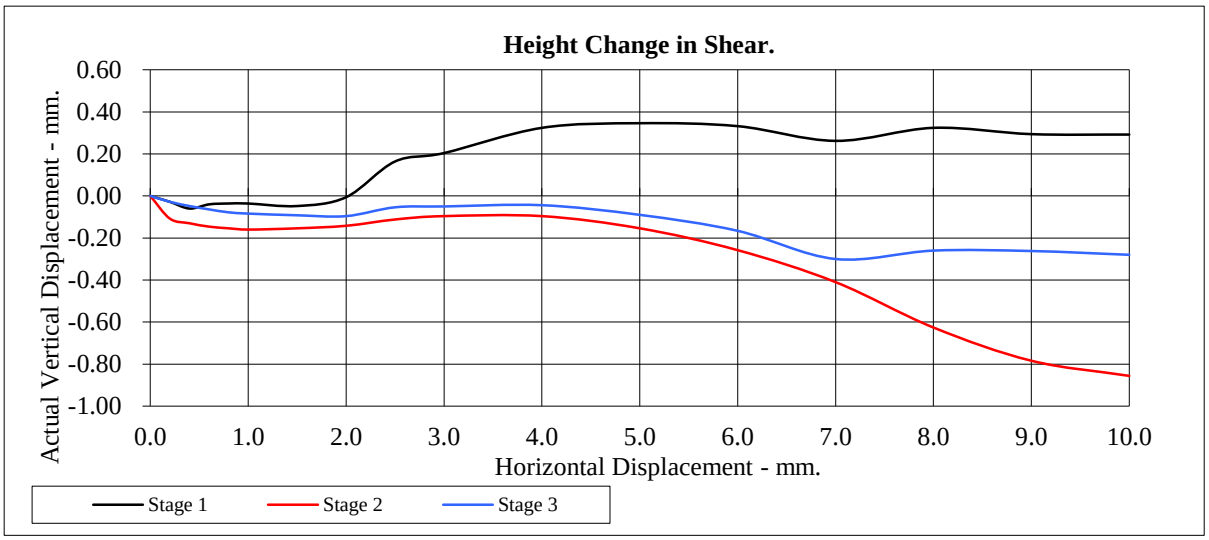
# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | |
|---|---|---|---|
| Hole Number: | **BH02C** | Top Depth: | **9.00** |
| Sample Number: | **17** | Base Depth: | |



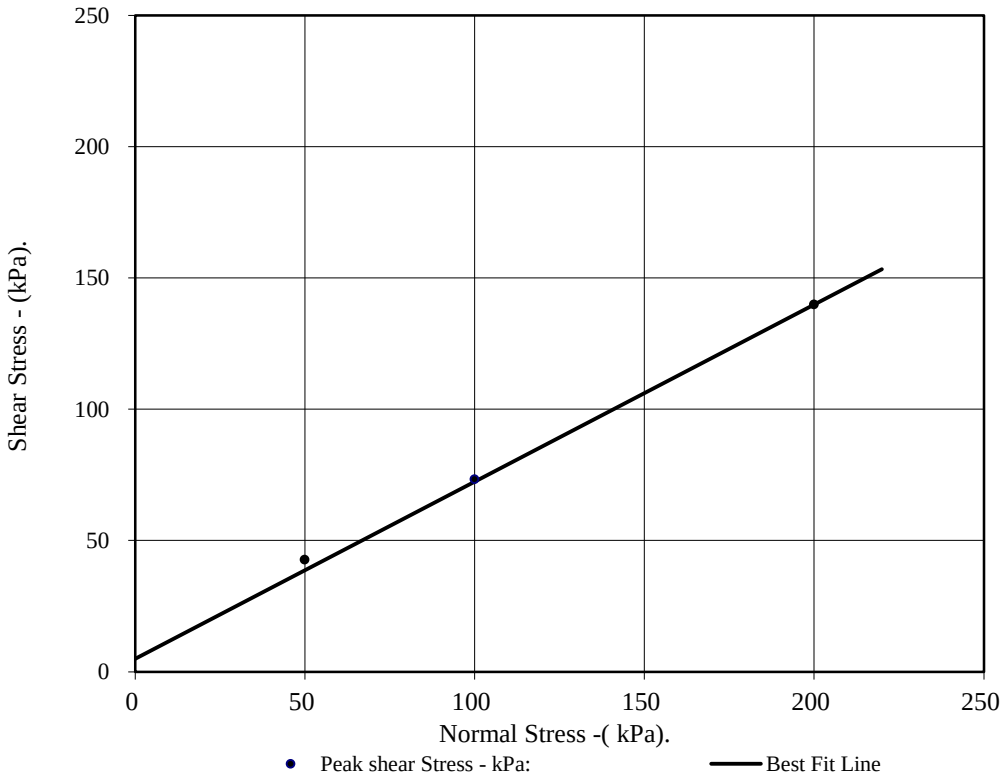

| | | |
|---|---|---|
| UKAS TESTING 4043 / PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055 / **Client Ref:** 17-1455 |

# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | | |
|---|---|---|---|---|
| Hole Number: | **BH03** | | Top Depth: | **7.50** |
| Sample Number: | **10** | | Base Depth: | |
| Sample Conditions: | Submerged | | Sample Type | **B** |
| Particle Density - Mg/m3: | 2.65 | Assumed | **Remarks:** | |
| Sample Preparation: | Remoulded using 2.5kg effort.<br>Material tested passing 2mm sieve | | | |
| Sample Description: | **See summary of soil descriptions.** | | | |

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 19.54 | 19.54 | 19.54 |
| Length - mm: | 60.03 | 60.03 | 60.03 |
| Moisture Content - %: | 15 | 15 | 15 |
| Bulk Density - Mg/m3: | 2.01 | 2.00 | 2.01 |
| Dry Density - Mg/m3: | 1.75 | 1.75 | 1.75 |
| Voids Ratio: | 0.514 | 0.518 | 0.515 |
| Normal Pressure- kPa | 50 | 100 | 200 |
| **Consolidation Stage** | | | |
| Consolidated Height - mm: | 19.20 | 19.02 | 18.62 |
| **Shearing Stage** | | | |
| Rate of Strain (mm/min) | 0.600 | 0.600 | 0.600 |
| Displacement at peak shear stress (mm) | 2.00 | 3.00 | 2.50 |
| Peak shear Stress - kPa: | 43 | 73 | 140 |
| **Final Consolidated Conditions** | | | |
| Moisture Content - %: | 18 | 19 | 18 |
| Bulk Density - Mg/m3: | 2.04 | 2.06 | 2.10 |
| Dry Density - Mg/m3: | 1.72 | 1.72 | 1.78 |
| **Peak** | | | |
| Angle of Shearing Resistance:(~~θ~~) | **34** | | |
| Effective Cohesion - kPa: | **5** | | |

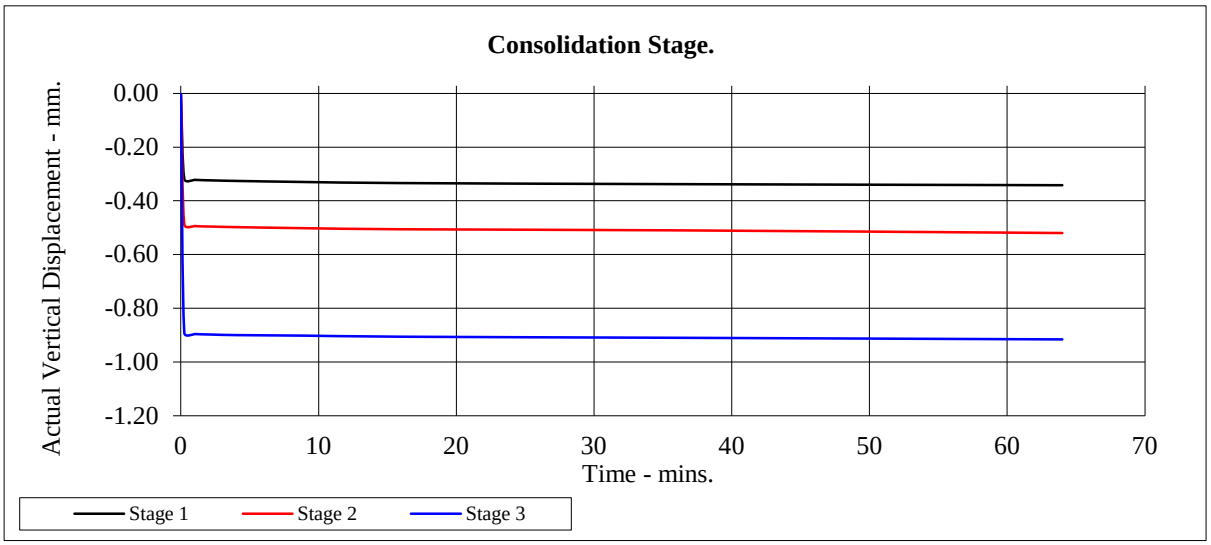


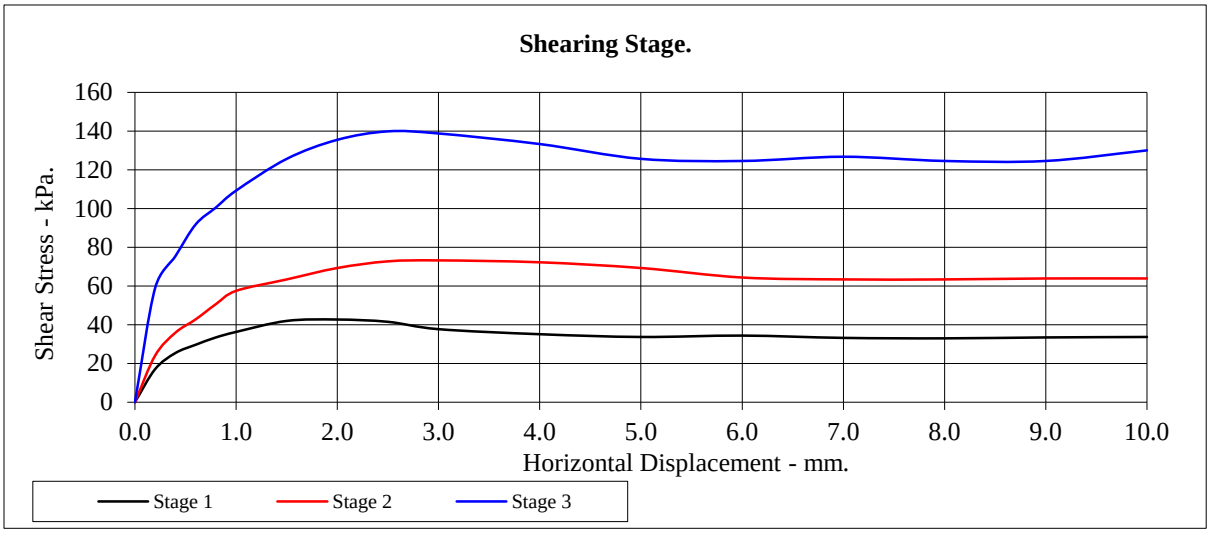

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055<br>**Client Ref:** 17-1455 |

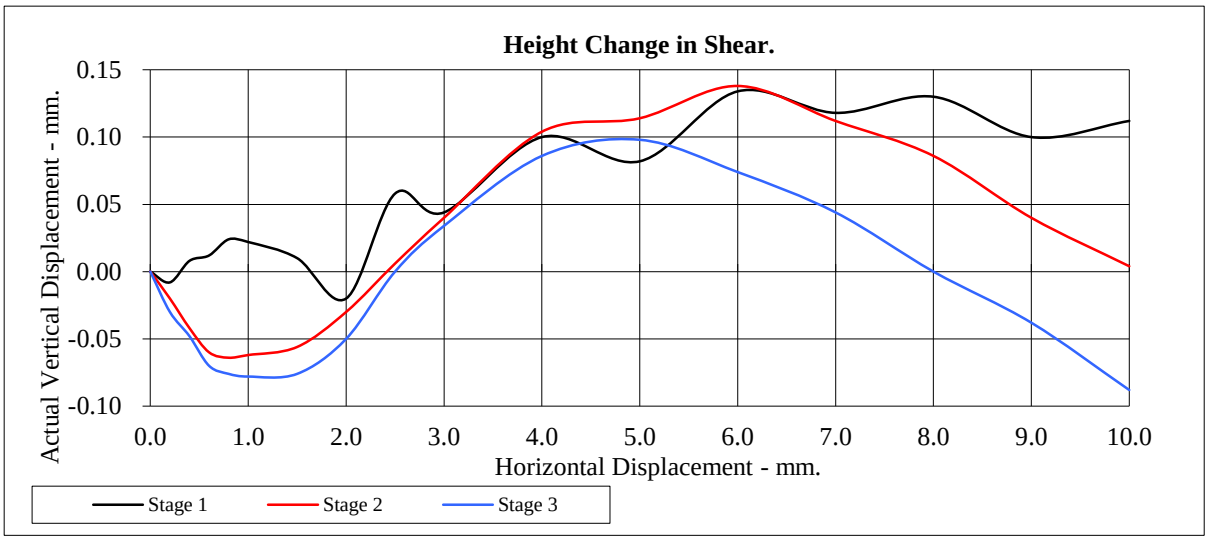
# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | |
|---|---|---|---|
| Hole Number: | **BH03** | Top Depth: | **7.50** |
| Sample Number: | **10** | Base Depth: | |




| | | |
|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** |

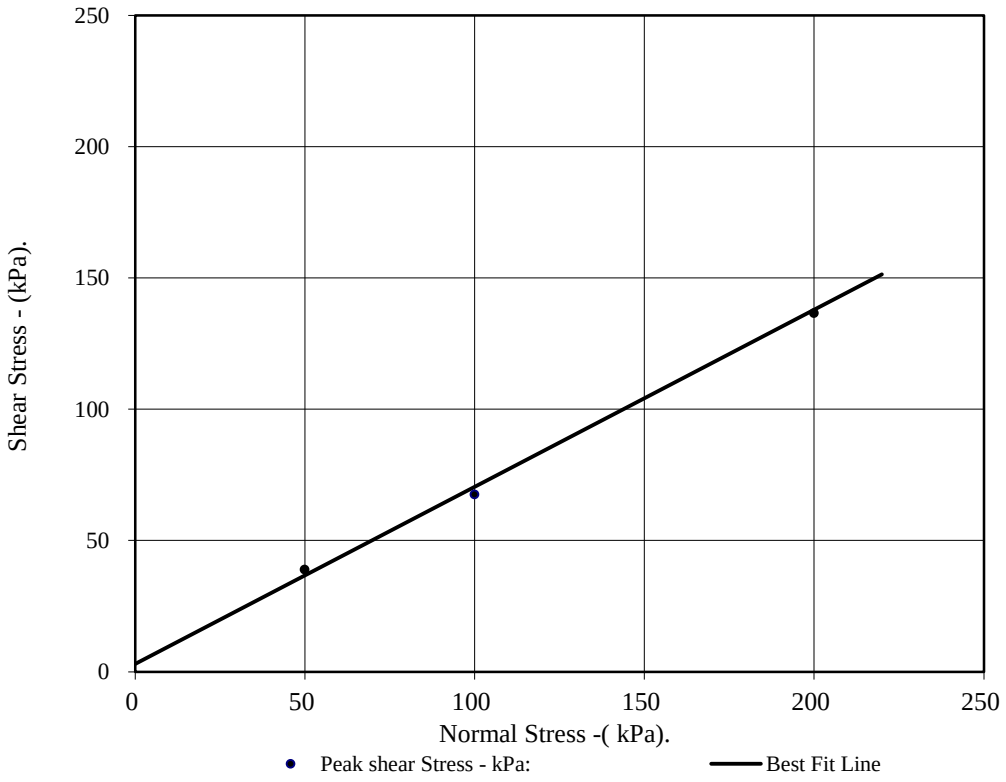
| |
|---|
| **Contract No:** |
| **PSL18/1055** |
| **Client Ref:** |
| **17-1455** |

# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | | | |
|---|---|---|---|---|---|
| Hole Number: | **BH05** | | Top Depth: | **6.00** | |
| Sample Number: | **11** | | Base Depth: | | |
| Sample Conditions: | Submerged | | Sample Type | **B** | |
| Particle Density - Mg/m3: | 2.65 | Assumed | **Remarks:** | | |
| Sample Preparation: | Remoulded using 2.5kg effort. Material tested passing 2mm sieve | | | | |
| Sample Description: | **See summary of soil descriptions.** | | | | |

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 19.54 | 19.54 | 19.54 |
| Length - mm: | 60.03 | 60.03 | 60.03 |
| Moisture Content - %: | 8.7 | 8.7 | 8.7 |
| Bulk Density - Mg/m3: | 1.87 | 1.87 | 1.87 |
| Dry Density - Mg/m3: | 1.72 | 1.72 | 1.72 |
| Voids Ratio: | 0.539 | 0.545 | 0.539 |
| Normal Pressure- kPa | 50 | 100 | 200 |
| **Consolidation Stage** | | | |
| Consolidated Height - mm: | 19.12 | 18.19 | 17.71 |
| **Shearing Stage** | | | |
| Rate of Strain (mm/min) | 0.600 | 0.600 | 0.600 |
| Displacement at peak shear stress (mm) | 4.00 | 4.00 | 9.00 |
| Peak shear Stress - kPa: | 39 | 68 | 137 |
| **Final Consolidated Conditions** | | | |
| Moisture Content - %: | 19 | 18 | 19 |
| Bulk Density - Mg/m3: | 1.91 | 2.00 | 2.07 |
| Dry Density - Mg/m3: | 1.60 | 1.70 | 1.74 |
| **Peak** | | | |
| Angle of Shearing Resistance:(~~θ~~) | **34** | | |
| Effective Cohesion - kPa: | **3** | | |

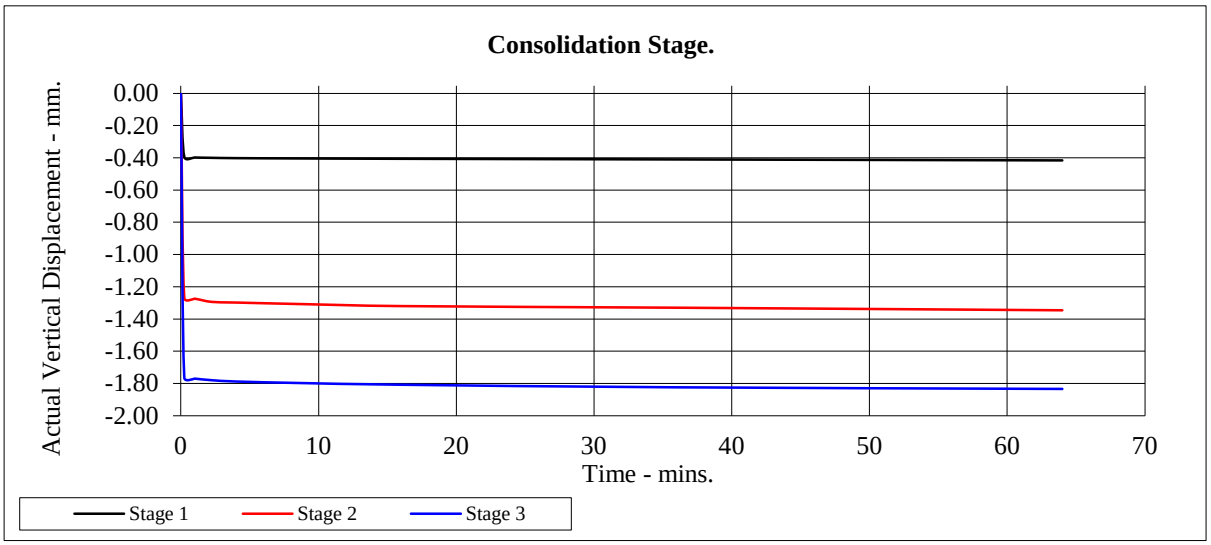


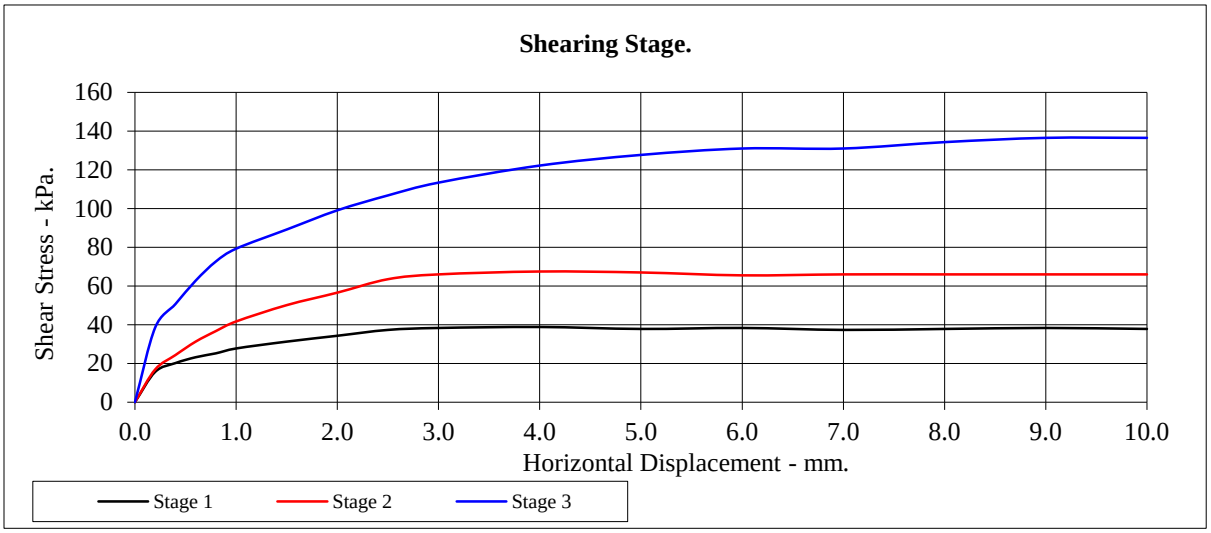

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** **PSL18/1055** **Client Ref:** **17-1455** |

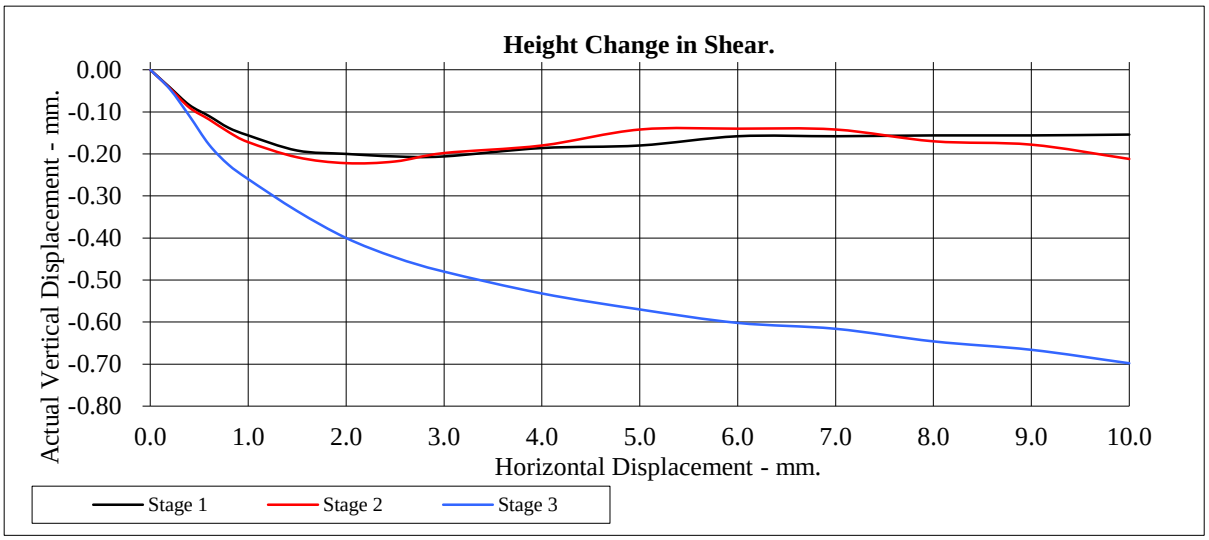
# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | |
|---|---|---|---|
| Hole Number: | **BH05** | Top Depth: | **6.00** |
| Sample Number: | **11** | Base Depth: | |




| | | |
|---|---|---|
| UKAS TESTING 4043 / PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1055<br>**Client Ref:** 17-1455 |

**Anthony Watkins**
PSL
5/7 Hexthorpe Road
Doncaster
South Yorkshire
DN4 0AR

**t:** 0844 8156641

**e:** ChemResults@prosoils.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-78505

| | | | |
|---|---|---|---|
| **Project / Site name:** | Arklow WWTP Land GI | **Samples received on:** | 08/03/2018 |
| **Your job number:** | PSL18-1055 | **Samples instructed on:** | 08/03/2018 |
| **Your order number:** | | **Analysis completed by:** | 15/03/2018 |
| **Report Issue Number:** | 1 | **Report issued on:** | 15/03/2018 |
| **Samples Analysed:** | 2 soil samples | | |

**Signed:**

Nicole Fay
Quality Assistant
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.


This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-78505**

**Project / Site name: Arklow WWTP Land GI**

| **Lab Sample Number** | | | | 922218 | 922219 | | | |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | BH04 | BH04 | | | |
| **Sample Number** | | | | 5 | 23 | | | |
| **Depth (m)** | | | | 3.00 | 15.00 | | | |
| **Date Sampled** | | | | Deviating | Deviating | | | |
| **Time Taken** | | | | None Supplied | None Supplied | | | |
| **Analytical Parameter (Soil Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| Stone Content | % | 0.1 | NONE | < 0.1 | < 0.1 | | | |
| Moisture Content | % | N/A | NONE | 13 | 21 | | | |
| Total mass of sample received | kg | 0.001 | NONE | 0.52 | 0.59 | | | |
| **General Inorganics** | | | | | | | | |
| pH - Automated | pH Units | N/A | MCERTS | 8.5 | 8.6 | | | |
| Total Sulphate as $SO_4$ | % | 0.005 | MCERTS | 0.389 | 0.054 | | | |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | g/l | 0.00125 | MCERTS | 0.21 | 0.14 | | | |
| Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent) | mg/l | 1.25 | MCERTS | 211 | 144 | | | |
| Water Soluble Chloride (2:1) (leachate equivalent) | mg/l | 0.5 | MCERTS | 7.0 | 570 | | | |
| Total Sulphur | % | 0.005 | MCERTS | 0.136 | 0.024 | | | |
| Organic Matter | % | 0.1 | MCERTS | 0.1 | 0.6 | | | |
| Water Soluble Nitrate (2:1) as N (leachate equivalent) | mg/l | 2 | NONE | < 2.0 | < 2.0 | | | |
| **Heavy Metals / Metalloids** | | | | | | | | |
| Magnesium (water soluble) | mg/kg | 5 | NONE | 9.5 | 42 | | | |
| Magnesium (leachate equivalent) | mg/l | 2.5 | NONE | 4.7 | 21 | | | |



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-78505**

**Project / Site name: Arklow WWTP Land GI**

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

| Lab Sample Number | Sample Reference | Sample Number | Depth (m) | Sample Description * |
|---|---|---|---|---|
| 922218 | BH04 | 5 | 3.00 | Light brown sand. |
| 922219 | BH04 | 23 | 15.00 | Brown clay. |


This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-78505**

**Project / Site name: Arklow WWTP Land GI**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Chloride, water soluble, in soil | Determination of Chloride colorimetrically by discrete analyser. | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction. | L082-PL | D | MCERTS |
| Magnesium, water soluble, in soil | Determination of water soluble magnesium by extraction with water followed by ICP-OES. | In-house method based on TRL 447 | L038-PL | D | NONE |
| Moisture Content | Moisture content, determined gravimetrically. | In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests | L019-UK/PL | W | NONE |
| Organic matter (Automated) in soil | Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate. | BS1377 Part 3, 1990, Chemical and Electrochemical Tests"" | L009-PL | D | MCERTS |
| pH in soil (automated) | Determination of pH in soil by addition of water followed by automated electrometric measurement. | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests | L099-PL | D | MCERTS |
| Stones content of soil | Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight. | In-house method based on British Standard Methods and MCERTS requirements. | L019-UK/PL | D | NONE |
| Sulphate, water soluble, in soil (16hr extraction) | Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent). | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES. | L038-PL | D | MCERTS |
| Total Sulphate in soil as % | Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES. | In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests"" | L038 | D | MCERTS |
| Total Sulphur in soil as % | Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES. | In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil | L038 | W | MCERTS |
| Water Soluble Nitrate (2:1) as N in soil | Determination of nitrate by reaction with sodium salicylate and colorimetry. | In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction. | L078-PL | W | NONE |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**


This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

# SOIL AND ROCK SAMPLE ANALYSIS
# LABORATORY TEST REPORT

| | |
|---|---|
| **Client:** | **Irish Water** |
| **Engineer:** | **Byrne Looby ARUP JV** |
| **From:** | **Stephen Watson**<br>**Laboratory Manager**<br>**Causeway Geotech Ltd** |
| **Tel:** | **+44(0)2827666640** |
| **E-mail:** | **stephen.watson@causewaygeotech.com** |
| **Date:** | **20/04/18** |
| **Ref:** | **17-1455 – Soils Schedule 4 & 5** |

**Arklow WWTP Land GI**

We are pleased to attach the results of laboratory testing carried out for the above project**.** This memo and its attachments constitute a report of the results of tests as detailed in the *Contents page(s)*.

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Approved Signatory



Stephen Watson
Laboratory Manager

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

**Project Name** **Arklow WWTP Land GI**

**Report Reference.** **17-1455 – Soils Schedule 4 & 5**

The table below details the tests carried out, the specifications used, and the number of tests included in this report:

| Material tested | Type of test/Properties measured/Range of measurement | Standard specifications | Number of test results included in the report |
|---|---|---|---|
| SOIL | Moisture Content of Soil | BS1377: Part 2: Clause 3.2: 1990 | 33 |
| SOIL | Liquid and Plastic Limits of soil<br>-1-point cone penetrometer method | BS1377: Part 2: Clauses 4.4, 5.3 & 5.4 1990 | 7 |
| SOIL | Particle size distribution<br>- wet sieving | BS1377: Part 2: Clause 9.2: 1990 | 28 |
| SOIL | Particle size distribution<br>-sedimentation<br>hydrometer method | BS1377: Part 2: Clause 9.5: 1990 | 9 |
| SOIL – Subcontracted to Pro Soils Ltd | Direct Shear Strength using 60mm Small Shear box (up to 4 days) | BS1377: Part 7: Clause 4: 1990 | 1 |

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 17-1455 | Arklow WWTP Land GI |

| Hole No. | Sample | | | | Soil Description | Density bulk / dry Mg/m3 | | w % | Passing 425µm % | LL % | PL % | PI % | Particle density Mg/m3 | Casagrande Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ref | Top | Base | Type | | | | | | | | | | |
| BH06A | 19 | 4.00 | | D | Brown gravelly fine to coarse SAND. | | | 7.5 | | | | | | |
| BH06A | 22 | 7.50 | | D | Brown very gravelly slightly silty SAND. | | | 18.0 | | | | | | |
| BH06A | 30 | 14.40 | | D | Brown slightly sandy silty CLAY. | | | 33.0 | 100 | 47 -1pt | 18 | 29 | | CI |
| BH07B | 25 | 7.50 | | D | Brown very gravelly slightly silty SAND. | | | 18.0 | | | | | | |
| BH07B | 27 | 10.50 | | D | Brown very gravelly fine to coarse SAND. | | | 19.0 | | | | | | |
| BH07B | 18 | 13.00 | | B | Grey silty CLAY. | | | 24.0 | 100 | 37 -1pt | 22 | 15 | | CI |
| BH08 | 17 | 5.00 | | D | Greyish brown gravelly fine to coarse SAND. | | | 16.0 | | | | | | |
| BH08 | 26 | 10.50 | | D | Brown fine to medium SAND. | | | 23.0 | | | | | | |
| BH08 | 29 | 12.00 | | U | Grey silty CLAY. | | | 32.0 | 100 | 51 -1pt | 19 | 32 | | CH |
| BH09 | 21 | 5.00 | | D | Brown gravelly fine to coarse SAND. | | | 15.0 | | | | | | |
| BH09 | 24 | 9.00 | | D | Greyish brown slightly gravelly fine to coarse SAND. | | | 22.0 | | | | | | |
| BH09 | 28 | 12.00 | | UT | Brownish grey silty CLAY. | | | 26.0 | 100 | 39 -1pt | 19 | 20 | | CI |
| BH10B | 8 | 3.00 | | D | Grey gravelly fine to coarse SAND. | | | 15.0 | | | | | | |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key

| | | |
|---|---|---|
| Density test | Liquid Limit | Particle density |
| Linear measurement unless : | 4pt cone unless : | sp - small pyknometer |
| wd - water displacement | cas - Casagrande method | gj - gas jar |
| wi - immersion in water | 1pt - single point test | |

Date Printed: 20/04/2018

Approved By: Stephen.Watson

Table 1

sheet 1

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 17-1455 | Arklow WWTP Land GI |

| Hole No. | Sample | | | | Soil Description | Density bulk / dry Mg/m3 | | w % | Passing 425µm % | LL % | PL % | PI % | Particle density Mg/m3 | Casagrande Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ref | Top | Base | Type | | | | | | | | | | |
| BH10B | 10 | 5.00 | | D | Grey brown gravelly fine to coarse SAND. | | | 6.0 | | | | | | |
| BH10B | 26 | 10.50 | | D | Brown fine to medium SAND. | | | 22.0 | | | | | | |
| BH10B | 22 | 15.00 | 14.95 | B | Brown slightly sandy silty CLAY. | | | 23.0 | 100 | 38 -1pt | 20 | 18 | | CI |
| BH11 | 23 | 4.00 | | D | Brown gravelly fine to coarse SAND. | | | 5.7 | | | | | | |
| BH11 | 26 | 7.50 | | D | Brownish grey slightly gravelly fine to coarse SAND. | | | 19.0 | | | | | | |
| BH11 | 34 | 12.20 | | U | Grey slightly sandy silty CLAY. | | | 25.0 | | | | | | |
| BH17 | 20 | 4.00 | | D | Brown gravelly fine to coarse SAND. | | | 16.0 | | | | | | |
| BH17 | 22 | 6.00 | | D | Dark grey slightly gravelly organic silty CLAY. | | | 129.0 | | | | | | |
| BH17 | 26 | 12.00 | | D | Grey brown gravelly fine to coarse SAND. | | | 20.0 | | | | | | |
| BH17 | 29 | 15.00 | | U | Brownish grey sandy clayey SILT. | | | 17.0 | 100 | 24 -1pt | NP | | | |
| BH18 | 38 | 3.00 | | D | Brown fine to medium SAND. | | | 18.0 | | | | | | |
| BH18 | 28 | 5.00 | | B | Reddish brown gravelly fine to coarse SAND. | | | 9.3 | | | | | | |
| BH18 | 16 | 7.50 | | D | Light brown slightly gravelly fine to medium SAND. | | | 15.0 | | | | | | |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key

| | | |
|---|---|---|
| Density test | Liquid Limit | Particle density |
| Linear measurement unless : | 4pt cone unless : | sp - small pyknometer |
| wd - water displacement | cas - Casagrande method | gj - gas jar |
| wi - immersion in water | 1pt - single point test | |

Date Printed: 20/04/2018

Approved By: Stephen.Watson

Table 1 sheet 2

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 17-1455 | Arklow WWTP Land GI |

| Hole No. | Sample | | | | Soil Description | Density bulk / dry Mg/m3 | | w % | Passing 425µm % | LL % | PL % | PI % | Particle density Mg/m3 | Casagrande Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ref | Top | Base | Type | | | | | | | | | | |
| BH18 | 22 | 12.00 | | U | Grey slightly sandy clayey SILT. | | | 26.0 | | | | | | |
| BH18 | 20 | 13.50 | | D | Brown sandy subangular fine to coarse GRAVEL. | | | 7.0 | | | | | | |
| BH20 | 14 | 5.00 | | D | Brown gravelly fine to coarse SAND. | | | 6.8 | | | | | | |
| BH20 | 16 | 7.50 | | D | Brown gravelly fine to coarse SAND. | | | 7.7 | | | | | | |
| BH20 | 27 | 10.50 | | D | Brown slightly gravelly silty fine to coarse SAND. | | | 21.0 | | | | | | |
| BH20 | 29 | 13.50 | | D | Brown gravelly fine to coarse SAND. | | | 11.0 | | | | | | |
| BH20 | 30 | 15.20 | | D | Brownish grey silty CLAY. | | | 32.0 | 100 | 41 -1pt | 18 | 23 | | CI |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key

| | | |
|---|---|---|
| Density test | Liquid Limit | Particle density |
| Linear measurement unless : | 4pt cone unless : | sp - small pyknometer |
| wd - water displacement | cas - Casagrande method | gj - gas jar |
| wi - immersion in water | 1pt - single point test | |

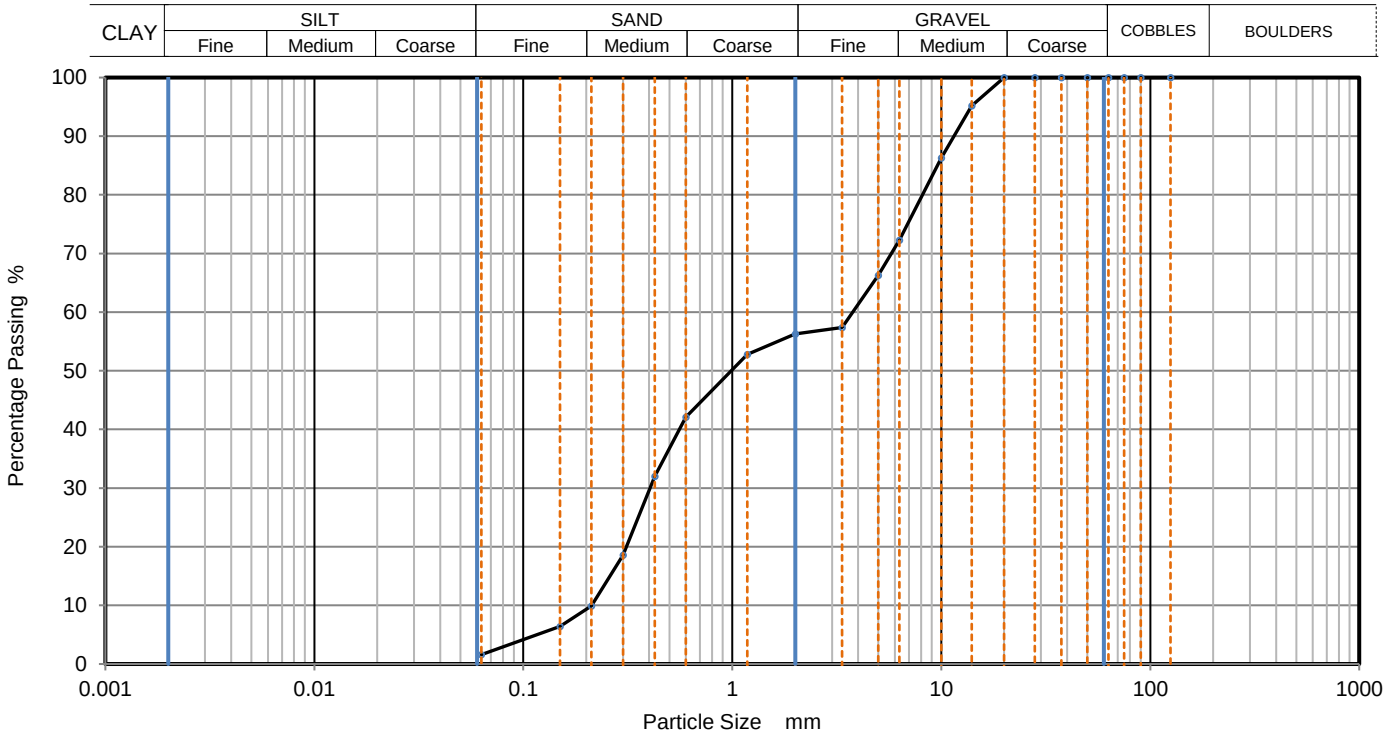
Date Printed: 20/04/2018

Approved By: Stephen.Watson

Table 1 sheet 3

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH06A |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 9 |
| Soil Description | Brown gravelly fine to coarse SAND. | | | Depth, m | 4.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus201803246 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 95 | | |
| 10 | 86 | | |
| 6.3 | 72 | | |
| 5 | 66 | | |
| 3.35 | 57 | | |
| 2 | 56 | | |
| 1.18 | 53 | | |
| 0.6 | 42 | | |
| 0.425 | 32 | | |
| 0.3 | 19 | | |
| 0.212 | 10 | | |
| 0.15 | 6 | | |
| 0.063 | 2 | | |

| | |
|---|---|
| Dry Mass of sample, g | 715 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 44 |
| Sand | 55 |
| | |
| Fines <0.063mm | 2 |

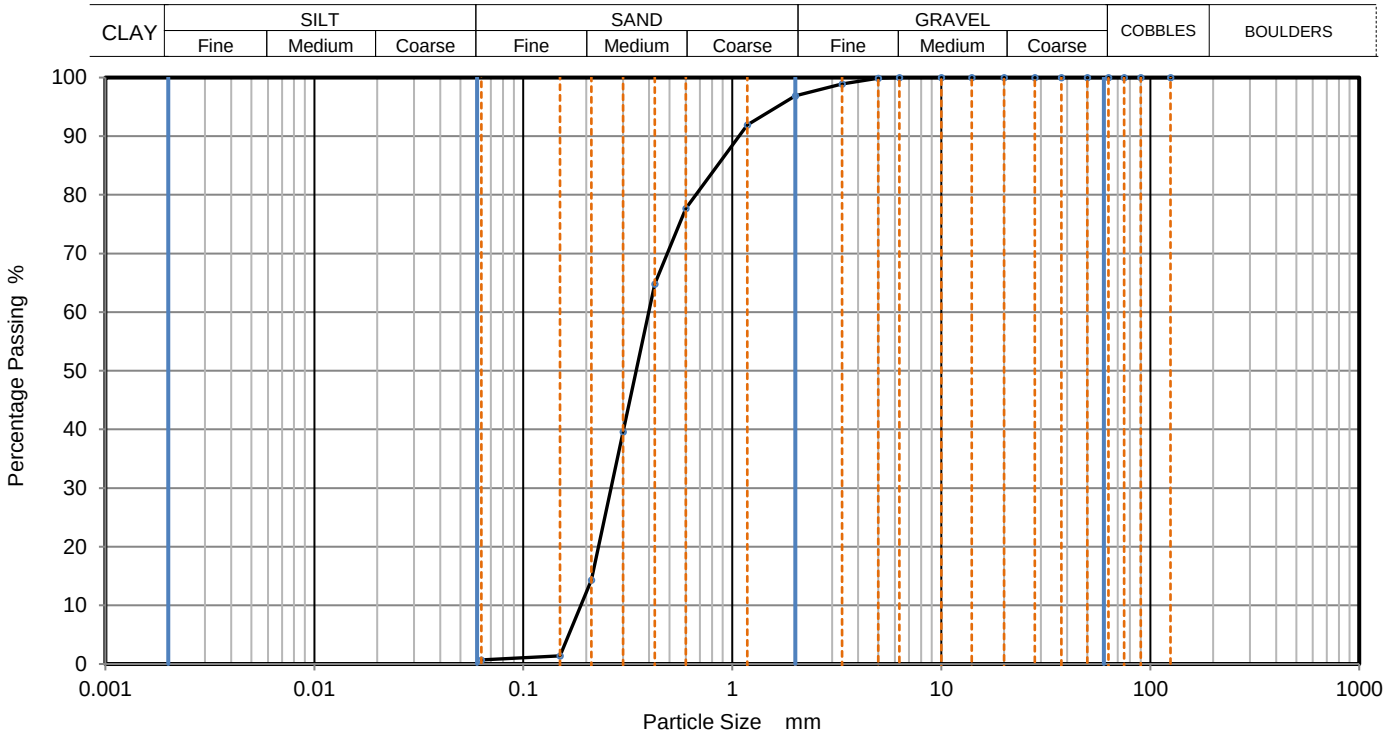
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 3.76 |
| D30 | mm | 0.404 |
| D10 | mm | 0.213 |
| Uniformity Coefficient | | 18 |
| Curvature Coefficient | | 0.2 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH06A |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 12 |
| Soil Description | Brownish grey slightly gravelly fine to coarse SAND. | | | Depth, m | 7.50 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus201803247 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 99 | | |
| 2 | 97 | | |
| 1.18 | 92 | | |
| 0.6 | 78 | | |
| 0.425 | 65 | | |
| 0.3 | 40 | | |
| 0.212 | 14 | | |
| 0.15 | 1 | | |
| 0.063 | 1 | | |

| Dry Mass of sample, g | 427 |
|---|---|

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 3 |
| Sand | 96 |
| | |
| Fines <0.063mm | 1 |

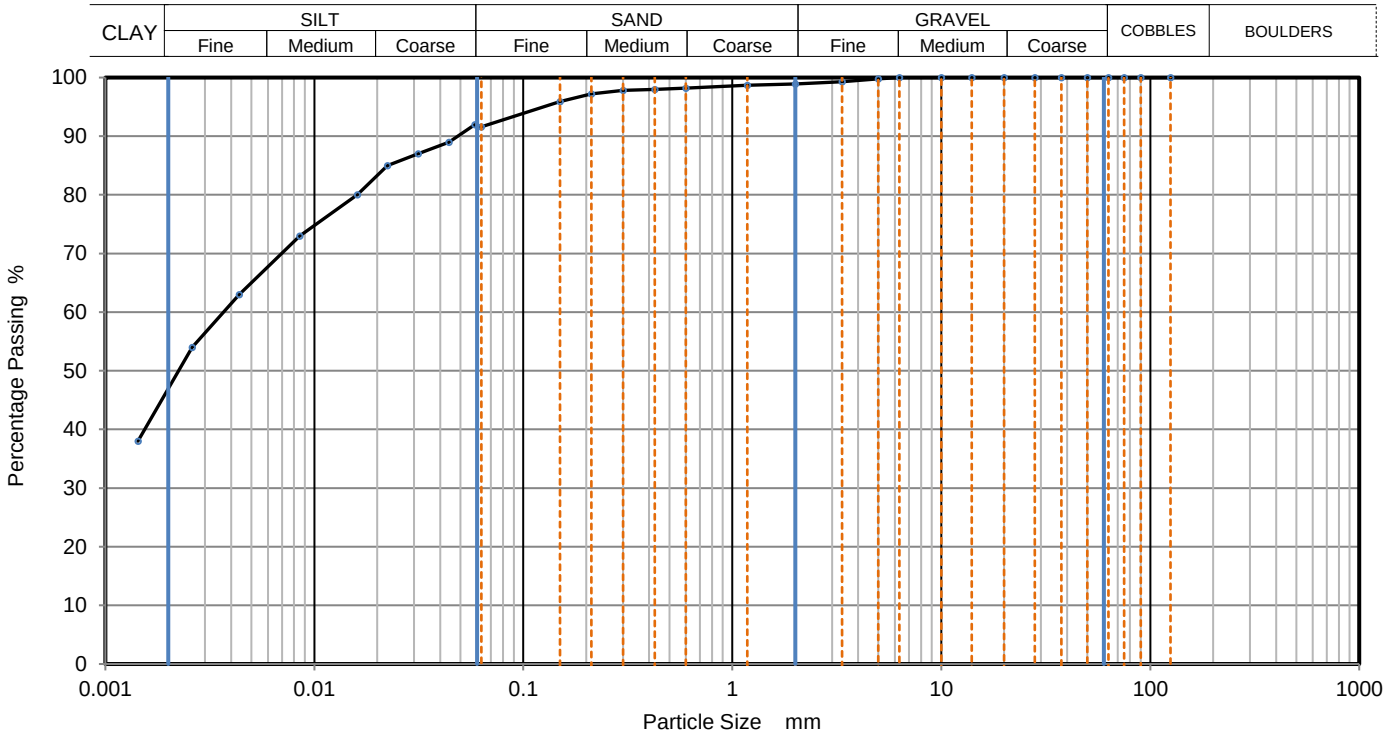
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.398 |
| D30 | mm | 0.263 |
| D10 | mm | 0.189 |
| Uniformity Coefficient | | 2.1 |
| Curvature Coefficient | | 0.92 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH06A |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 29 |
| Soil Description | Brown slightly sandy silty CLAY. | | | Depth, m | 14.40 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus201803249 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0586 | 92 |
| 90 | 100 | 0.0440 | 89 |
| 75 | 100 | 0.0314 | 87 |
| 63 | 100 | 0.0224 | 85 |
| 50 | 100 | 0.0161 | 80 |
| 37.5 | 100 | 0.0085 | 73 |
| 28 | 100 | 0.0044 | 63 |
| 20 | 100 | 0.0026 | 54 |
| 14 | 100 | 0.0014 | 38 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 99 | | |
| 2 | 99 | | |
| 1.18 | 99 | | |
| 0.6 | 98 | Particle density | (assumed) |
| 0.425 | 98 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 97 | | |
| 0.15 | 96 | | |
| 0.063 | 92 | | |

| | |
|---|---|
| Dry Mass of sample, g | 331 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 7 |
| Silt | 45 |
| Clay | 47 |

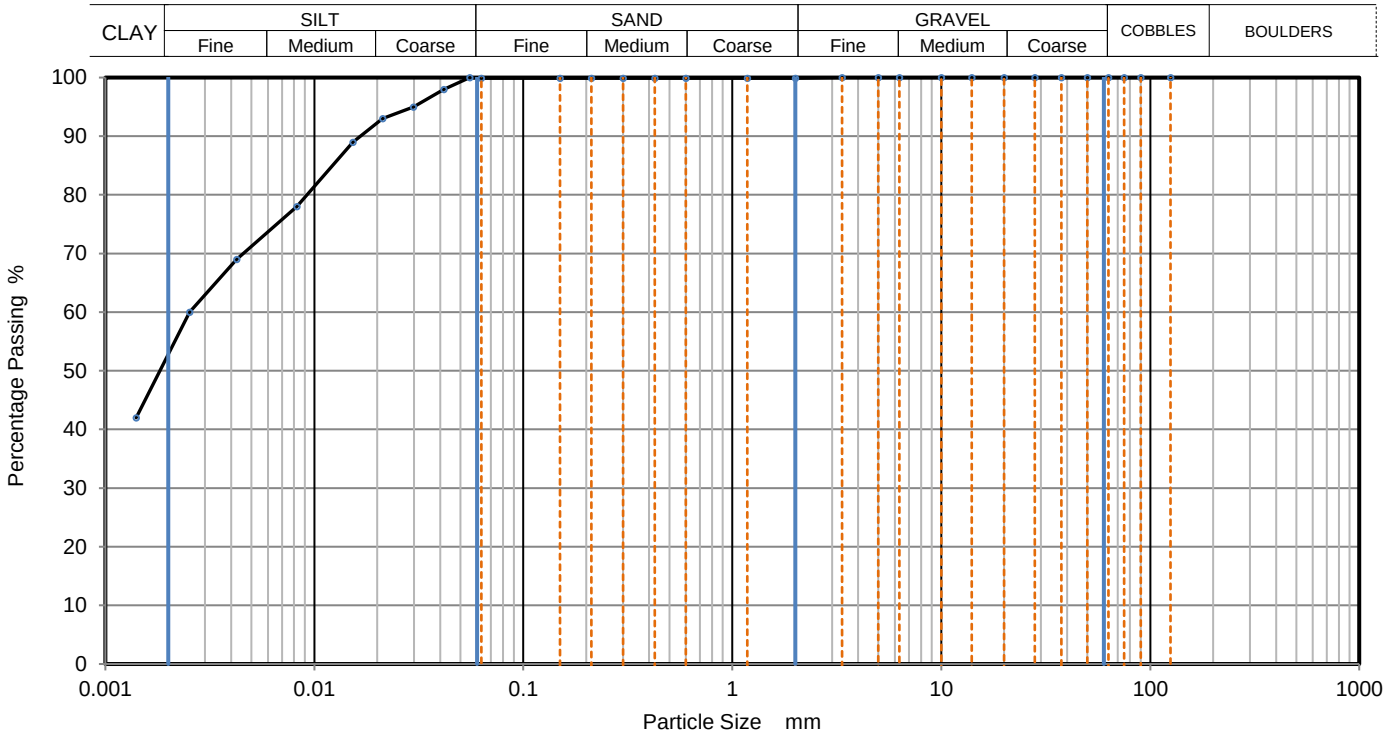
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.00362 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH07B |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 18 |
| Soil Description | Grey silty CLAY. | | | Depth, m | 13.00 |
| Specimen Reference | 5 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032413 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0555 | 100 |
| 90 | 100 | 0.0417 | 98 |
| 75 | 100 | 0.0297 | 95 |
| 63 | 100 | 0.0212 | 93 |
| 50 | 100 | 0.0153 | 89 |
| 37.5 | 100 | 0.0082 | 78 |
| 28 | 100 | 0.0042 | 69 |
| 20 | 100 | 0.0025 | 60 |
| 14 | 100 | 0.0014 | 42 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 100 | Particle density | (assumed) |
| 0.425 | 100 | 2.65 | Mg/m3 |
| 0.3 | 100 | | |
| 0.212 | 100 | | |
| 0.15 | 100 | | |
| 0.063 | 100 | | |

| | |
|---|---|
| Dry Mass of sample, g | 220 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 0 |
| Silt | 47 |
| Clay | 53 |

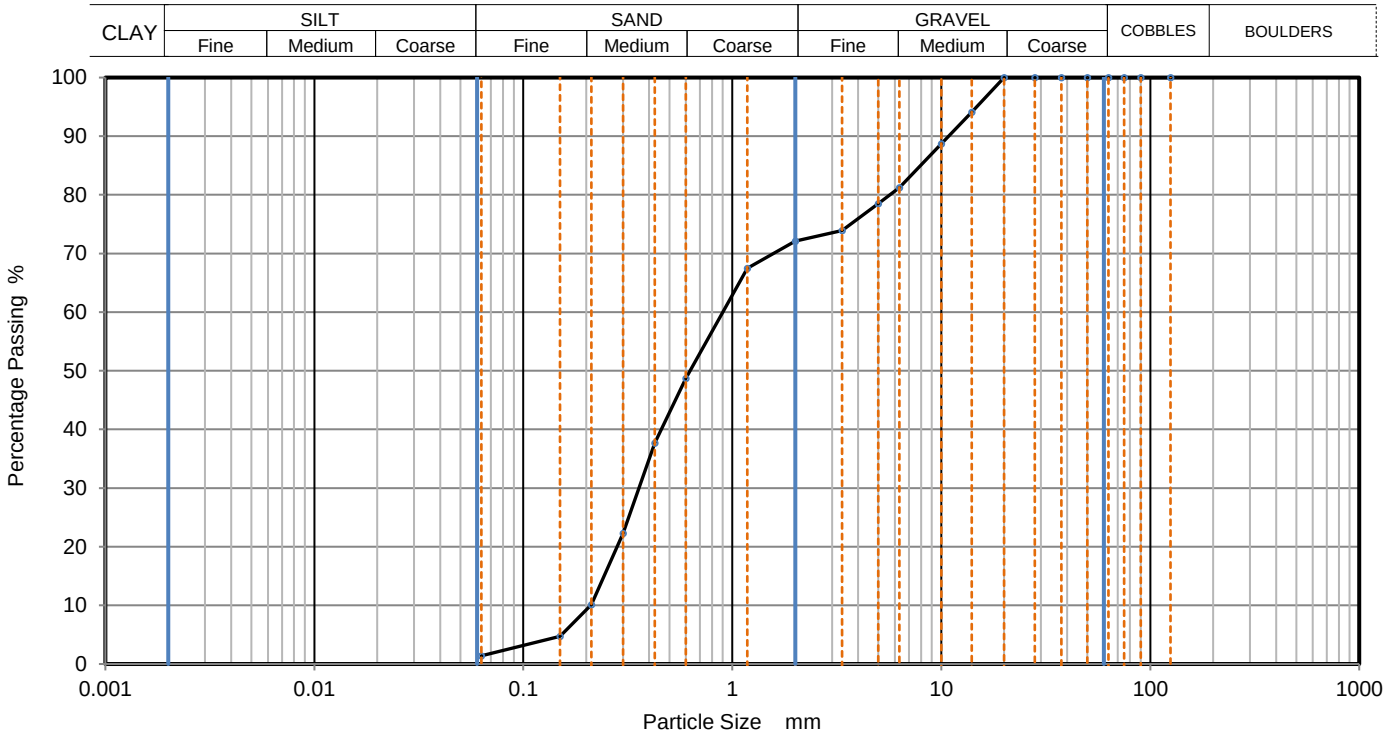
| **Grading Analysis** | | |
|---|---|---|
| $D_{100}$ | mm | |
| $D_{60}$ | mm | 0.00254 |
| $D_{30}$ | mm | |
| $D_{10}$ | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 24/04/2018 17:02 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH08 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 16 |
| Soil Description | Greyish brown gravelly fine to coarse SAND. | | | Depth, m | 5.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032414 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 94 | | |
| 10 | 89 | | |
| 6.3 | 81 | | |
| 5 | 79 | | |
| 3.35 | 74 | | |
| 2 | 72 | | |
| 1.18 | 68 | | |
| 0.6 | 49 | | |
| 0.425 | 38 | | |
| 0.3 | 22 | | |
| 0.212 | 10 | | |
| 0.15 | 5 | | |
| 0.063 | 1 | | |

| Dry Mass of sample, g | 665 |
|---|---|

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 28 |
| Sand | 71 |
| | |
| Fines <0.063mm | 1 |

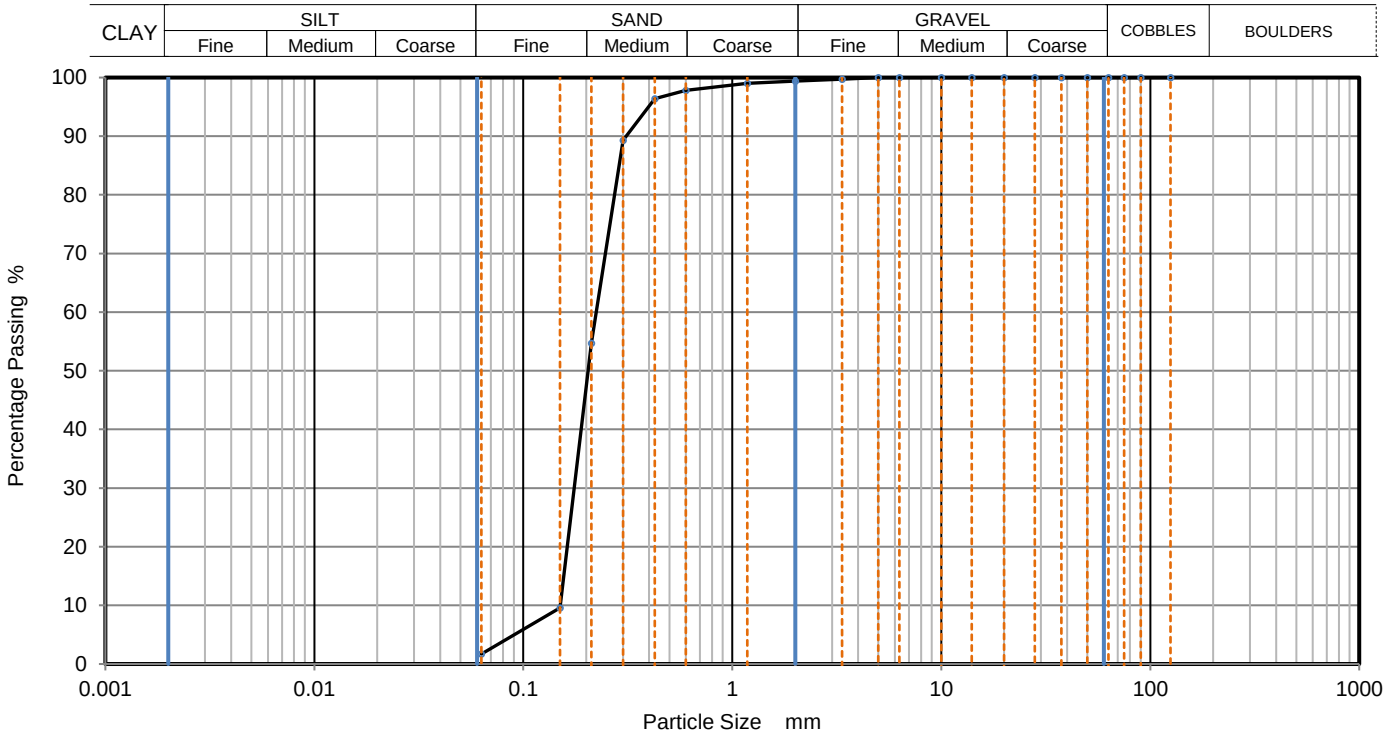
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.901 |
| D30 | mm | 0.357 |
| D10 | mm | 0.21 |
| Uniformity Coefficient | | 4.3 |
| Curvature Coefficient | | 0.67 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH08 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 25 |
| Soil Description | Brown fine to medium SAND. | | | Depth, m | 10.50 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032416 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 99 | | |
| 1.18 | 99 | | |
| 0.6 | 98 | | |
| 0.425 | 96 | | |
| 0.3 | 89 | | |
| 0.212 | 55 | | |
| 0.15 | 10 | | |
| 0.063 | 2 | | |

| Dry Mass of sample, g | 275 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 98 |
| | |
| Fines <0.063mm | 2 |

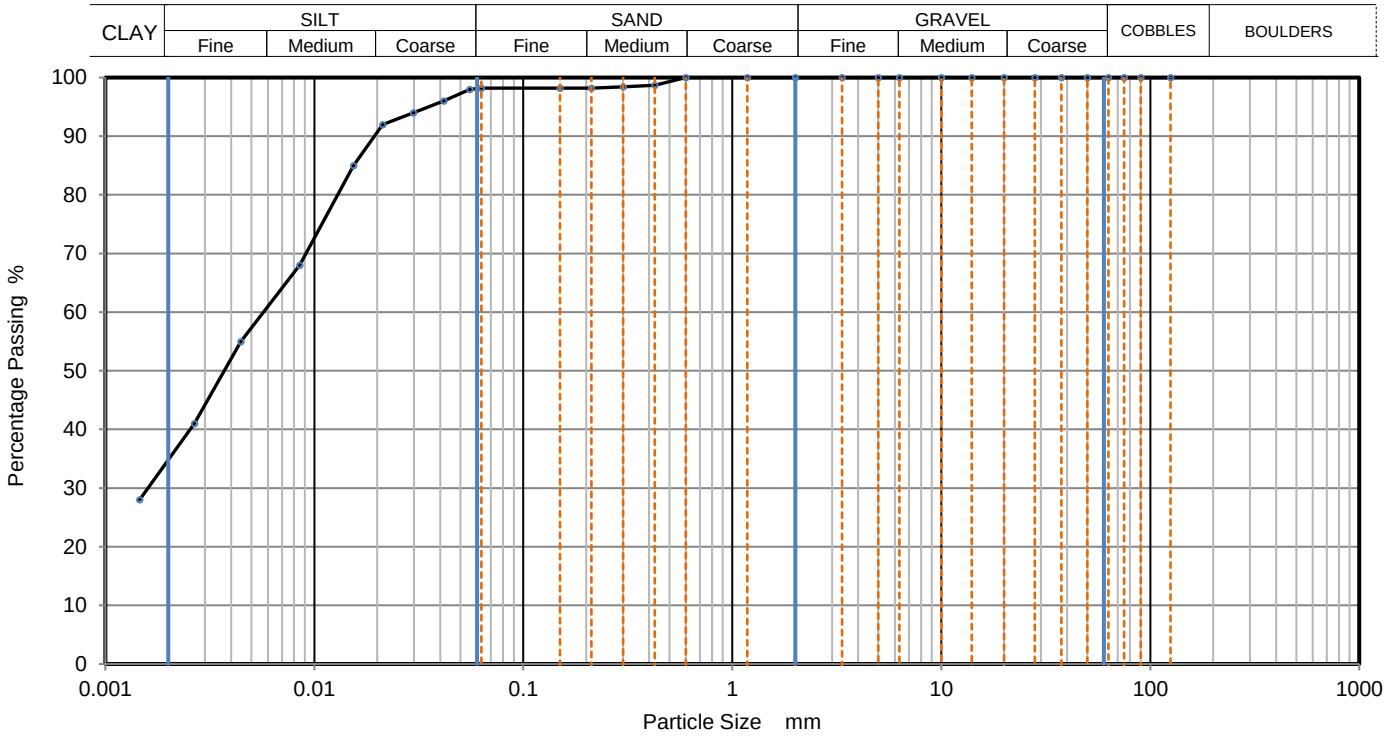
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.224 |
| D30 | mm | 0.175 |
| D10 | mm | 0.15 |
| Uniformity Coefficient | | 1.5 |
| Curvature Coefficient | | 0.91 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | **Fig** 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH08 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 29 |
| Soil Description | Grey silty CLAY. | | | Depth, m | 12.00 |
| Specimen Reference | 5 | Specimen Depth | m | Sample Type | U |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032418 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0555 | 98 |
| 90 | 100 | 0.0417 | 96 |
| 75 | 100 | 0.0297 | 94 |
| 63 | 100 | 0.0212 | 92 |
| 50 | 100 | 0.0154 | 85 |
| 37.5 | 100 | 0.0085 | 68 |
| 28 | 100 | 0.0044 | 55 |
| 20 | 100 | 0.0027 | 41 |
| 14 | 100 | 0.0015 | 28 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 100 | Particle density | (assumed) |
| 0.425 | 99 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 98 | | |
| 0.15 | 98 | | |
| 0.063 | 98 | | |

| Dry Mass of sample, g | 211 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 2 |
| Silt | 63 |
| Clay | 35 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.00582 |
| D30 | mm | 0.00157 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

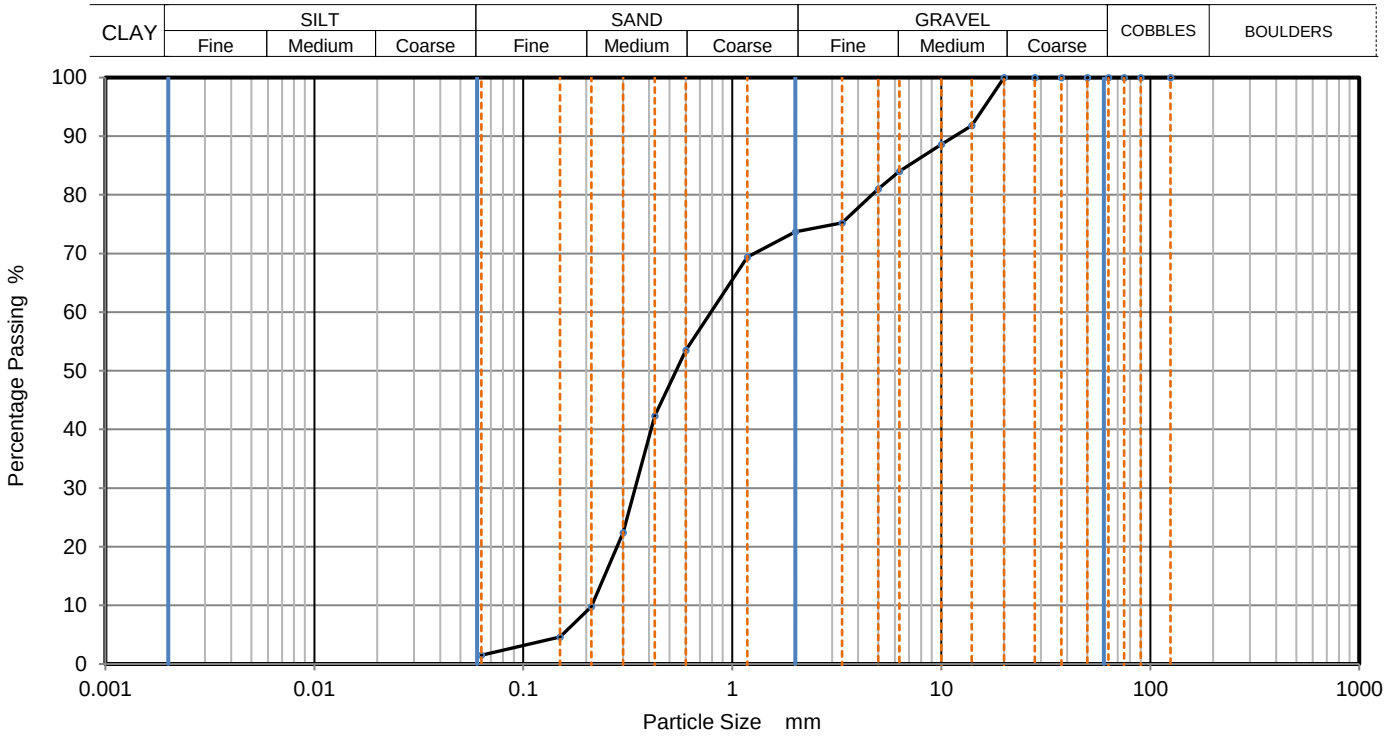
Remarks

Preparation and testing in accordance with BS1377 unless noted below

0

| Approved | Sheet printed | **Fig** 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH09 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 6 |
| Soil Description | Brown gravelly fine to coarse SAND. | | | Depth, m | 5.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032419 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 92 | | |
| 10 | 89 | | |
| 6.3 | 84 | | |
| 5 | 81 | | |
| 3.35 | 75 | | |
| 2 | 74 | | |
| 1.18 | 69 | | |
| 0.6 | 54 | | |
| 0.425 | 42 | | |
| 0.3 | 22 | | |
| 0.212 | 10 | | |
| 0.15 | 5 | | |
| 0.063 | 2 | | |

| | |
|---|---|
| Dry Mass of sample, g | 683 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 26 |
| Sand | 72 |
| | |
| Fines <0.063mm | 1 |

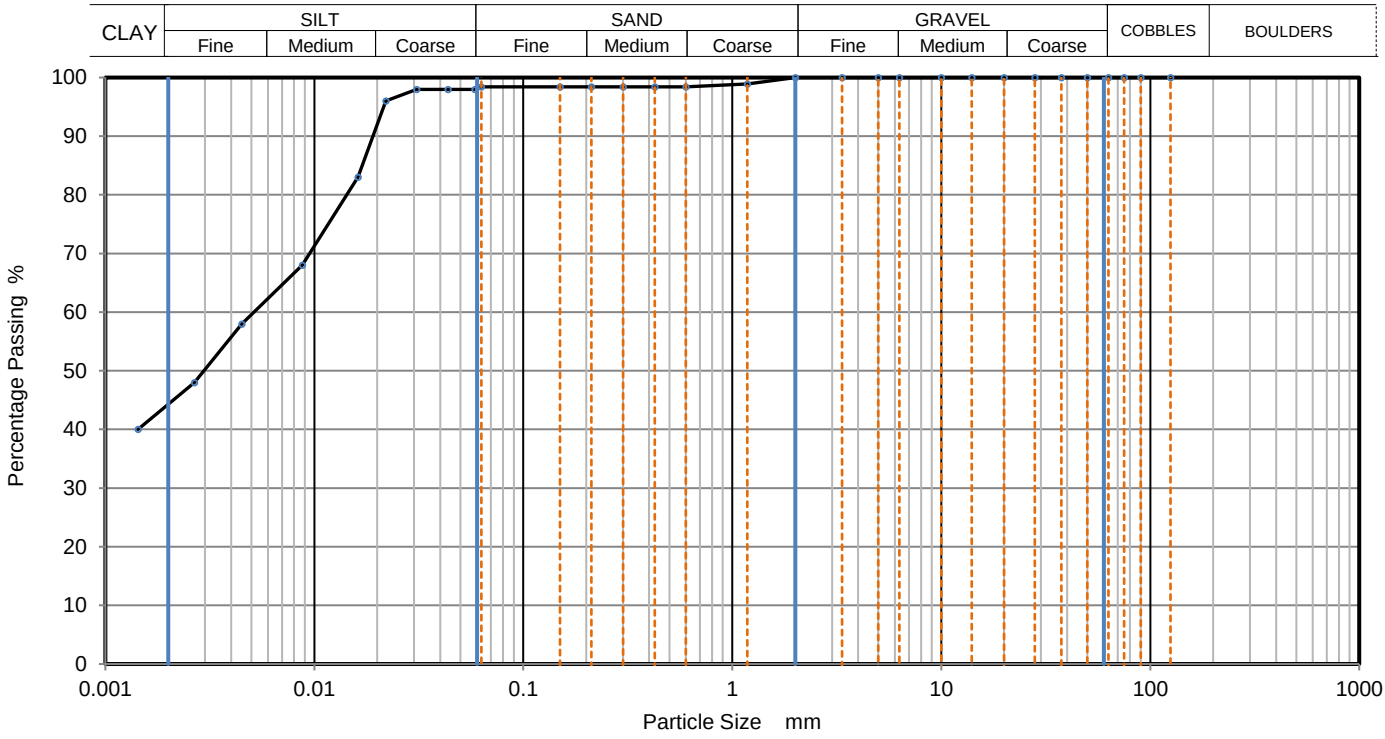
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.79 |
| D30 | mm | 0.343 |
| D10 | mm | 0.213 |
| Uniformity Coefficient | | 3.7 |
| Curvature Coefficient | | 0.7 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH09 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 28 |
| Soil Description | Brownish grey silty CLAY. | | | Depth, m | 12.00 |
| Specimen Reference | 5 | Specimen Depth | m | Sample Type | UT |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032422 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0586 | 98 |
| 90 | 100 | 0.0436 | 98 |
| 75 | 100 | 0.0308 | 98 |
| 63 | 100 | 0.0220 | 96 |
| 50 | 100 | 0.0162 | 83 |
| 37.5 | 100 | 0.0088 | 68 |
| 28 | 100 | 0.0045 | 58 |
| 20 | 100 | 0.0027 | 48 |
| 14 | 100 | 0.0014 | 40 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 99 | | |
| 0.6 | 98 | Particle density | (assumed) |
| 0.425 | 98 | 2.65 | Mg/m3 |
| 0.3 | 98 | | |
| 0.212 | 98 | | |
| 0.15 | 98 | | |
| 0.063 | 98 | | |

Dry Mass of sample, g: 175

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 2 |
| Silt | 54 |
| Clay | 44 |

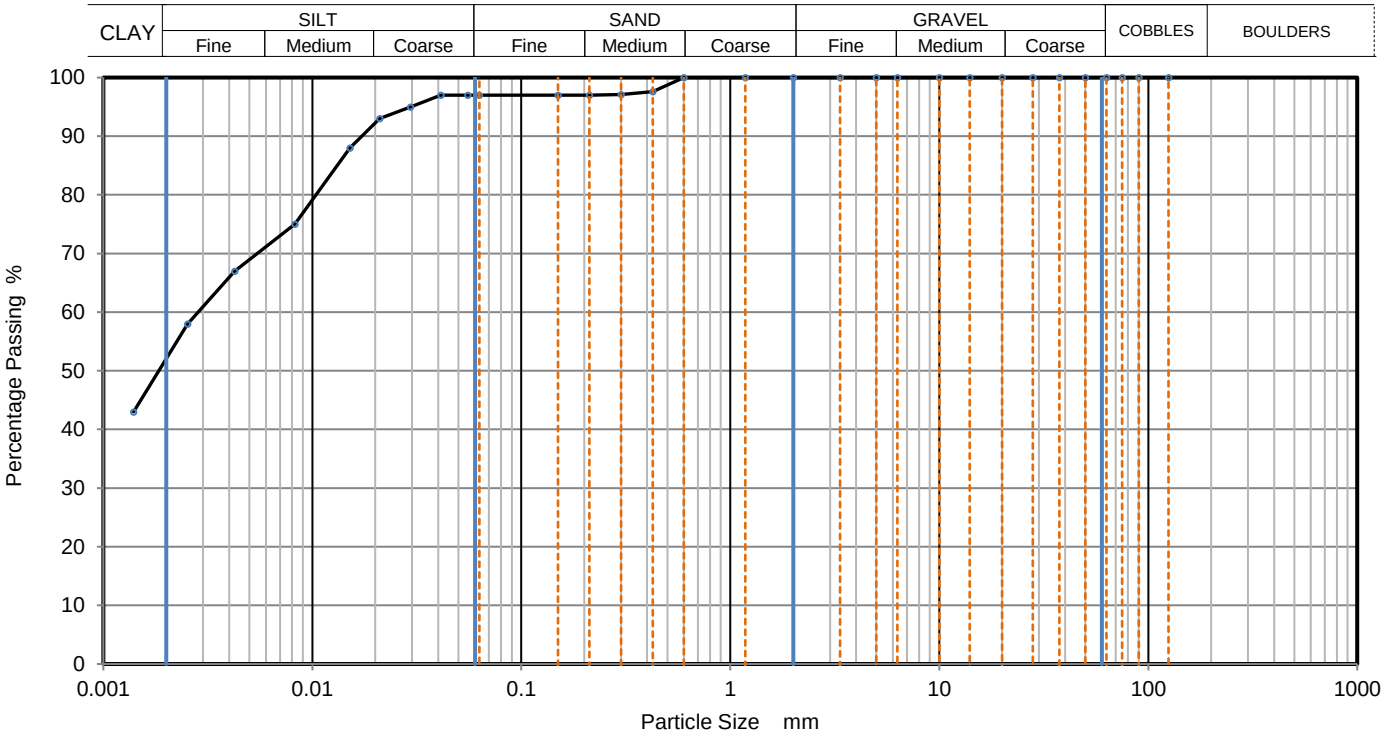
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.00513 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH09 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 36 |
| Soil Description | Brown silty CLAY. | | | Depth, m | 15.30 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | U |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032423 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0555 | 97 |
| 90 | 100 | 0.0413 | 97 |
| 75 | 100 | 0.0295 | 95 |
| 63 | 100 | 0.0210 | 93 |
| 50 | 100 | 0.0151 | 88 |
| 37.5 | 100 | 0.0082 | 75 |
| 28 | 100 | 0.0042 | 67 |
| 20 | 100 | 0.0025 | 58 |
| 14 | 100 | 0.0014 | 43 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 100 | Particle density | (assumed) |
| 0.425 | 98 | 2.65 | Mg/m3 |
| 0.3 | 97 | | |
| 0.212 | 97 | | |
| 0.15 | 97 | | |
| 0.063 | 97 | | |

| Dry Mass of sample, g | 194 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 3 |
| Silt | 45 |
| Clay | 52 |

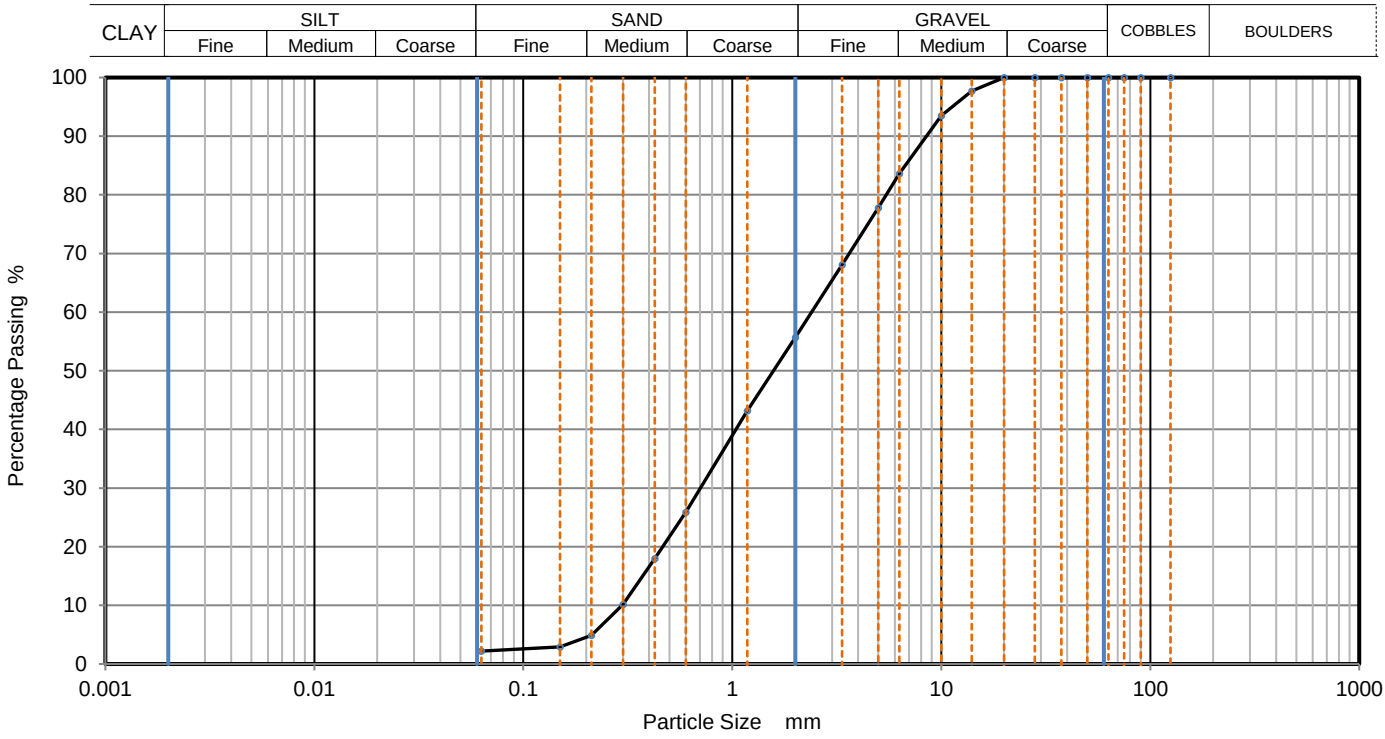
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.00282 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | **Fig** 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH10B |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 3 |
| Soil Description | Grey gravelly fine to coarse SAND. | | | Depth, m | 3.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032425 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 98 | | |
| 10 | 94 | | |
| 6.3 | 84 | | |
| 5 | 78 | | |
| 3.35 | 68 | | |
| 2 | 56 | | |
| 1.18 | 43 | | |
| 0.6 | 26 | | |
| 0.425 | 18 | | |
| 0.3 | 10 | | |
| 0.212 | 5 | | |
| 0.15 | 3 | | |
| 0.063 | 2 | | |

| | |
|---|---|
| Dry Mass of sample, g | 501 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 44 |
| Sand | 54 |
| | |
| Fines <0.063mm | 2 |

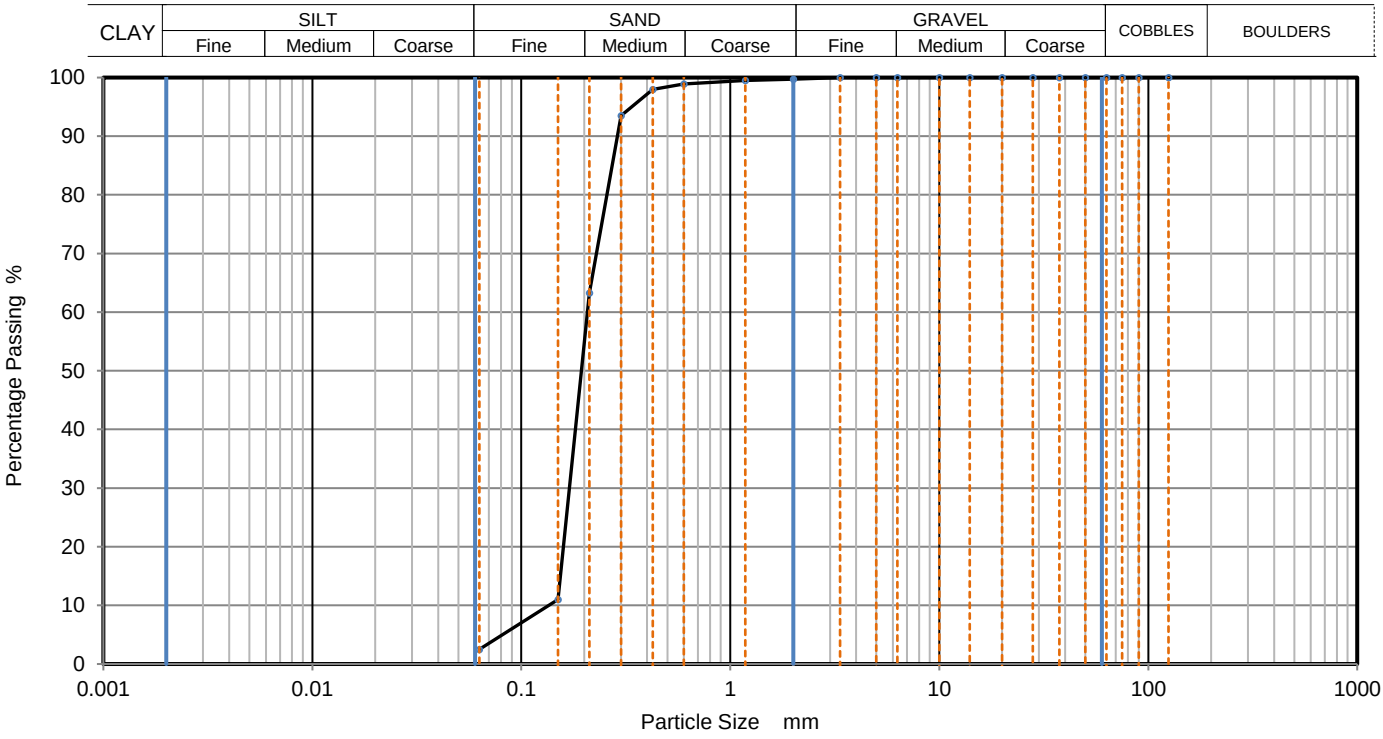
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.39 |
| D30 | mm | 0.705 |
| D10 | mm | 0.295 |
| Uniformity Coefficient | | 8.1 |
| Curvature Coefficient | | 0.71 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:25 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH10B |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 19 |
| Soil Description | Brown fine to medium SAND. | | | Depth, m | 10.50 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032427 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 99 | | |
| 0.425 | 98 | | |
| 0.3 | 94 | | |
| 0.212 | 63 | | |
| 0.15 | 11 | | |
| 0.063 | 3 | | |

| Dry Mass of sample, g | 288 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 97 |
| | |
| Fines <0.063mm | 2 |

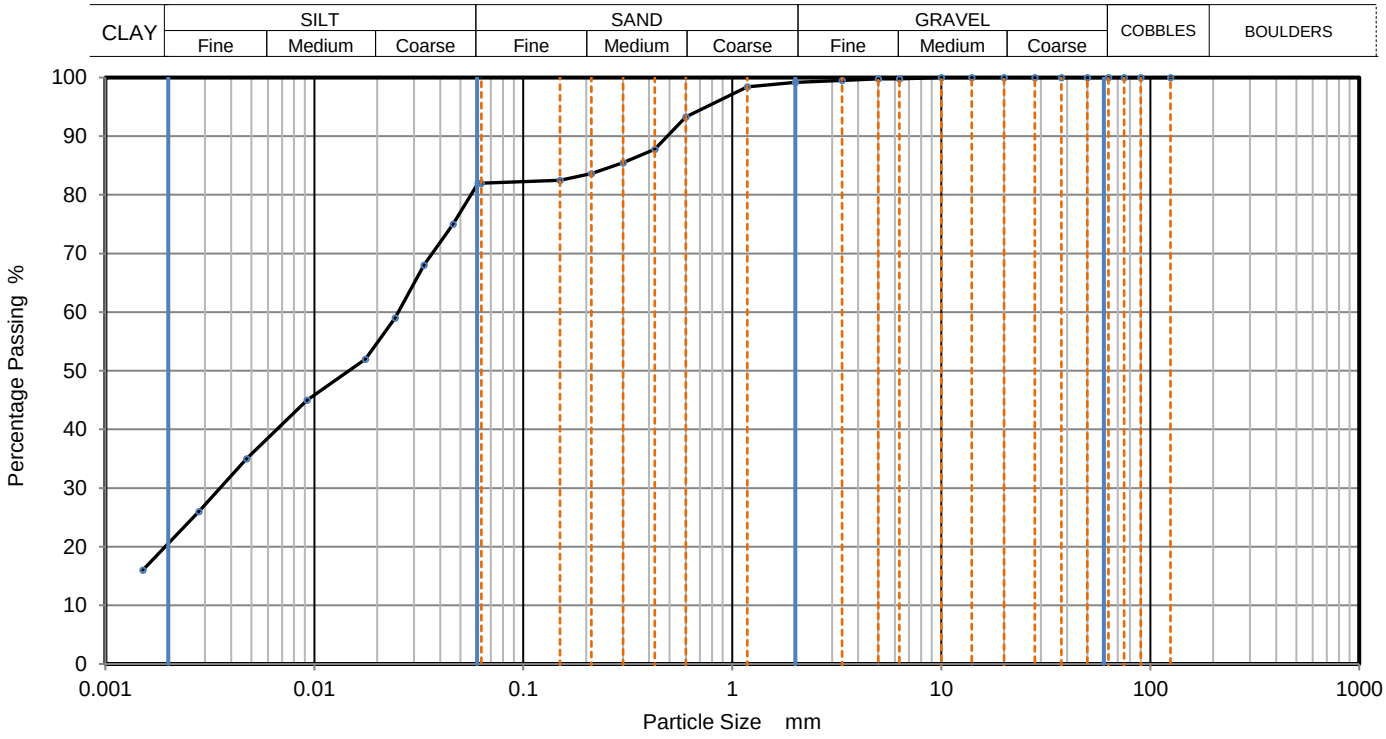
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.207 |
| D30 | mm | 0.17 |
| D10 | mm | 0.136 |
| Uniformity Coefficient | | 1.5 |
| Curvature Coefficient | | 1 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | **Fig** 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH10B |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 22 |
| Soil Description | Brown slightly sandy silty CLAY. | | | Depth, m | 15.00 |
| Specimen Reference | 5 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032429 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0607 | 82 |
| 90 | 100 | 0.0462 | 75 |
| 75 | 100 | 0.0334 | 68 |
| 63 | 100 | 0.0243 | 59 |
| 50 | 100 | 0.0176 | 52 |
| 37.5 | 100 | 0.0092 | 45 |
| 28 | 100 | 0.0047 | 35 |
| 20 | 100 | 0.0028 | 26 |
| 14 | 100 | 0.0015 | 16 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 99 | | |
| 1.18 | 98 | | |
| 0.6 | 93 | Particle density | (assumed) |
| 0.425 | 88 | 2.65 | Mg/m3 |
| 0.3 | 86 | | |
| 0.212 | 84 | | |
| 0.15 | 83 | | |
| 0.063 | 82 | | |

| | |
|---|---|
| Dry Mass of sample, g | 396 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 17 |
| Silt | 61 |
| Clay | 21 |

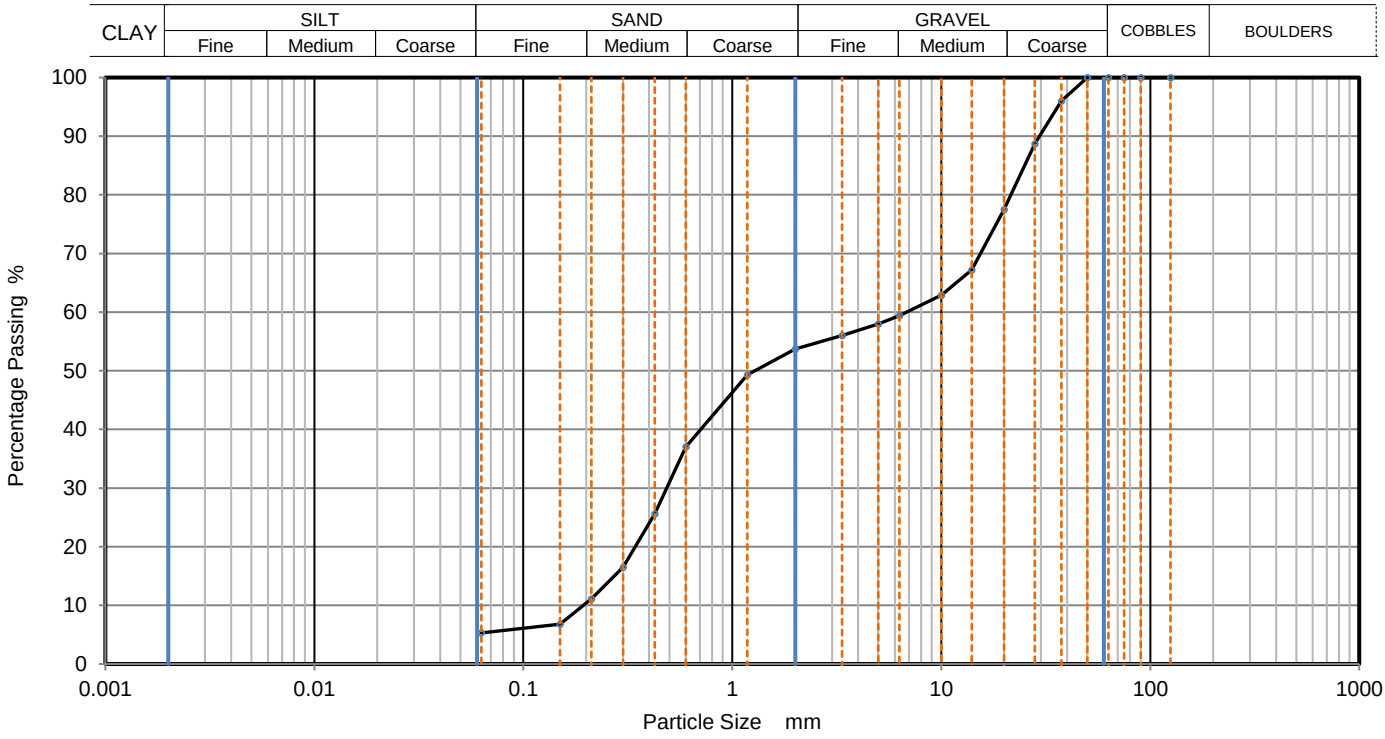
| **Grading Analysis** | | |
|---|---|---|
| $D_{100}$ | mm | |
| $D_{60}$ | mm | 0.0255 |
| $D_{30}$ | mm | 0.00355 |
| $D_{10}$ | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 24/04/2018 17:03 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH11 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 6 |
| Soil Description | MADE GROUND: Brown gravelly fine to coarse SAND. | | | Depth, m | 1.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032430 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 96 | | |
| 28 | 89 | | |
| 20 | 78 | | |
| 14 | 67 | | |
| 10 | 63 | | |
| 6.3 | 59 | | |
| 5 | 58 | | |
| 3.35 | 56 | | |
| 2 | 54 | | |
| 1.18 | 49 | | |
| 0.6 | 37 | | |
| 0.425 | 26 | | |
| 0.3 | 17 | | |
| 0.212 | 11 | | |
| 0.15 | 7 | | |
| 0.063 | 5 | | |

| | |
|---|---|
| Dry Mass of sample, g | 6254 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 46 |
| Sand | 48 |
| | |
| Fines <0.063mm | 5 |

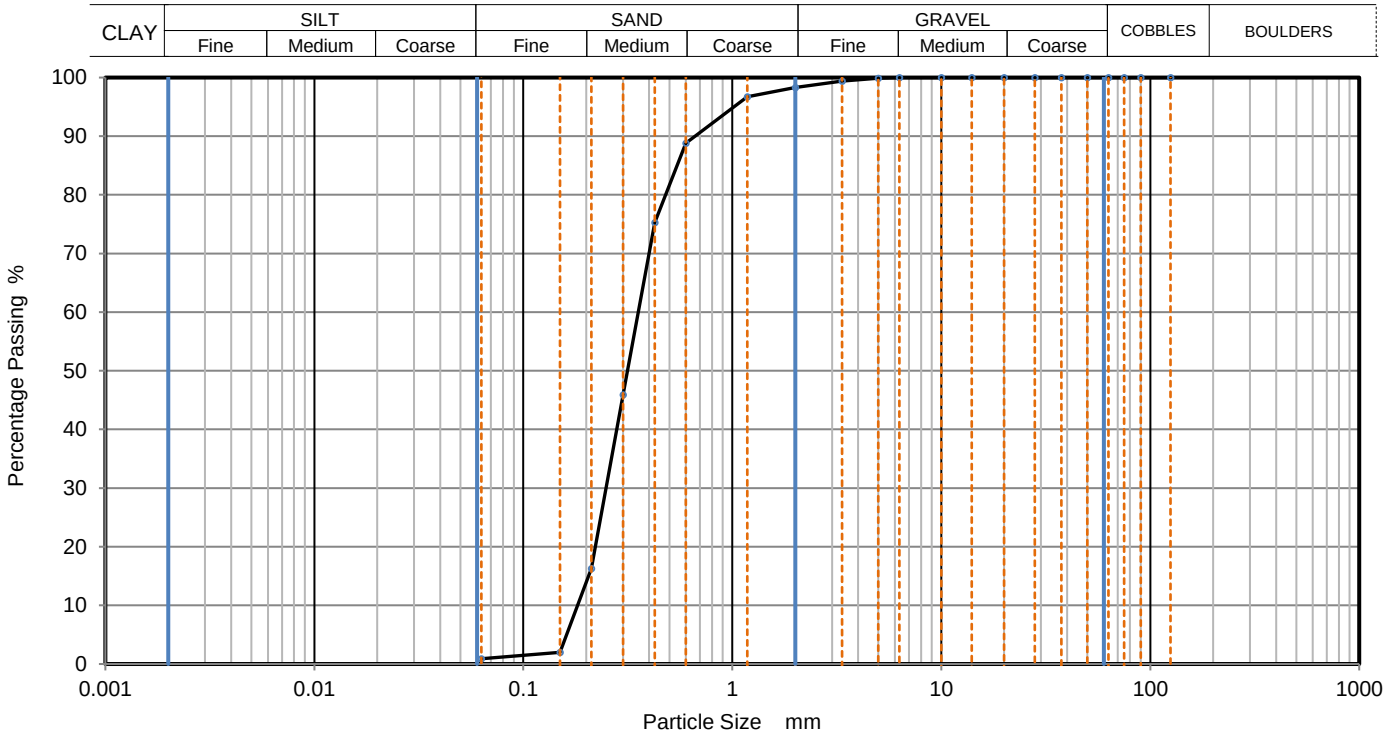
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 6.83 |
| D30 | mm | 0.486 |
| D10 | mm | 0.194 |
| Uniformity Coefficient | | 35 |
| Curvature Coefficient | | 0.18 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH11 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 12 |
| Soil Description | Brownish grey slightly gravelly fine to coarse SAND. | | | Depth, m | 7.50 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032432 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 99 | | |
| 2 | 98 | | |
| 1.18 | 97 | | |
| 0.6 | 89 | | |
| 0.425 | 75 | | |
| 0.3 | 46 | | |
| 0.212 | 16 | | |
| 0.15 | 2 | | |
| 0.063 | 1 | | |

| Dry Mass of sample, g | 299 |
|---|---|

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 2 |
| Sand | 97 |
| | |
| Fines <0.063mm | 1 |

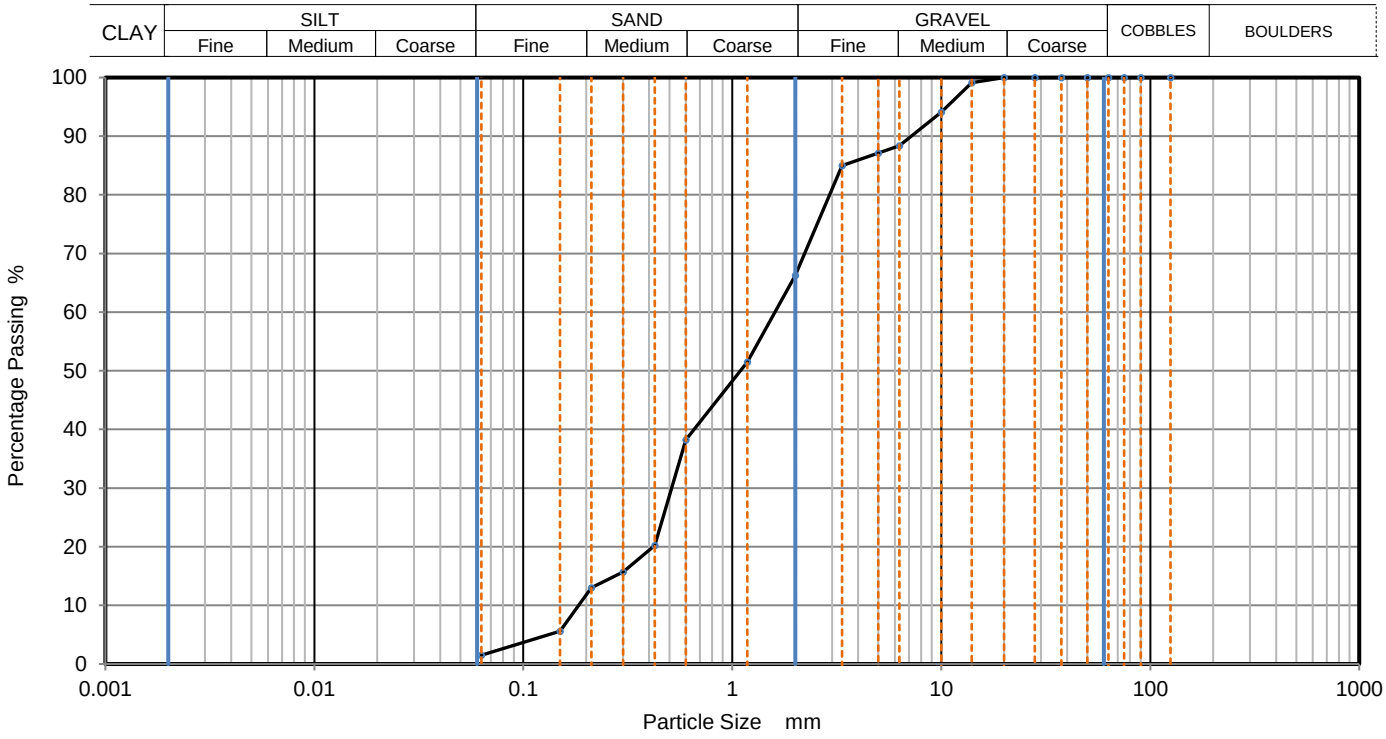
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.355 |
| D30 | mm | 0.249 |
| D10 | mm | 0.182 |
| Uniformity Coefficient | | 2 |
| Curvature Coefficient | | 0.96 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH17 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 8 |
| Soil Description | Brown gravelly fine to coarse SAND. | | | Depth, m | 4.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032436 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 99 | | |
| 10 | 94 | | |
| 6.3 | 88 | | |
| 5 | 87 | | |
| 3.35 | 85 | | |
| 2 | 66 | | |
| 1.18 | 52 | | |
| 0.6 | 38 | | |
| 0.425 | 20 | | |
| 0.3 | 16 | | |
| 0.212 | 13 | | |
| 0.15 | 6 | | |
| 0.063 | 2 | | |

| | |
|---|---|
| Dry Mass of sample, g | 495 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 34 |
| Sand | 65 |
| | |
| Fines <0.063mm | 1 |

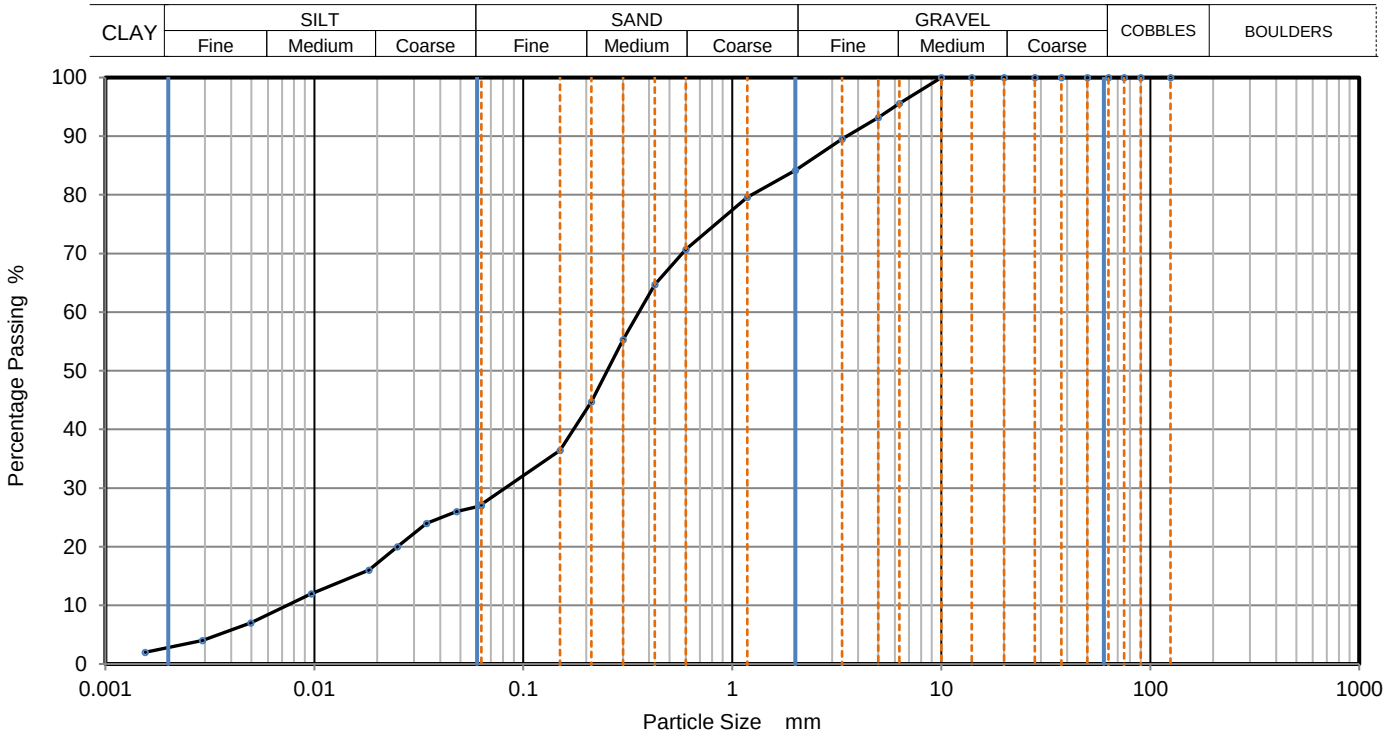
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.6 |
| D30 | mm | 0.513 |
| D10 | mm | 0.184 |
| Uniformity Coefficient | | 8.7 |
| Curvature Coefficient | | 0.89 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH17 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 10 |
| Soil Description | Dark grey slightly gravelly organic silty CLAY. | | | Depth, m | 6.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032438 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 27 |
| 90 | 100 | 0.0480 | 26 |
| 75 | 100 | 0.0344 | 24 |
| 63 | 100 | 0.0250 | 20 |
| 50 | 100 | 0.0182 | 16 |
| 37.5 | 100 | 0.0097 | 12 |
| 28 | 100 | 0.0050 | 7 |
| 20 | 100 | 0.0029 | 4 |
| 14 | 100 | 0.0016 | 2 |
| 10 | 100 | | |
| 6.3 | 96 | | |
| 5 | 93 | | |
| 3.35 | 90 | | |
| 2 | 84 | | |
| 1.18 | 80 | | |
| 0.6 | 71 | Particle density | (assumed) |
| 0.425 | 65 | 2.65 | Mg/m3 |
| 0.3 | 55 | | |
| 0.212 | 45 | | |
| 0.15 | 36 | | |
| 0.063 | 27 | | |

| | |
|---|---|
| Dry Mass of sample, g | 230 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 16 |
| Sand | 57 |
| Silt | 25 |
| Clay | 3 |

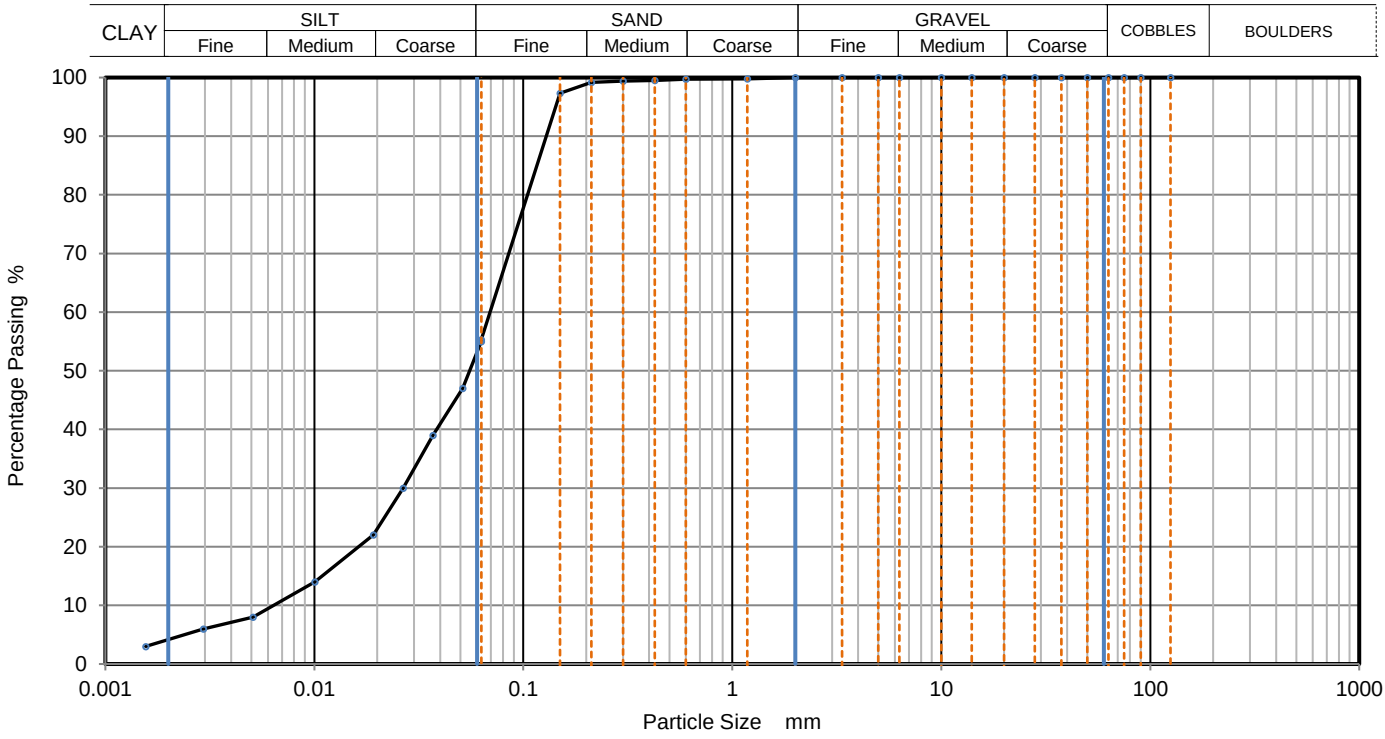
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.357 |
| D30 | mm | 0.0821 |
| D10 | mm | 0.0077 |
| Uniformity Coefficient | | 46 |
| Curvature Coefficient | | 2.4 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH17 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 29 |
| Soil Description | Brownish grey sandy clayey SILT. | | | Depth, m | 15.00 |
| Specimen Reference | 5 | Specimen Depth | m | Sample Type | U |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032440 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 55 |
| 90 | 100 | 0.0513 | 47 |
| 75 | 100 | 0.0369 | 39 |
| 63 | 100 | 0.0266 | 30 |
| 50 | 100 | 0.0191 | 22 |
| 37.5 | 100 | 0.0100 | 14 |
| 28 | 100 | 0.0051 | 8 |
| 20 | 100 | 0.0029 | 6 |
| 14 | 100 | 0.0016 | 3 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 100 | | |
| 1.18 | 100 | | |
| 0.6 | 100 | Particle density | (assumed) |
| 0.425 | 100 | 2.65 | Mg/m3 |
| 0.3 | 99 | | |
| 0.212 | 99 | | |
| 0.15 | 97 | | |
| 0.063 | 55 | | |

| | |
|---|---|
| Dry Mass of sample, g | 389 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 0 |
| Sand | 45 |
| Silt | 52 |
| Clay | 4 |

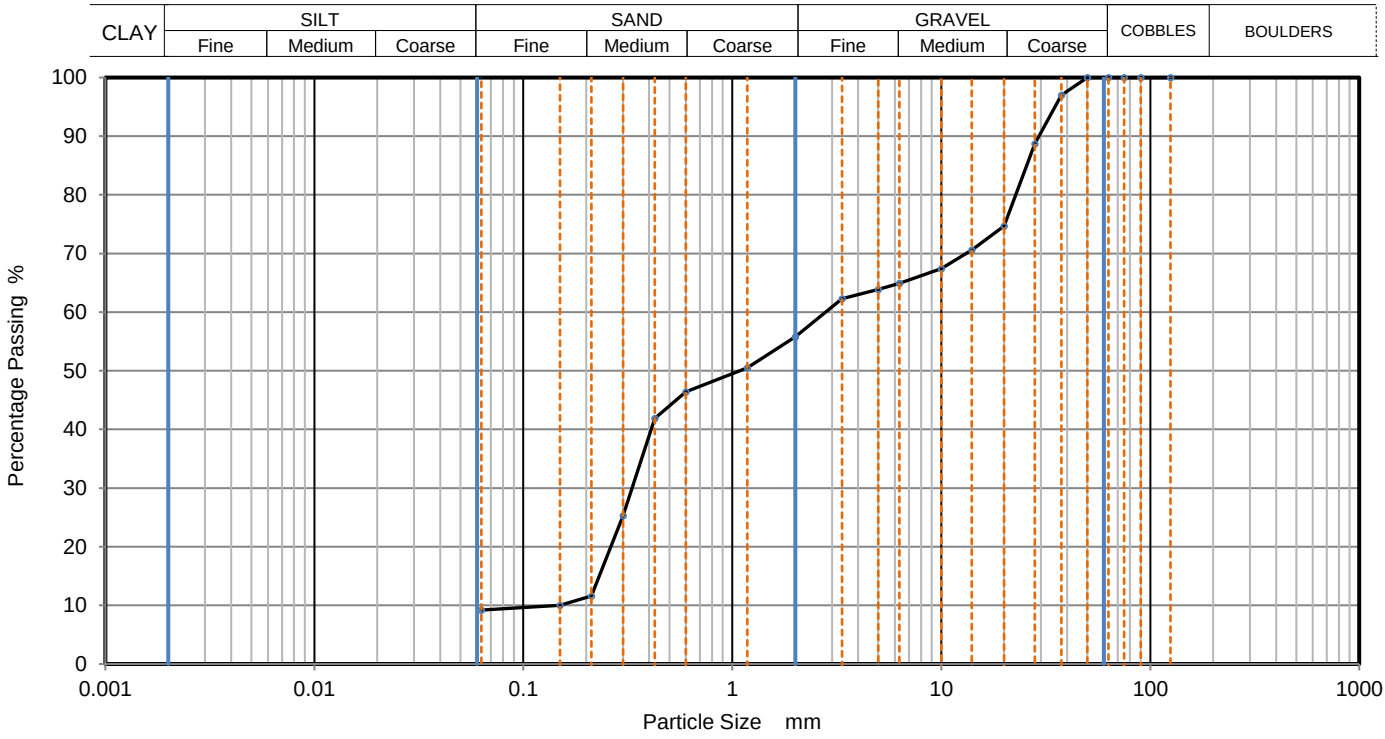
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0695 |
| D30 | mm | 0.0262 |
| D10 | mm | 0.00627 |
| Uniformity Coefficient | | 11 |
| Curvature Coefficient | | 1.6 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH18 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 24 |
| Soil Description | MADE GROUND: Grey gravelly fine to coarse SAND. | | | Depth, m | 1.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032441 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 97 | | |
| 28 | 89 | | |
| 20 | 75 | | |
| 14 | 71 | | |
| 10 | 67 | | |
| 6.3 | 65 | | |
| 5 | 64 | | |
| 3.35 | 62 | | |
| 2 | 56 | | |
| 1.18 | 51 | | |
| 0.6 | 46 | | |
| 0.425 | 42 | | |
| 0.3 | 25 | | |
| 0.212 | 12 | | |
| 0.15 | 10 | | |
| 0.063 | 9 | | |

| Dry Mass of sample, g | 5966 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 44 |
| Sand | 47 |
| | |
| Fines <0.063mm | 9 |

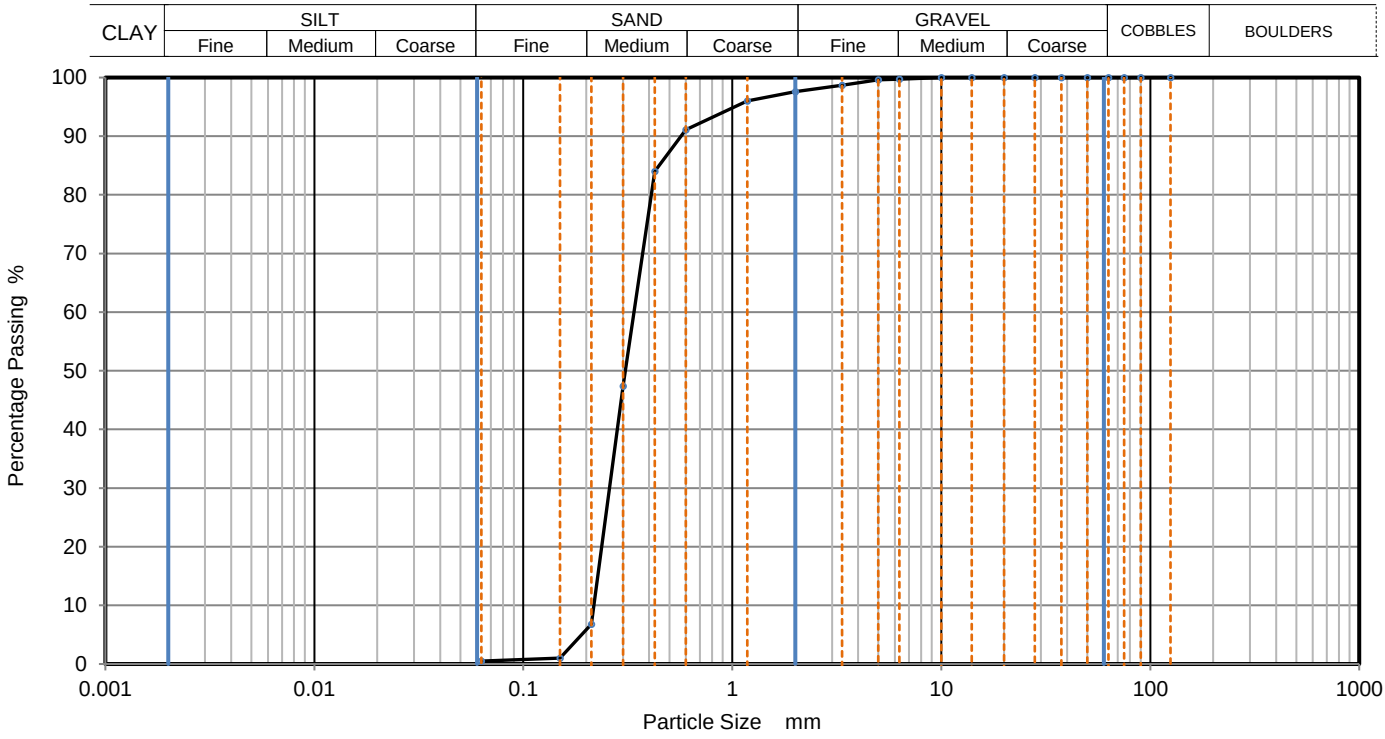
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.79 |
| D30 | mm | 0.331 |
| D10 | mm | 0.151 |
| Uniformity Coefficient | | 18 |
| Curvature Coefficient | | 0.26 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | **Fig** 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH18 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 26 |
| Soil Description | Brown fine to medium SAND. | | | Depth, m | 3.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032442 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 99 | | |
| 2 | 98 | | |
| 1.18 | 96 | | |
| 0.6 | 91 | | |
| 0.425 | 84 | | |
| 0.3 | 47 | | |
| 0.212 | 7 | | |
| 0.15 | 1 | | |
| 0.063 | 1 | | |

| Dry Mass of sample, g | 400 |
|---|---|

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 2 |
| Sand | 97 |
| | |
| Fines <0.063mm | 0 |

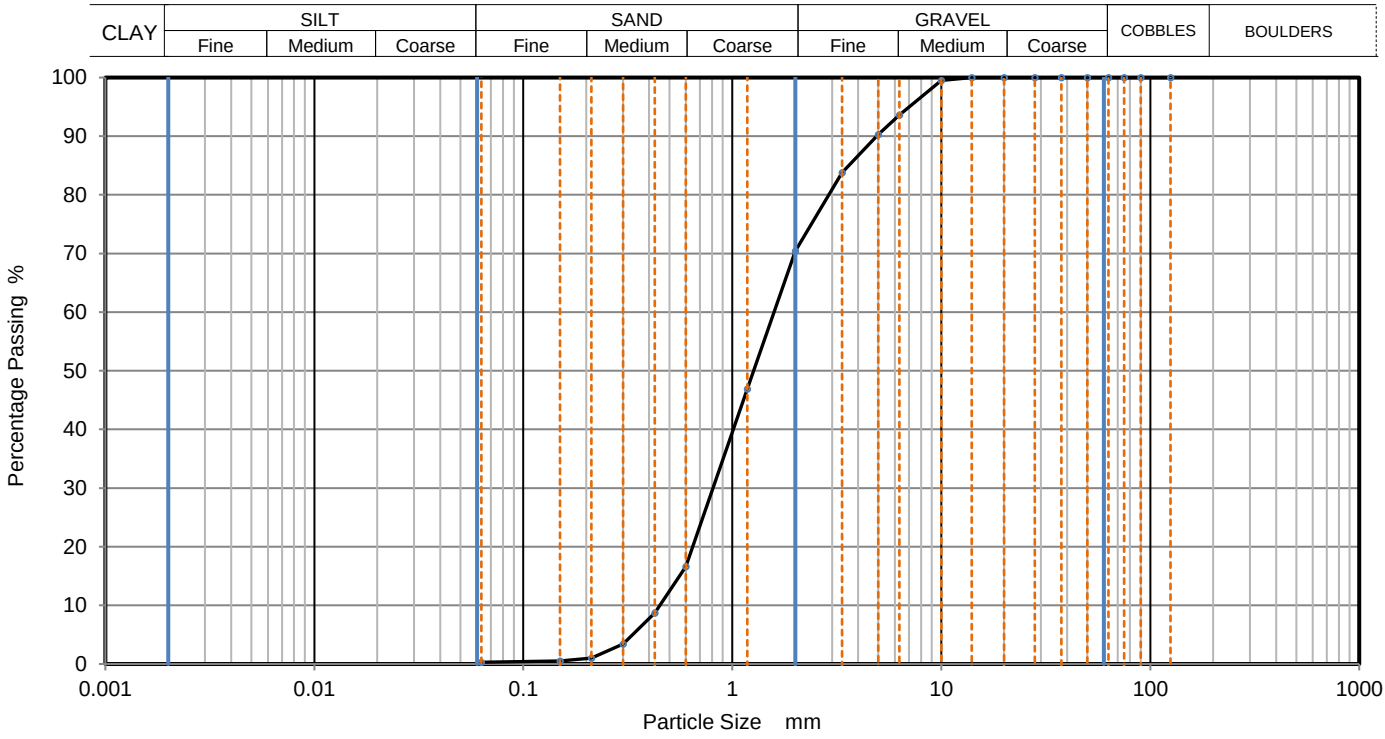
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.338 |
| D30 | mm | 0.259 |
| D10 | mm | 0.218 |
| Uniformity Coefficient | | 1.6 |
| Curvature Coefficient | | 0.91 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH18 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 28 |
| Soil Description | Reddish brown gravelly fine to coarse SAND. | | | Depth, m | 5.00 |
| Specimen Reference | 4 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032444 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 94 | | |
| 5 | 90 | | |
| 3.35 | 84 | | |
| 2 | 70 | | |
| 1.18 | 47 | | |
| 0.6 | 17 | | |
| 0.425 | 9 | | |
| 0.3 | 3 | | |
| 0.212 | 1 | | |
| 0.15 | 1 | | |
| 0.063 | 0 | | |

| | |
|---|---|
| Dry Mass of sample, g | 579 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 30 |
| Sand | 70 |
| | |
| Fines <0.063mm | 0 |

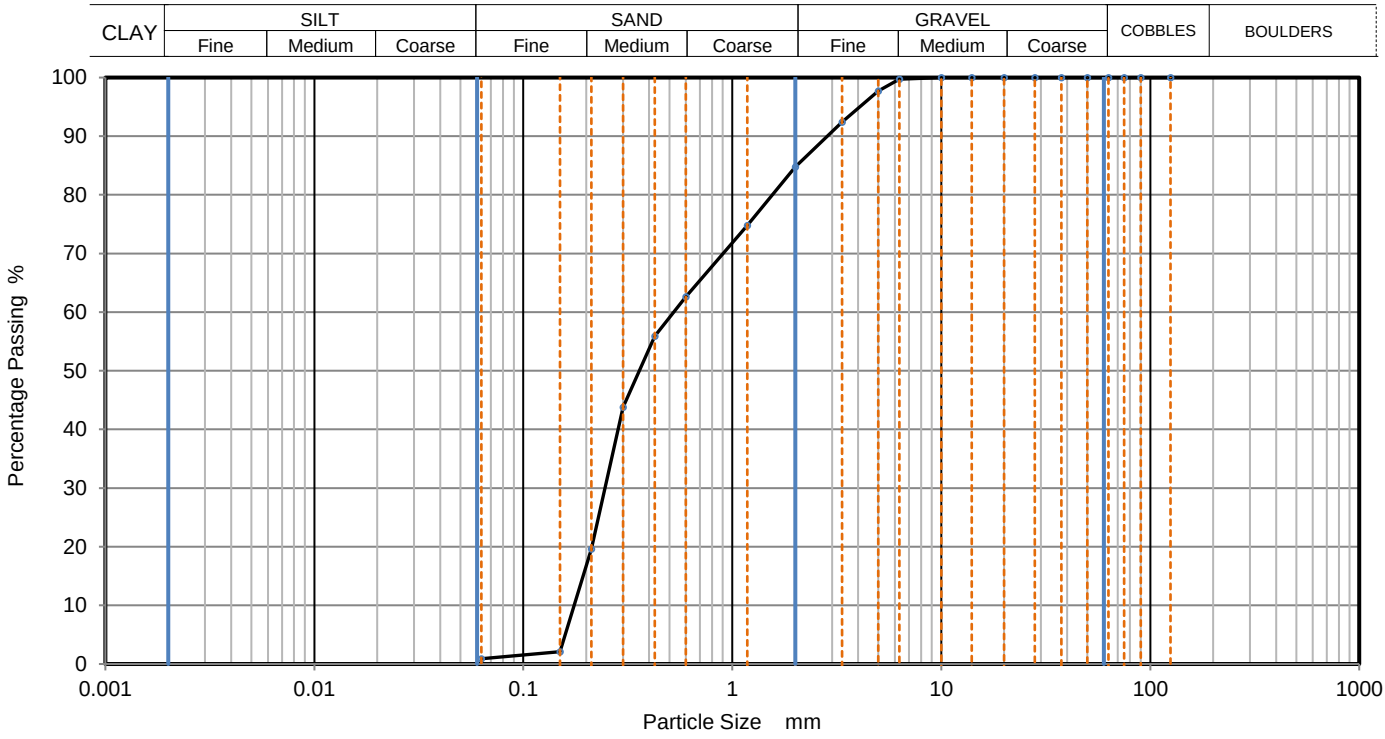
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.58 |
| D30 | mm | 0.809 |
| D10 | mm | 0.45 |
| Uniformity Coefficient | | 3.5 |
| Curvature Coefficient | | 0.92 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH18 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 1 |
| Soil Description | Light brown slightly gravelly fine to medium SAND. | | | Depth, m | 7.50 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032445 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 98 | | |
| 3.35 | 92 | | |
| 2 | 85 | | |
| 1.18 | 75 | | |
| 0.6 | 63 | | |
| 0.425 | 56 | | |
| 0.3 | 44 | | |
| 0.212 | 20 | | |
| 0.15 | 2 | | |
| 0.063 | 1 | | |

| Dry Mass of sample, g | 476 |
|---|---|

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 15 |
| Sand | 84 |
| | |
| Fines <0.063mm | 1 |

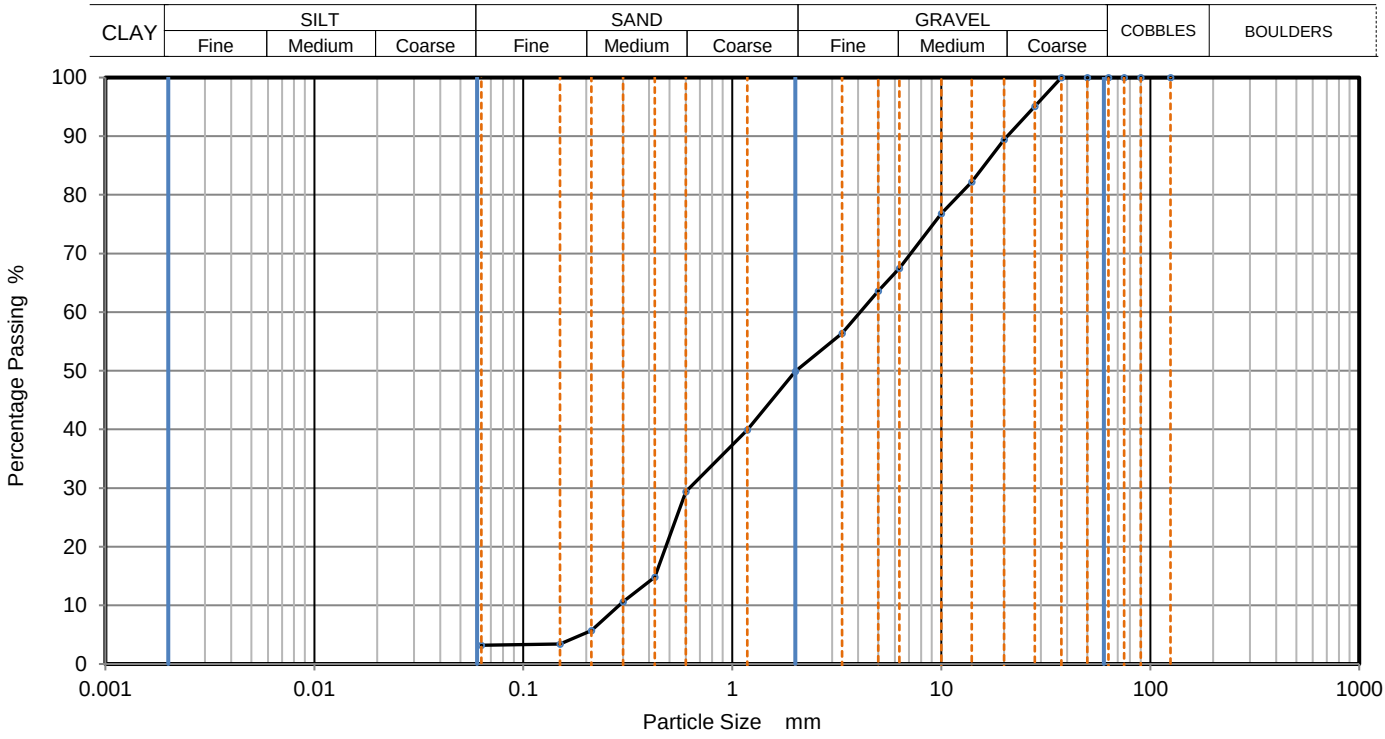
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.524 |
| D30 | mm | 0.246 |
| D10 | mm | 0.175 |
| Uniformity Coefficient | | 3 |
| Curvature Coefficient | | 0.66 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH18 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 5 |
| Soil Description | Brown sandy subangular fine to coarse GRAVEL. | | | Depth, m | 13.50 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032448 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 95 | | |
| 20 | 89 | | |
| 14 | 82 | | |
| 10 | 77 | | |
| 6.3 | 68 | | |
| 5 | 64 | | |
| 3.35 | 56 | | |
| 2 | 50 | | |
| 1.18 | 40 | | |
| 0.6 | 29 | | |
| 0.425 | 15 | | |
| 0.3 | 11 | | |
| 0.212 | 6 | | |
| 0.15 | 3 | | |
| 0.063 | 3 | | |

| Dry Mass of sample, g | 2382 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 50 |
| Sand | 47 |
| | |
| Fines <0.063mm | 3 |

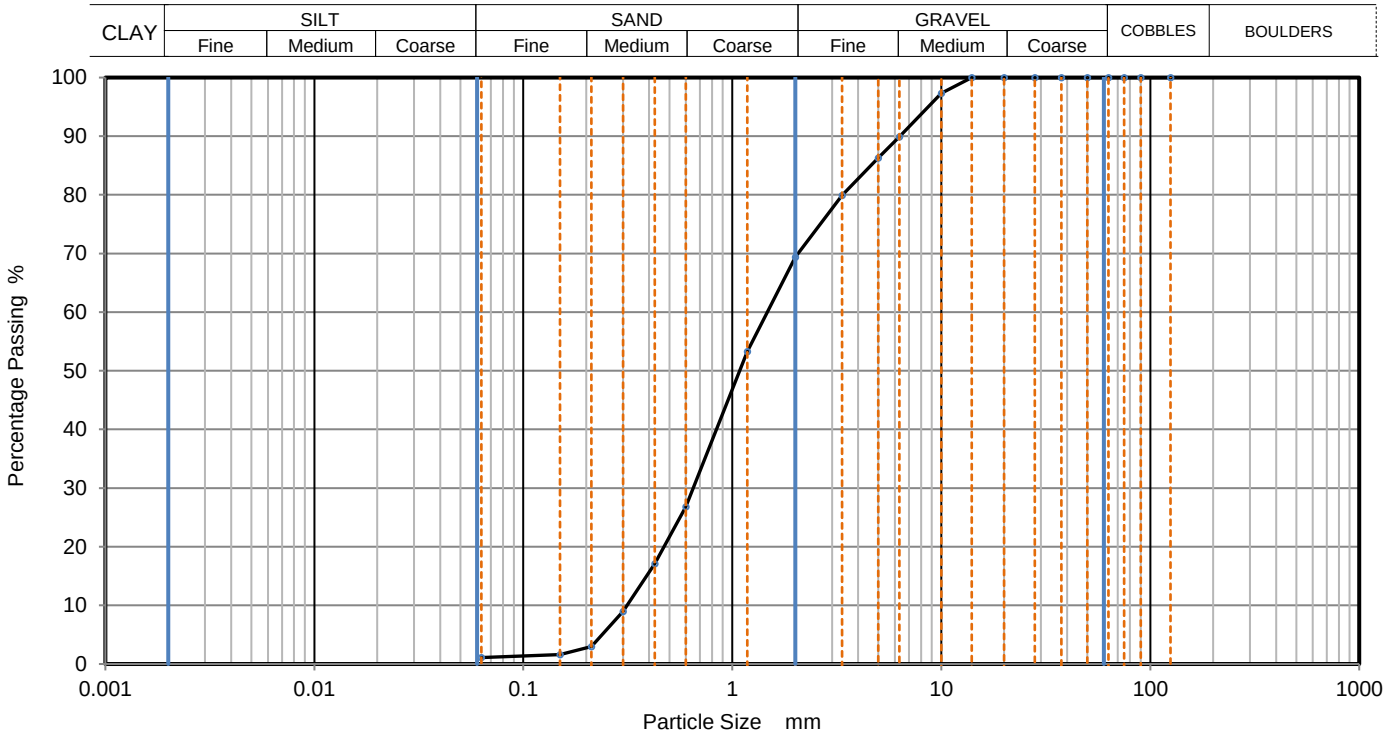
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 4.1 |
| D30 | mm | 0.624 |
| D10 | mm | 0.288 |
| Uniformity Coefficient | | 14 |
| Curvature Coefficient | | 0.33 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH20 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 6 |
| Soil Description | Brown gravelly fine to coarse SAND. | | | Depth, m | 5.00 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032451 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 97 | | |
| 6.3 | 90 | | |
| 5 | 86 | | |
| 3.35 | 80 | | |
| 2 | 69 | | |
| 1.18 | 53 | | |
| 0.6 | 27 | | |
| 0.425 | 17 | | |
| 0.3 | 9 | | |
| 0.212 | 3 | | |
| 0.15 | 2 | | |
| 0.063 | 1 | | |

| Dry Mass of sample, g | 690 |
|---|---|

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 31 |
| Sand | 68 |
| | |
| Fines <0.063mm | 1 |

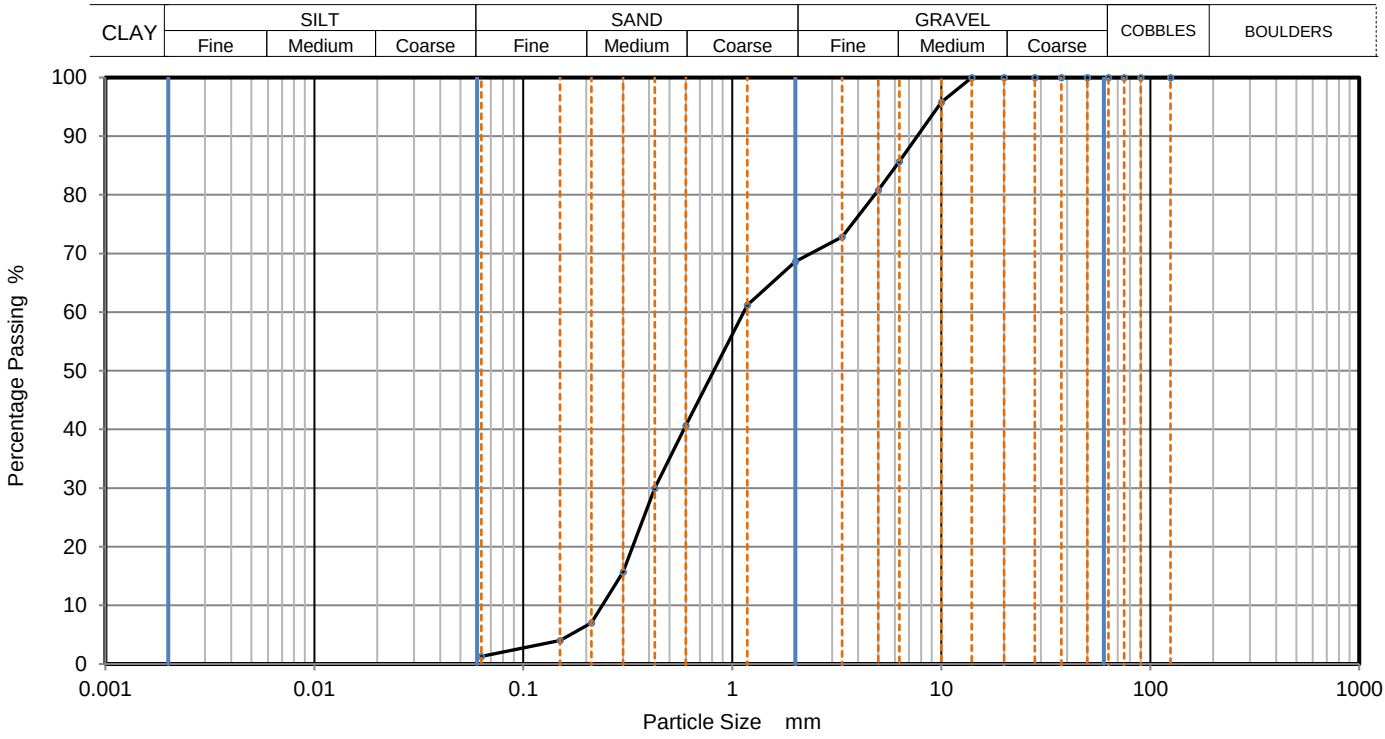
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.47 |
| D30 | mm | 0.652 |
| D10 | mm | 0.313 |
| Uniformity Coefficient | | 4.7 |
| Curvature Coefficient | | 0.92 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| CAUSEWAY GEOTECH | PARTICLE SIZE DISTRIBUTION | | | Job Ref | 17-1455 |
|---|---|---|---|---|---|
| | | | | Borehole/Pit No. | BH20 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 8 |
| Soil Description | Brown gravelly fine to coarse SAND. | | | Depth, m | 7.50 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | Caus2018032453 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 96 | | |
| 6.3 | 86 | | |
| 5 | 81 | | |
| 3.35 | 73 | | |
| 2 | 69 | | |
| 1.18 | 61 | | |
| 0.6 | 41 | | |
| 0.425 | 30 | | |
| 0.3 | 16 | | |
| 0.212 | 7 | | |
| 0.15 | 4 | | |
| 0.063 | 1 | | |

| Dry Mass of sample, g | 977 |
|---|---|

| Sample Proportions | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 31 |
| Sand | 67 |
| | |
| Fines <0.063mm | 1 |

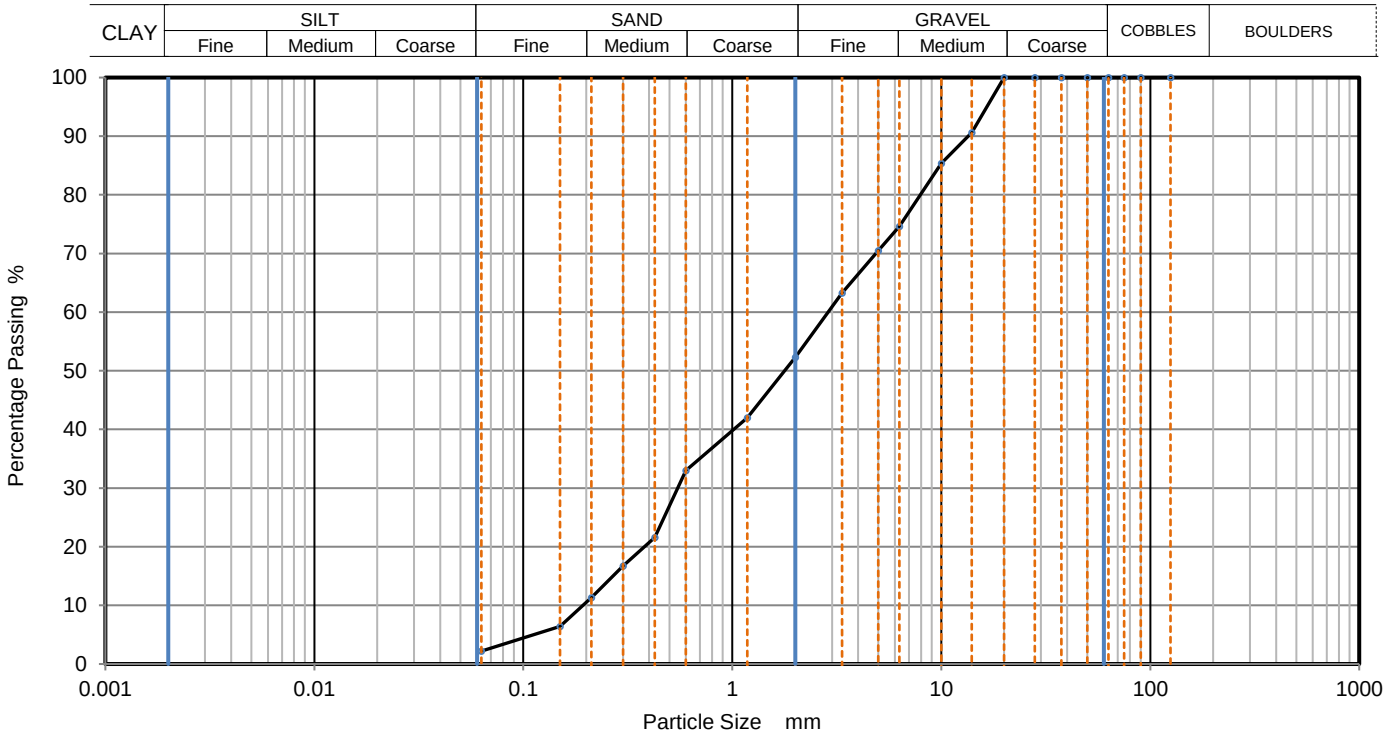
| Grading Analysis | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.13 |
| D30 | mm | 0.425 |
| D10 | mm | 0.239 |
| Uniformity Coefficient | | 4.7 |
| Curvature Coefficient | | 0.67 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Approved | Sheet printed | Fig 1 |
|---|---|---|
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | |
|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | Job Ref | **17-1455** |
| | | Borehole/Pit No. | BH20 |
| Site Name | Arklow WWTP Land GI | Sample No. | 24 |
| Soil Description | Brown gravelly fine to coarse SAND. | Depth, m | 13.50 |
| Specimen Reference | 2 / Specimen Depth: m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | KeyLAB ID | Caus2018032456 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | | |
| 90 | 100 | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 91 | | |
| 10 | 85 | | |
| 6.3 | 75 | | |
| 5 | 71 | | |
| 3.35 | 63 | | |
| 2 | 52 | | |
| 1.18 | 42 | | |
| 0.6 | 33 | | |
| 0.425 | 22 | | |
| 0.3 | 17 | | |
| 0.212 | 11 | | |
| 0.15 | 6 | | |
| 0.063 | 2 | | |

| | |
|---|---|
| Dry Mass of sample, g | 2048 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 48 |
| Sand | 50 |
| | |
| Fines <0.063mm | 2 |

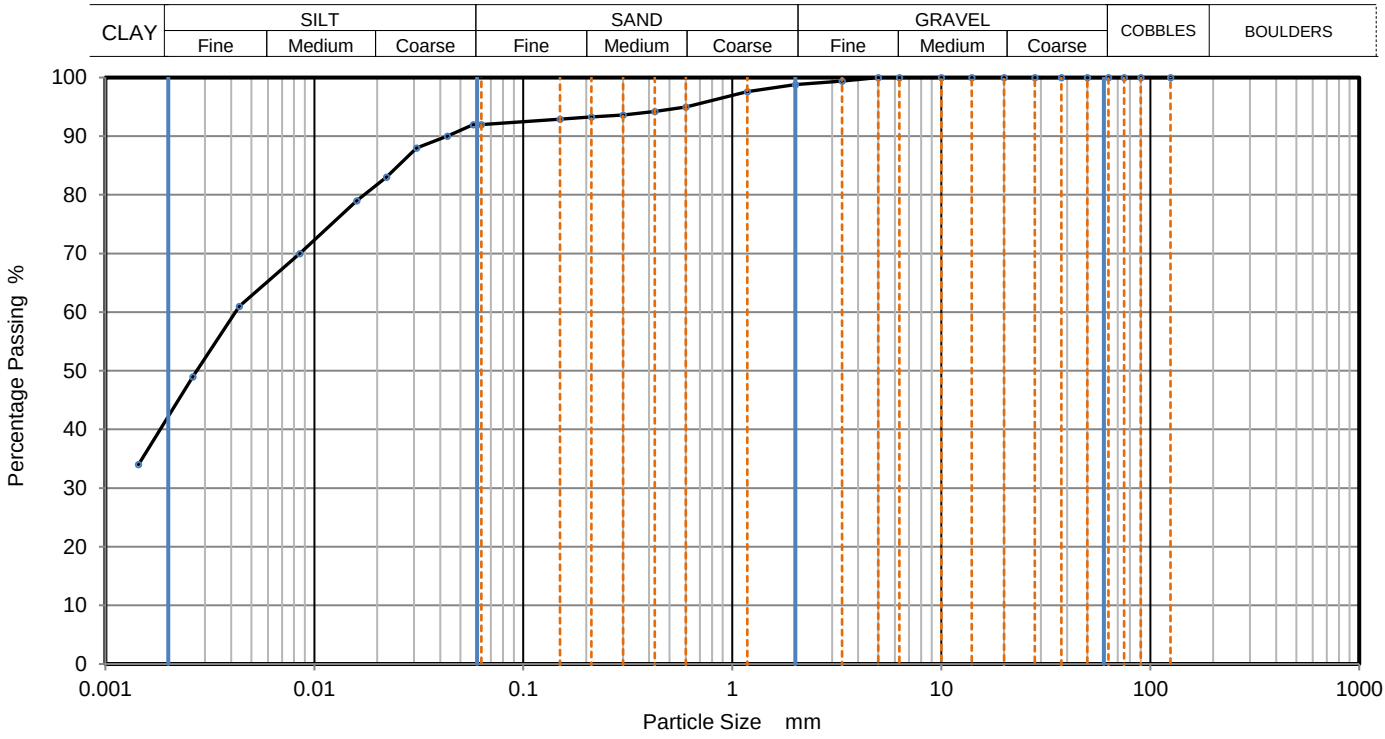
| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.87 |
| D30 | mm | 0.548 |
| D10 | mm | 0.193 |
| Uniformity Coefficient | | 15 |
| Curvature Coefficient | | 0.54 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

| | | | | | |
|---|---|---|---|---|---|
| CAUSEWAY GEOTECH | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **17-1455** |
| | | | | Borehole/Pit No. | BH20 |
| Site Name | Arklow WWTP Land GI | | | Sample No. | 25 |
| Soil Description | Brownish grey silty CLAY. | | | Depth, m | 15.20 |
| Specimen Reference | 2 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | Caus2018032458 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0576 | 92 |
| 90 | 100 | 0.0432 | 90 |
| 75 | 100 | 0.0308 | 88 |
| 63 | 100 | 0.0222 | 83 |
| 50 | 100 | 0.0159 | 79 |
| 37.5 | 100 | 0.0085 | 70 |
| 28 | 100 | 0.0044 | 61 |
| 20 | 100 | 0.0026 | 49 |
| 14 | 100 | 0.0014 | 34 |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 99 | | |
| 2 | 99 | | |
| 1.18 | 98 | | |
| 0.6 | 95 | Particle density | (assumed) |
| 0.425 | 94 | 2.65 | Mg/m3 |
| 0.3 | 94 | | |
| 0.212 | 93 | | |
| 0.15 | 93 | | |
| 0.063 | 92 | | |

| | |
|---|---|
| Dry Mass of sample, g | 263 |

| **Sample Proportions** | % dry mass |
|---|---|
| Cobbles | 0 |
| Gravel | 1 |
| Sand | 7 |
| Silt | 50 |
| Clay | 42 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.00426 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| | | |
|---|---|---|
| Approved | Sheet printed | **Fig** 1 |
| Stephen.Watson | 20/04/2018 10:26 | Sheet |

# LABORATORY REPORT

4043

**Contract Number: PSL18/1448**

Report Date: 19 April 2018

Client's Reference: 17-1455

Client Name: Causeway Geotech
8 Drumahiskey Road
Ballymoney
Co.Antrim
BT53 7QL

**For the attention of: Stephen Watson**

Contract Title: Arklow WWTP Land GI

Date Received: 29/3/2018
Date Commenced: 29/3/2018
Date Completed: 13/4/2018

**Notes: Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

| | | |
|---|---|---|
| R Gunson<br>(Director) | A Watkins<br>(Director) | R Berriman<br>(Quality Manager) |
| L Knight<br>(Senior Technician) | S Eyre<br>(Senior Technician) | A Fry<br>(Senior Technician) |



**5 – 7 Hexthorpe Road, Hexthorpe,**
**Doncaster DN4 0AR**
**tel: +44 (0)844 815 6641**
**fax: +44 (0)844 815 6642**
**e-mail: rgunson@prosoils.co.uk**
**awatkins@prosoils.co.uk**

# SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|---|---|---|---|---|---|
| BH07B | 14 | B | 7.50 | | Brown very gravelly slightly silty SAND. |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | Arklow WWTP Land GI | Contract No: PSL18/1448 Client Ref: 17-1455 |

# PARTICLE SIZE DISTRIBUTION TEST

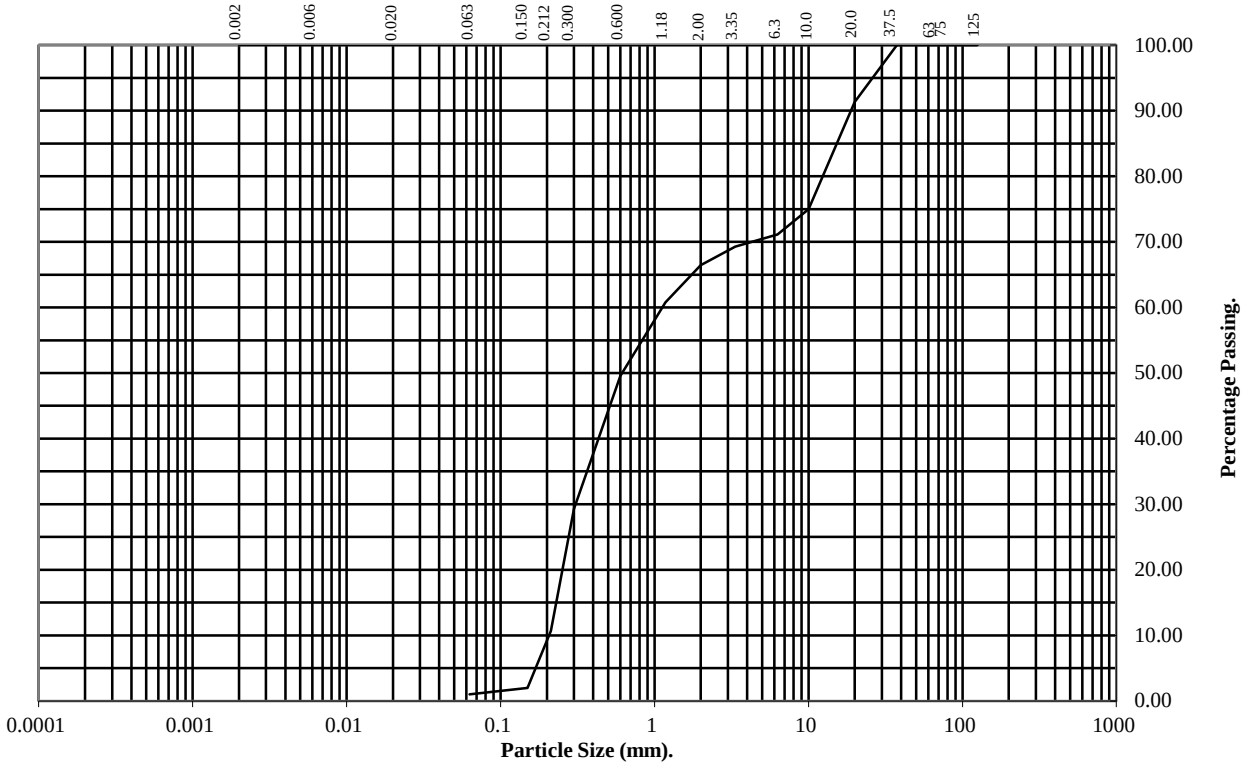
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** **BH07B** **Top Depth (m):** **7.50**

**Sample Number:** **14** **Base Depth(m):**

**Sample Type:** **B**




| BS Test Sieve (mm) | Percentage Passing |
|---|---|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 91 |
| 10 | 75 |
| 6.3 | 71 |
| 3.35 | 69 |
| 2 | 66 |
| 1.18 | 61 |
| 0.6 | 50 |
| 0.3 | 29 |
| 0.212 | 11 |
| 0.15 | 2 |
| 0.063 | 1 |

| Soil Fraction | Total Percentage |
|---|---|
| Cobbles | 0 |
| Gravel | 34 |
| Sand | 65 |
| Silt/Clay | 1 |

**Remarks:**

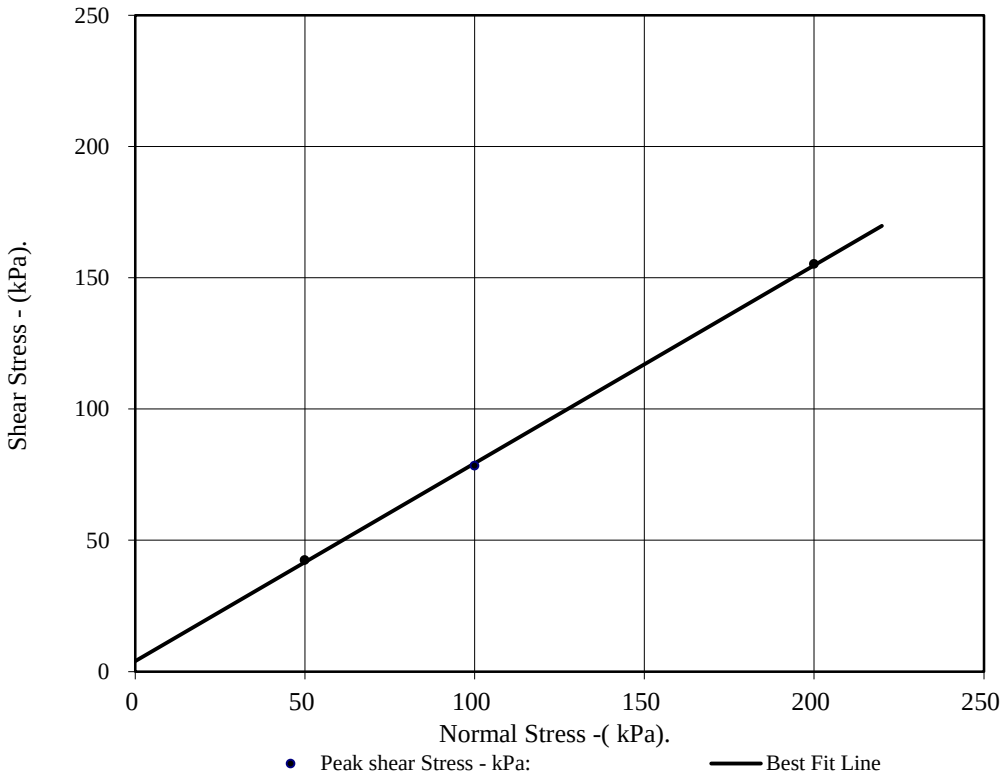
| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** PSL18/1448 **Client Ref:** 17-1455 |

# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | | | |
|---|---|---|---|---|---|
| Hole Number: | **BH07B** | | Top Depth: | **7.50** | |
| Sample Number: | **14** | | Base Depth: | | |
| Sample Conditions: | Submerged | | Sample Type | **B** | |
| Particle Density - Mg/m3: | 2.65 | Assumed | **Remarks:** | | |
| Sample Preparation: | Remoulded using hand tamped effort. Material tested passing 2mm sieve | | | | |
| Sample Description: | **See summary of soil descriptions.** | | | | |

| **STAGE** | **1** | **2** | **3** |
|---|---|---|---|
| **Initial Conditions** | | | |
| Height - mm: | 19.54 | 19.54 | 19.54 |
| Length - mm: | 60.03 | 60.03 | 60.03 |
| Moisture Content - %: | 12 | 12 | 12 |
| Bulk Density - Mg/m3: | 1.88 | 1.87 | 1.90 |
| Dry Density - Mg/m3: | 1.68 | 1.67 | 1.70 |
| Voids Ratio: | 0.575 | 0.584 | 0.563 |
| Normal Pressure- kPa | 50 | 100 | 200 |
| **Consolidation Stage** | | | |
| Consolidated Height - mm: | 19.02 | 18.61 | 18.55 |
| **Shearing Stage** | | | |
| Rate of Strain (mm/min) | 1.200 | 1.200 | 1.200 |
| Displacement at peak shear stress (mm) | 2.00 | 3.00 | 4.00 |
| Peak shear Stress - kPa: | 42 | 78 | 155 |
| **Final Consolidated Conditions** | | | |
| Moisture Content - %: | 21 | 20 | 20 |
| Bulk Density - Mg/m3: | 1.93 | 1.96 | 2.00 |
| Dry Density - Mg/m3: | 1.60 | 1.63 | 1.67 |
| **Peak** | | | |
| Angle of Shearing Resistance:(~~θ~~) | **37** | | |
| Effective Cohesion - kPa: | **4** | | |

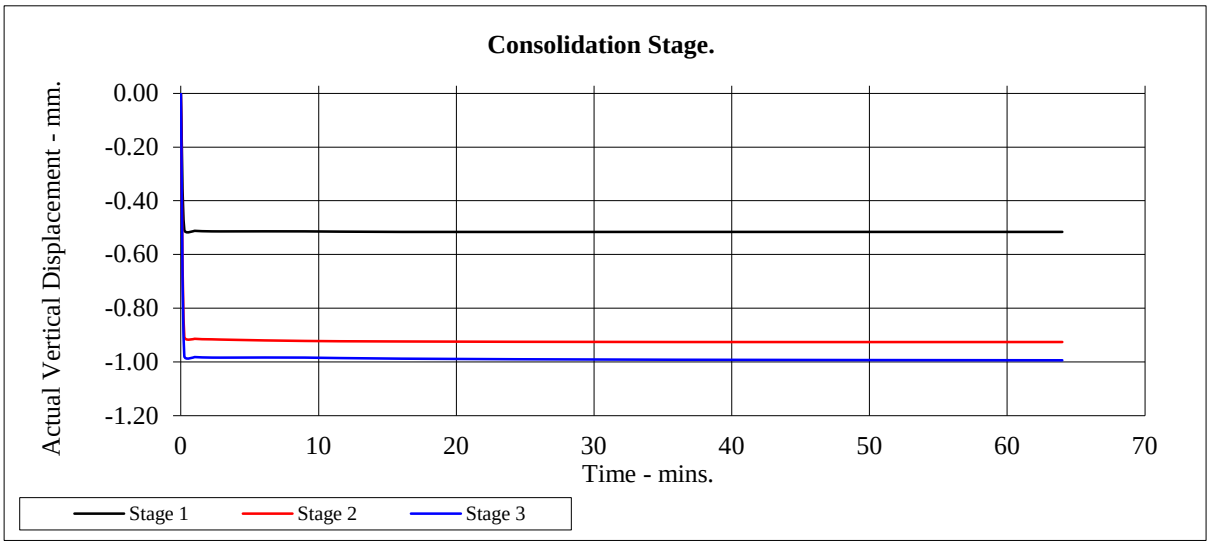


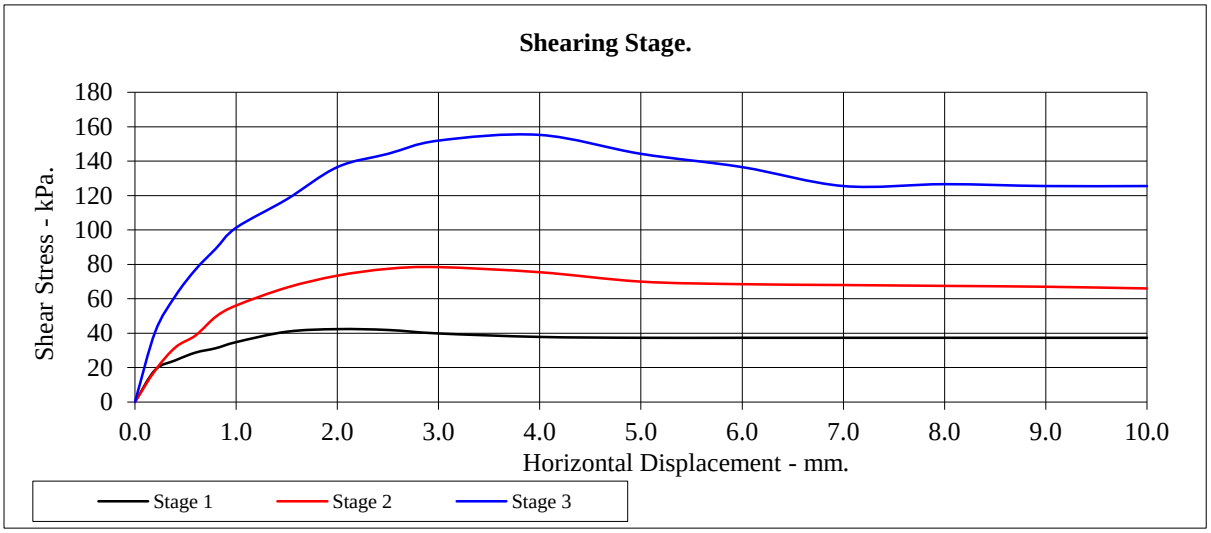

| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No:** **PSL18/1448** **Client Ref:** **17-1455** |

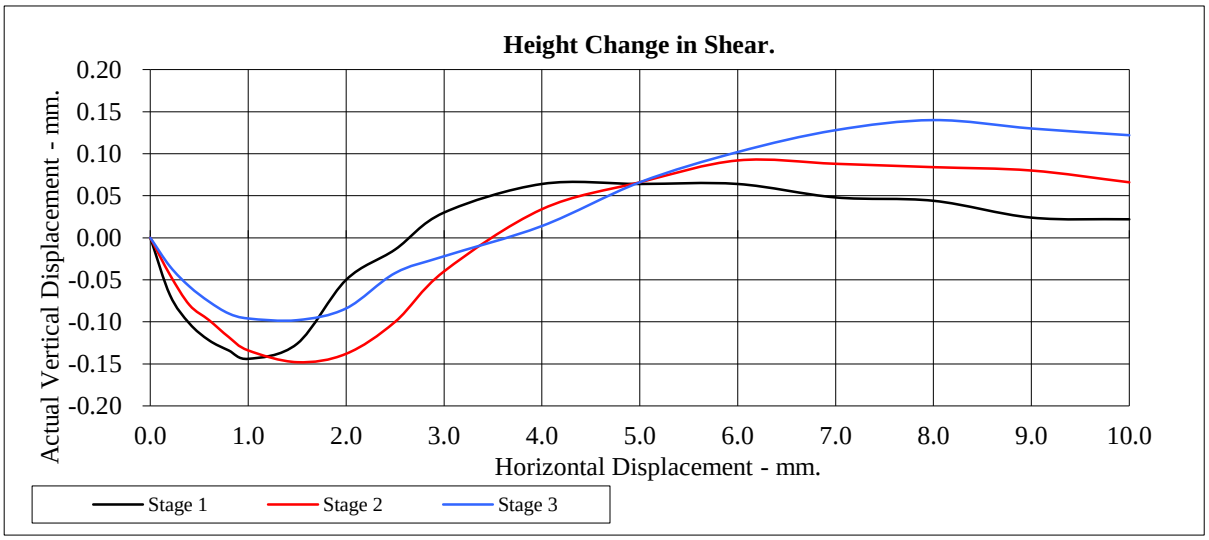
# CONSOLIDATED DRAINED SHEARBOX TEST

**BS1377:Part 7:1990 Clause 4.5.4**

| | | | |
|---|---|---|---|
| Hole Number: | **BH07B** | Top Depth: | **7.50** |
| Sample Number: | **14** | Base Depth: | |




| | | | |
|---|---|---|---|
| UKAS TESTING 4043 | PSL Professional Soils Laboratory | **Arklow WWTP Land GI** | **Contract No: PSL18/1448** **Client Ref: 17-1455** |

# LABORATORY TEST CERTIFICATE

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Tel: 0141 774 4032
Fax: 0141 774 3552

email: info@mattest.org
Website: www.mattest.org

**Certificate No :** **18/336 - 01**

**To :** **Stephen Watson**

**Client :** **Causeway Geotech Limited**
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

Dear Sirs,

## LABORATORY TESTING OF ROCK

**Introduction**

We refer to samples taken from Arklow WwTW Land GI and delivered to our laboratory on 26th March 2018.

**Material & Source**

| | | |
|---|---|---|
| Sample Reference | : | See Report Plates |
| Sampled By | : | Client |
| Sampling Certificate | : | Not Supplied |
| Location | : | See Report Plates |
| Description | : | Rock Cores |
| Date Sampled | : | Not Supplied |
| Date Tested | : | 26th March 2018 Onwards |
| Source | : | 17-1455 - Arklow WwTW Land GI |

**Test Results;**

As Detailed On Page 2 to Page 7 inclusive

**Comments;**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
All remaining samples for this project will be disposed of 28 days after issue of this test certificate

**Remarks;**

**Approved for Issue**

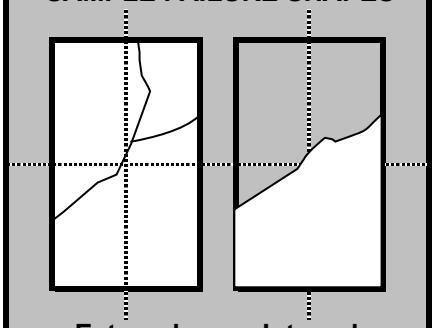
T McLelland (Director)

Date 04/04/2018

2643

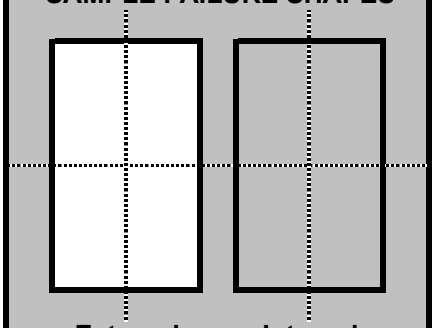
| | | |
|---|---|---|
| BOREHOLE | | **BH04** |
| SAMPLE | | **CS7** |
| DEPTH | m | **24.20-24.50** |
| SAMPLE DIAMETER | mm | **101.80** |
| SAMPLE HEIGHT | mm | **217.27** |
| TEST CONDITION | | **As Received** |
| RATE OF LOADING | kN/s | **0.7** |
| TEST DURATION | min.sec | **3.45** |
| DATE OF TESTING | | **31/03/2018** |
| LOAD FRAME USED | | **2000kN** |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | **Unknown** |
| FAILURE LOAD | kN | **153.1** |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | **18.8** |
| WATER CONTENT (ISRM Suggested Methods) | % | **0.6** |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.70** |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.69** |

**SAMPLE FAILURE SHAPES**



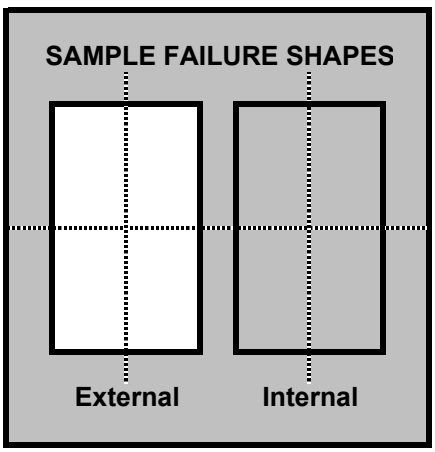

| | | |
|---|---|---|
| BOREHOLE | | |
| SAMPLE | | |
| DEPTH | m | |
| SAMPLE DIAMETER | mm | |
| SAMPLE HEIGHT | mm | |
| TEST CONDITION | | |
| RATE OF LOADING | kN/s | |
| TEST DURATION | min.sec | |
| DATE OF TESTING | | |
| LOAD FRAME USED | | |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | |
| FAILURE LOAD | kN | |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | |
| WATER CONTENT (ISRM Suggested Methods) | % | |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |

**SAMPLE FAILURE SHAPES**




| | | |
|---|---|---|
| BOREHOLE | | |
| SAMPLE | | |
| DEPTH | m | |
| SAMPLE DIAMETER | mm | |
| SAMPLE HEIGHT | mm | |
| TEST CONDITION | | |
| RATE OF LOADING | kN/s | |
| TEST DURATION | min.sec | |
| DATE OF TESTING | | |
| LOAD FRAME USED | | |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | |
| FAILURE LOAD | kN | |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | |
| WATER CONTENT (ISRM Suggested Methods) | % | |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |

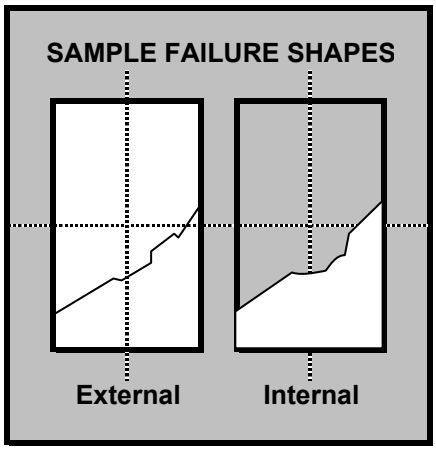
**SAMPLE FAILURE SHAPES**



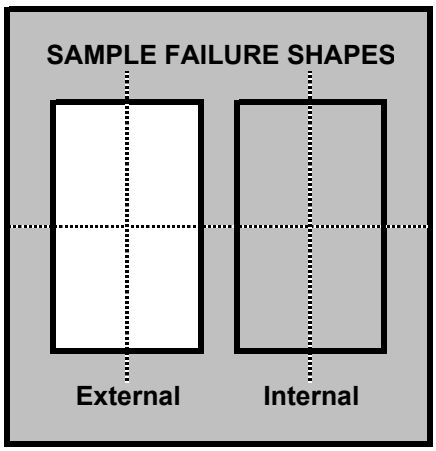

Tested in accordance with ASTM D7012 - 14

## SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

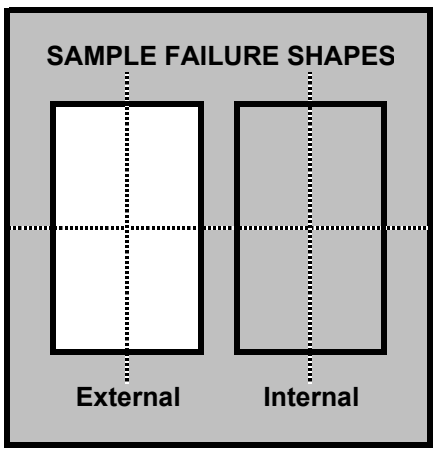
| | | |
|---|---|---|
| BOREHOLE | | **BH05** |
| SAMPLE | | **CS7** |
| DEPTH | m | **23.50-23.80** |
| SAMPLE DIAMETER | mm | **101.85** |
| SAMPLE HEIGHT | mm | **223.24** |
| TEST CONDITION | | **As Received** |
| RATE OF LOADING | kN/s | **0.7** |
| TEST DURATION | min.sec | **2.25** |
| DATE OF TESTING | | **31/03/2018** |
| LOAD FRAME USED | | **2000kN** |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | **Unknown** |
| FAILURE LOAD | kN | **92.1** |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | **11.3** |
| WATER CONTENT (ISRM Suggested Methods) | % | **0.3** |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.94** |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.93** |




| | | |
|---|---|---|
| BOREHOLE | | |
| SAMPLE | | |
| DEPTH | m | |
| SAMPLE DIAMETER | mm | |
| SAMPLE HEIGHT | mm | |
| TEST CONDITION | | |
| RATE OF LOADING | kN/s | |
| TEST DURATION | min.sec | |
| DATE OF TESTING | | |
| LOAD FRAME USED | | |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | |
| FAILURE LOAD | kN | |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | |
| WATER CONTENT (ISRM Suggested Methods) | % | |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |




| | | |
|---|---|---|
| BOREHOLE | | |
| SAMPLE | | |
| DEPTH | m | |
| SAMPLE DIAMETER | mm | |
| SAMPLE HEIGHT | mm | |
| TEST CONDITION | | |
| RATE OF LOADING | kN/s | |
| TEST DURATION | min.sec | |
| DATE OF TESTING | | |
| LOAD FRAME USED | | |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | |
| FAILURE LOAD | kN | |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | |
| WATER CONTENT (ISRM Suggested Methods) | % | |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |




Tested in accordance with ASTM D7012 - 14

## SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

| | | |
|---|---|---|
| BOREHOLE | | **BH11** |
| SAMPLE | | **CS2** |
| DEPTH | m | **25.50-25.95** |
| SAMPLE DIAMETER | mm | **101.72** |
| SAMPLE HEIGHT | mm | **215.90** |
| TEST CONDITION | | **As Received** |
| RATE OF LOADING | kN/s | **0.7** |
| TEST DURATION | min.sec | **9.16** |
| DATE OF TESTING | | **31/03/2018** |
| LOAD FRAME USED | | **2000kN** |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | **Unknown** |
| FAILURE LOAD | kN | **369.4** |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | **45.5** |
| WATER CONTENT (ISRM Suggested Methods) | % | **0.2** |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.91** |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.90** |

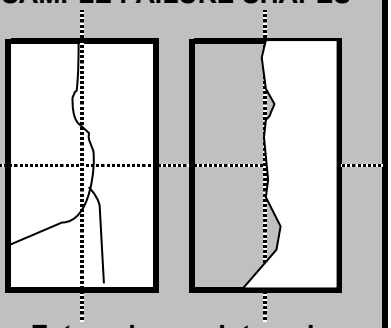
**SAMPLE FAILURE SHAPES**



**External** **Internal**

| | | |
|---|---|---|
| BOREHOLE | | **BH11** |
| SAMPLE | | **CS3** |
| DEPTH | m | **25.95-26.30** |
| SAMPLE DIAMETER | mm | **101.64** |
| SAMPLE HEIGHT | mm | **215.49** |
| TEST CONDITION | | **As Received** |
| RATE OF LOADING | kN/s | **0.9** |
| TEST DURATION | min.sec | **11.03** |
| DATE OF TESTING | | **31/03/2018** |
| LOAD FRAME USED | | **2000kN** |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | **Unknown** |
| FAILURE LOAD | kN | **620.0** |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | **76.4** |
| WATER CONTENT (ISRM Suggested Methods) | % | **0.1** |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.92** |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | **2.92** |

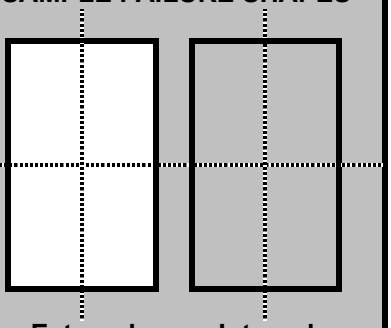
**SAMPLE FAILURE SHAPES**



**External** **Internal**

| | | |
|---|---|---|
| BOREHOLE | | |
| SAMPLE | | |
| DEPTH | m | |
| SAMPLE DIAMETER | mm | |
| SAMPLE HEIGHT | mm | |
| TEST CONDITION | | |
| RATE OF LOADING | kN/s | |
| TEST DURATION | min.sec | |
| DATE OF TESTING | | |
| LOAD FRAME USED | | |
| LOAD DIRECTION WITH RESPECT TO LITHOLOGY | | |
| FAILURE LOAD | kN | |
| UNCONFINED COMPRESSIVE STRENGTH | MPa | |
| WATER CONTENT (ISRM Suggested Methods) | % | |
| BULK DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |
| DRY DENSITY (ISRM Suggested Methods) | $Mg/m^3$ | |

**SAMPLE FAILURE SHAPES**



**External** **Internal**

Tested in accordance with ASTM D7012 - 14

## SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

MATtest Limited
materials testing & consultancy

| BOREHOLE | SAMPLE | DEPTH (m) | MOISTURE CONTENT (%) | TYPE OF TEST * (see below) | CORE DIAMETER (mm) | EQUIVALENT DIAMETER (mm) | PLATEN SEPARATION (mm) | FAILURE LOAD (kN) | Is (MPa) | Is(50) (MPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| BH04 | CS1 | 20.20-20.60 | As Received | I | 101.76 | 80.87 | 50.47 | 4.64 | 0.71 | 0.88 |
| | | | | I | 84.89 | 68.00 | 42.78 | 13.28 | 2.87 | 3.30 |
| | | | | I | 102.07 | 81.02 | 50.51 | 20.50 | 3.12 | 3.88 |
| | CS1 | 20.20-20.60 | As Received | D | 101.82 | 101.82 | 101.82 | 16.67 | 1.61 | 2.21 |
| | | | | I | 101.48 | 77.44 | 46.41 | 16.15 | 2.69 | 3.28 |
| | | | | I | 94.34 | 78.31 | 51.05 | 13.85 | 2.26 | 2.76 |
| | CS2 | 20.75-20.85 | As Received | D | 101.75 | 101.75 | 101.75 | 2.64 | 0.25 | 0.35 |
| | | | | A | 101.62 | 62.62 | 30.31 | 8.47 | 2.16 | 2.39 |
| | | | | I | 101.74 | 87.79 | 59.49 | 15.78 | 2.05 | 2.64 |
| | CS3 | 21.75-21.85 | As Received | D | 100.31 | 100.31 | 100.31 | 33.45 | 3.32 | 4.55 |
| | | | | A | 100.05 | 96.86 | 73.65 | 23.20 | 2.47 | 3.33 |
| | | | | I | 87.13 | 61.64 | 34.25 | 14.33 | 3.77 | 4.14 |
| | CS4 | 22.05-22.15 | As Received | D | 101.81 | 101.81 | 101.81 | 20.18 | 1.95 | 2.68 |
| | | | | A | 101.81 | 80.31 | 49.76 | 19.81 | 3.07 | 3.80 |
| | | | | A | 101.81 | 82.16 | 52.07 | 20.95 | 3.10 | 3.88 |
| | CS5 | 22.45-22.55 | As Received | D | 101.84 | 101.84 | 101.84 | 6.25 | 0.60 | 0.83 |
| | | | | A | 101.84 | 81.76 | 51.55 | 11.05 | 1.65 | 2.06 |
| | | | | A | 101.84 | 76.26 | 44.85 | 13.44 | 2.31 | 2.80 |
| | CS6 | 23.80-23.90 | As Received | D | 102.12 | 102.12 | 102.12 | 7.37 | 0.71 | 0.97 |
| | | | | A | 102.12 | 77.14 | 45.77 | 14.06 | 2.36 | 2.87 |
| | | | | A | 102.12 | 79.89 | 49.08 | 14.55 | 2.28 | 2.82 |
| | CS7 | 24.20-24.50 | As Received | D | 101.51 | 101.51 | 101.51 | 39.01 | 3.79 | 5.21 |
| | | | | A | 101.51 | 70.72 | 38.69 | 36.10 | 7.22 | 8.44 |
| | | | | A | 101.51 | 63.31 | 31.01 | 30.17 | 7.53 | 8.37 |

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

| | |
|---|---|
| Mean Is(50) - Axial tests | 4.08 |
| Mean Is(50) - Diametrical tests | 2.40 |
| Ia(50) | 1.70 |

Tested in accordance with ISRM (2007)

## SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

| BOREHOLE | SAMPLE | DEPTH (m) | MOISTURE CONTENT (%) | TYPE OF TEST * (see below) | CORE DIAMETER (mm) | EQUIVALENT DIAMETER (mm) | PLATEN SEPARATION (mm) | FAILURE LOAD (kN) | Is (MPa) | Is(50) (MPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| BH05 | CS1 | 20.70-20.80 | As Received | I | 90.00 | 70.34 | 43.18 | 40.28 | 8.14 | 9.49 |
| | | | | I | 88.76 | 62.50 | 34.56 | 36.07 | 9.24 | 10.21 |
| | | | | I | 78.69 | 65.05 | 42.23 | 22.40 | 5.29 | 5.96 |
| | CS2 | 20.90-21.15 | As Received | D | 102.07 | 102.07 | 102.07 | >40 | >3.84 | >5.29 |
| | | | | A | 101.83 | 84.30 | 54.81 | 36.15 | 5.09 | 6.44 |
| | | | | I | 101.91 | 70.63 | 38.44 | 15.39 | 3.09 | 3.60 |
| | CS3 | 21.15-21.25 | As Received | A | 101.75 | 85.25 | 56.09 | 25.44 | 3.50 | 4.45 |
| | | | | I | 101.67 | 71.35 | 39.33 | 17.78 | 3.49 | 4.10 |
| | | | | I | 98.43 | 63.21 | 31.88 | 20.02 | 5.01 | 5.57 |
| | CS4 | 21.40-21.50 | As Received | A | 101.89 | 97.13 | 72.72 | >40 | >4.24 | >5.72 |
| | | | | I | 101.77 | 71.13 | 39.05 | 22.01 | 4.35 | 5.10 |
| | | | | I | 93.91 | 58.92 | 29.03 | 6.51 | 1.88 | 2.02 |
| | CS5 | 22.65-22.75 | As Received | D | 101.84 | 101.84 | 101.84 | 39.19 | 3.78 | 5.20 |
| | | | | A | 101.84 | 80.03 | 49.39 | >40 | >6.25 | >7.72 |
| | | | | A | 101.84 | 64.14 | 31.73 | 36.86 | 8.96 | 10.02 |
| | CS6 | 22.85-22.95 | As Received | D | 101.98 | 101.98 | 101.98 | 9.87 | 0.95 | 1.31 |
| | | | | A | 101.98 | 80.93 | 50.44 | 15.09 | 2.30 | 2.86 |
| | | | | A | 101.98 | 60.42 | 28.11 | 7.90 | 2.16 | 2.36 |
| | CS8 | 23.80-24.05 | As Received | D | 100.11 | 100.11 | 100.11 | 9.60 | 0.96 | 1.31 |
| | | | | A | 100.11 | 84.61 | 56.16 | 4.73 | 0.66 | 0.84 |
| | | | | I | 101.37 | 96.95 | 72.82 | 2.40 | 0.26 | 0.34 |
| | CS9 | 24.05-24.25 | As Received | D | 102.08 | 102.08 | 102.08 | 8.90 | 0.85 | 1.18 |
| | | | | A | 102.08 | 72.64 | 40.60 | 30.11 | 5.71 | 6.75 |
| | | | | A | 102.08 | 83.55 | 53.71 | 14.69 | 2.10 | 2.65 |
| | CS10 | 24.40-24.55 | As Received | D | 101.62 | 101.62 | 101.62 | 23.01 | 2.23 | 3.07 |
| | | | | I | 101.73 | 107.89 | 89.86 | 35.31 | 3.03 | 4.29 |
| | | | | I | 89.23 | 74.35 | 48.65 | 30.09 | 5.44 | 6.51 |

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

| | |
|---|---|
| Mean Is(50) - Axial tests | 3.64 |
| Mean Is(50) - Diametrical tests | 2.01 |
| Ia(50) | 1.81 |

Tested in accordance with ISRM (2007)

## SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

| BOREHOLE | SAMPLE | DEPTH (m) | MOISTURE CONTENT (%) | TYPE OF TEST * (see below) | CORE DIAMETER (mm) | EQUIVALENT DIAMETER (mm) | PLATEN SEPARATION (mm) | FAILURE LOAD (kN) | Is (MPa) | Is(50) (MPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| BH11 | CS1 | 24.60-24.70 | As Received | D | 101.99 | 101.99 | 101.99 | 7.34 | 0.71 | 0.97 |
| | | | | A | 101.99 | 76.28 | 44.81 | 16.31 | 2.80 | 3.39 |
| | | | | A | 101.99 | 80.23 | 49.57 | 20.01 | 3.11 | 3.85 |
| | CS2 | 25.50-25.95 | As Received | D | 101.55 | 101.55 | 101.55 | 29.16 | 2.83 | 3.89 |
| | | | | A | 101.55 | 74.73 | 43.19 | 30.98 | 5.55 | 6.65 |
| | | | | A | 101.55 | 79.66 | 49.08 | 25.16 | 3.96 | 4.89 |
| | CS3 | 25.95-26.30 | As Received | D | 101.63 | 101.63 | 101.63 | 35.73 | 3.46 | 4.76 |
| | | | | A | 101.63 | 60.73 | 28.50 | 8.53 | 2.31 | 2.52 |
| | | | | A | 101.63 | 79.08 | 48.33 | 29.84 | 4.77 | 5.86 |
| | CS5 | 26.30-26.45 | As Received | I | 101.49 | 96.03 | 71.36 | >40 | >4.34 | >5.82 |
| | | | | I | 98.30 | 64.98 | 33.74 | 6.01 | 1.42 | 1.60 |
| | | | | I | 100.97 | 84.19 | 55.13 | >40 | >5.64 | >7.13 |

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

| | |
|---|---|
| Mean Is(50) - Axial tests | 4.53 |
| Mean Is(50) - Diametrical tests | 3.21 |
| Ia(50) | 1.41 |

Tested in accordance with ISRM (2007)

## SUMMARY OF POINT LOAD TEST RESULTS

CAUSEWAY GEOTECH

# APPENDIX K

## Environmental Laboratory Test Results



Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-00911-2 | | |
| **Initial Date of Issue:** | 02-Feb-2018 | **Date of Re-Issue:** | 13-Feb-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 - Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 12-Jan-2018 |
| **Order No.:** | | **Date Instructed:** | 17-Jan-2018 |
| **No. of Samples:** | 31 | | |
| **Turnaround (Wkdays):** | 18 | **Results Due:** | 09-Feb-2018 |
| **Date Approved:** | 13-Feb-2018 | **Subcon Results Due:** | 27-Feb-2018 |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

# Bulk Identification Certificate

| | | | |
|---|---|---|---|
| **Client:** | Causeway Geotech Ltd | **Your Ref.:** | |
| **Site Address:** | | **Project:** | 17-1455 - Arklow WWTW Land GI |
| **Date Sampled:** | 09-Jan-2018 | **Job Number:** | 18-00911 |
| **Date Received:** | 12-Jan-2018 | **No Samples:** | |
| | | **Date Reported:** | 02-Feb-2018 |

| Sample No. | Sample Ref. | Description | SOP | Accred. | Laboratory | Material | Result |
|---|---|---|---|---|---|---|---|
| **562990** | ES3 | TP01 | 2185 | U | COVENTRY | Cement | Chrysotile |

**The in-house procedure SOP2185 is in accordance with the requirements of Appendix 2 of the Analyst Guide (HSG 248).**

**The results relate only to items tested as supplied by the client.**

**Comments and interpretations are beyond the scope of UKAS accreditation.**

**Samples associated with asbestos in building surveys are retained for six months (HSG 264 refers)**

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 562984 | 562985 | 562986 | 562987 | 562988 | 562989 | 562991 | 562992 |
| Order No.: | | | | Client Sample Ref.: | TP15 | TP15 | TP15 | TP15 | TP01 | TP01 | TP16 | TP16 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.00 | 1.50 | 2.00 | 0.50 | 1.50 | 0.40 | 1.00 |
| | | | | Date Sampled: | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Asbestos by Gravimetry | U | 2192 | % | 0.001 | | | | | | | | |
| Total Asbestos | N | 2192 | % | 0.001 | | | | | | | | |
| Moisture | N | 2030 | % | 0.020 | 7.8 | 4.1 | 3.9 | 12 | 12 | 13 | 11 | 3.7 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | | | | | | |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 6.4 | 1.9 | 11 | 3.6 | 2.6 | 4.1 | 2.4 | 2.4 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 460 | 300 | 48 | 44 | 100 | 90 | 230 | 220 |
| Barium | U | 2450 | mg/kg | 10 | 150 | 41 | < 10 | < 10 | 410 | 220 | 330 | 130 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.91 | 0.92 | < 0.10 | < 0.10 | 0.87 | 1.5 | 4.7 | 0.32 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 35 | 13 | < 2.0 | < 2.0 | 12 | 27 | 41 | 2.6 |
| Antimony | N | 2450 | mg/kg | 2.0 | 17 | 8.2 | < 2.0 | < 2.0 | 14 | 19 | 14 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 2100 | 840 | 180 | 51 | 370 | 410 | 970 | 230 |
| Mercury | U | 2450 | mg/kg | 0.10 | 1.2 | 0.32 | 0.11 | < 0.10 | 1.9 | 4.1 | 1.5 | 0.18 |
| Nickel | U | 2450 | mg/kg | 0.50 | 10 | 10 | 5.2 | 2.3 | 12 | 17 | 17 | 11 |
| Lead | U | 2450 | mg/kg | 0.50 | 3200 | 740 | 170 | 120 | 6600 | 7300 | 1800 | 260 |
| Selenium | U | 2450 | mg/kg | 0.20 | 2.6 | 0.66 | < 0.20 | < 0.20 | 2.9 | 7.0 | 3.2 | 0.27 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 32 | 22 | 10 | 12 | 39 | 54 | 59 | 26 |
| Zinc | U | 2450 | mg/kg | 0.50 | 390 | 460 | 120 | 38 | 300 | 370 | 1300 | 130 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 14 | 11 | 7.7 | 3.0 | 9.7 | 12 | 38 | 17 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 26 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 4.8 | < 0.10 | < 0.10 | < 0.10 | 19 | 15 | 98 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 4.8 | < 1.0 | < 1.0 | < 1.0 | 19 | 15 | 120 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 6.2 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 562984 | 562985 | 562986 | 562987 | 562988 | 562989 | 562991 | 562992 |
| Order No.: | | | | Client Sample Ref.: | TP15 | TP15 | TP15 | TP15 | TP01 | TP01 | TP16 | TP16 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.00 | 1.50 | 2.00 | 0.50 | 1.50 | 0.40 | 1.00 |
| | | | | Date Sampled: | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 3.7 | < 0.10 | < 0.10 | < 0.10 | 22 | 72 | 1.1 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 24 | < 0.10 | < 0.10 | < 0.10 | 100 | 190 | 74 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 27 | < 1.0 | < 1.0 | < 1.0 | 130 | 260 | 75 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | 32 | < 2.0 | < 2.0 | < 2.0 | 150 | 280 | 200 | < 2.0 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | | | | | | | |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Benzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Toluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | |

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| Client: Causeway Geotech Ltd | | | | Chemtest Job No.: | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | Chemtest Sample ID.: | 562984 | 562985 | 562986 | 562987 | 562988 | 562989 | 562991 | 562992 |
| Order No.: | | | | Client Sample Ref.: | TP15 | TP15 | TP15 | TP15 | TP01 | TP01 | TP16 | TP16 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.00 | 1.50 | 2.00 | 0.50 | 1.50 | 0.40 | 1.00 |
| | | | | Date Sampled: | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Styrene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Phenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | 0.24 | < 0.050 | < 0.050 |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | 0.18 | < 0.050 | < 0.050 |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | 0.75 | < 0.050 | < 0.050 |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Isophorone | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 562984 | 562985 | 562986 | 562987 | 562988 | 562989 | 562991 | 562992 |
| Order No.: | | | | | Client Sample Ref.: | TP15 | TP15 | TP15 | TP15 | TP01 | TP01 | TP16 | TP16 |
| | | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.50 | 1.00 | 1.50 | 2.00 | 0.50 | 1.50 | 0.40 | 1.00 |
| | | | | | Date Sampled: | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Naphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | 0.32 | 13 | 0.15 | < 0.050 |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | 0.30 | 7.0 | 0.24 | < 0.050 |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | 0.16 | 0.078 | < 0.050 |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | 0.32 | 11 | < 0.050 | < 0.050 |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | | 0.11 | < 0.050 | < 0.050 | | 0.37 | 14 | 0.18 | < 0.050 |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Fluorene | N | 2790 | mg/kg | 0.050 | | 0.065 | < 0.050 | < 0.050 | | < 0.050 | 16 | 0.067 | < 0.050 |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Azobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | | 1.3 | < 0.050 | < 0.050 | | 7.8 | 37 | 2.0 | < 0.050 |
| Anthracene | N | 2790 | mg/kg | 0.050 | | 0.23 | < 0.050 | < 0.050 | | 1.3 | 31 | 0.38 | < 0.050 |
| Carbazole | N | 2790 | mg/kg | 0.050 | | 0.087 | < 0.050 | < 0.050 | | 0.64 | 14 | 0.11 | < 0.050 |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | | 1.8 | 0.18 | 0.094 | | 11 | 37 | 2.7 | 0.10 |
| Pyrene | N | 2790 | mg/kg | 0.050 | | 1.6 | 0.18 | 0.062 | | 8.1 | 76 | 2.1 | 0.073 |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | | 0.90 | 0.13 | 0.073 | | 5.5 | 42 | 1.5 | 0.062 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 562984 | 562985 | 562986 | 562987 | 562988 | 562989 | 562991 | 562992 |
| Order No.: | | | | | Client Sample Ref.: | TP15 | TP15 | TP15 | TP15 | TP01 | TP01 | TP16 | TP16 |
| | | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.50 | 1.00 | 1.50 | 2.00 | 0.50 | 1.50 | 0.40 | 1.00 |
| | | | | | Date Sampled: | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Chrysene | N | 2790 | mg/kg | 0.050 | | 0.97 | 0.14 | 0.052 | | 5.7 | 47 | 1.5 | 0.062 |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | | 1.3 | 0.23 | 0.083 | | 6.8 | 40 | 1.8 | < 0.050 |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.45 | 0.073 | < 0.050 | | 2.3 | 15 | 0.55 | < 0.050 |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | | 0.65 | 0.12 | < 0.050 | | 4.3 | 32 | 1.2 | < 0.050 |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | | 0.56 | 0.063 | < 0.050 | | 2.1 | 11 | 0.61 | < 0.050 |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | | 0.28 | < 0.050 | < 0.050 | | 0.78 | 3.9 | 0.22 | < 0.050 |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | | 0.58 | < 0.050 | < 0.050 | | 2.6 | 14 | 0.67 | < 0.050 |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Naphthalene | N | 2800 | mg/kg | 0.010 | | 0.18 | < 0.010 | < 0.010 | < 0.010 | 0.94 | 0.55 | 0.32 | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | | 0.12 | < 0.010 | < 0.010 | < 0.010 | 0.40 | 0.23 | 0.080 | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.63 | 0.44 | 0.050 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | | 0.030 | < 0.010 | < 0.010 | < 0.010 | 0.86 | 0.67 | 0.070 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | | 1.3 | 0.23 | < 0.010 | < 0.010 | 13 | 8.2 | 1.9 | 0.21 |
| Anthracene | N | 2800 | mg/kg | 0.010 | | 0.18 | 0.020 | < 0.010 | < 0.010 | 2.2 | 1.7 | 0.31 | < 0.010 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | | 2.0 | 0.38 | < 0.010 | < 0.010 | 15 | 9.9 | 2.4 | 0.30 |
| Pyrene | N | 2800 | mg/kg | 0.010 | | 1.6 | 0.27 | < 0.010 | < 0.010 | 11 | 7.6 | 1.9 | 0.21 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | | 0.77 | < 0.010 | < 0.010 | < 0.010 | 6.1 | 4.1 | 1.0 | < 0.010 |
| Chrysene | N | 2800 | mg/kg | 0.010 | | 1.0 | < 0.010 | < 0.010 | < 0.010 | 7.8 | 4.7 | 1.3 | < 0.010 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | | 1.1 | < 0.010 | < 0.010 | < 0.010 | 7.5 | 4.7 | 1.4 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | | 0.39 | < 0.010 | < 0.010 | < 0.010 | 2.7 | 1.7 | 0.46 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | | 0.54 | < 0.010 | < 0.010 | < 0.010 | 4.4 | 3.1 | 0.88 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | | 0.49 | < 0.010 | < 0.010 | < 0.010 | 3.6 | 2.2 | 0.71 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | | 0.080 | < 0.010 | < 0.010 | < 0.010 | 0.88 | 0.47 | 0.060 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | | 0.48 | < 0.010 | < 0.010 | < 0.010 | 2.9 | 2.1 | 0.66 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | | 10 | 0.90 | < 0.20 | < 0.20 | 80 | 52 | 14 | 0.72 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | 562984 | 562985 | 562986 | 562987 | 562988 | 562989 | 562991 | 562992 |
| Order No.: | | | Client Sample Ref.: | TP15 | TP15 | TP15 | TP15 | TP01 | TP01 | TP16 | TP16 |
| | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | 0.50 | 1.00 | 1.50 | 2.00 | 0.50 | 1.50 | 0.40 | 1.00 |
| | | | Date Sampled: | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 08-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 | < 5000 | | | < 5000 | < 5000 | > 5000 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 562994 | 562995 | 562996 | 562997 | 562998 | 562999 | 563000 | 563001 |
| Order No.: | | | | Client Sample Ref.: | TP16 | TP24 | TP24 | TP25 | TP25 | TP25 | TP26 | TP26 |
| | | | | Client Sample ID.: | ES4 | ES1 | ES2 | ES1 | ES2 | ES3 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.70 | 0.50 | 1.40 | 0.50 | 1.50 | 2.30 | 0.50 | 1.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Asbestos by Gravimetry | U | 2192 | % | 0.001 | | | | | | | | |
| Total Asbestos | N | 2192 | % | 0.001 | | | | | | | | |
| Moisture | N | 2030 | % | 0.020 | 4.9 | 20 | 10 | 14 | 17 | 6.5 | 19 | 5.2 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | See attached | See attached | See attached | See attached | See attached | See attached | See attached |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 2.7 | 2.0 | 2.0 | 2.4 | 1.8 | 2.3 | 1.9 | 1.9 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 12 | 6.1 | 16 | 4.6 | 4.4 | 44 | 3.7 | 17 |
| Barium | U | 2450 | mg/kg | 10 | < 10 | 28 | 20 | 22 | 23 | 100 | 23 | 54 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 3.3 | 0.16 | 0.20 | < 0.10 | < 0.10 | 0.57 | < 0.10 | < 0.10 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | 3.9 | < 2.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | 3.1 | < 2.0 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 7700 | 93 | 36 | 1.7 | 3.1 | 120 | 2.4 | 67 |
| Mercury | U | 2450 | mg/kg | 0.10 | < 0.10 | < 0.10 | 0.15 | < 0.10 | < 0.10 | 0.33 | < 0.10 | 0.14 |
| Nickel | U | 2450 | mg/kg | 0.50 | 14 | 0.62 | 7.5 | < 0.50 | < 0.50 | 15 | < 0.50 | 8.8 |
| Lead | U | 2450 | mg/kg | 0.50 | 9.1 | 3.4 | 120 | < 0.50 | < 0.50 | 380 | 4.1 | 150 |
| Selenium | U | 2450 | mg/kg | 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.35 | < 0.20 | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 13 | < 5.0 | 39 | < 5.0 | < 5.0 | 30 | < 5.0 | 22 |
| Zinc | U | 2450 | mg/kg | 0.50 | 2500 | 32 | 76 | 8.2 | 8.8 | 340 | 8.4 | 98 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 4.5 | 2.8 | 11 | 2.0 | 2.1 | 12 | 2.0 | 8.5 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 38 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 38 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 562994 | 562995 | 562996 | 562997 | 562998 | 562999 | 563000 | 563001 |
| Order No.: | | | | Client Sample Ref.: | TP16 | TP24 | TP24 | TP25 | TP25 | TP25 | TP26 | TP26 |
| | | | | Client Sample ID.: | ES4 | ES1 | ES2 | ES1 | ES2 | ES3 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.70 | 0.50 | 1.40 | 0.50 | 1.50 | 2.30 | 0.50 | 1.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 3.9 | < 0.10 | 5.4 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 9.8 | < 0.10 | 28 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 14 | < 1.0 | 34 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | 14 | < 2.0 | 72 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | | | | | | | |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Benzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Toluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | |

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 562994 | 562995 | 562996 | 562997 | 562998 | 562999 | 563000 | 563001 |
| Order No.: | | | | Client Sample Ref.: | TP16 | TP24 | TP24 | TP25 | TP25 | TP25 | TP26 | TP26 |
| | | | | Client Sample ID.: | ES4 | ES1 | ES2 | ES1 | ES2 | ES3 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.70 | 0.50 | 1.40 | 0.50 | 1.50 | 2.30 | 0.50 | 1.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Styrene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Phenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Isophorone | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 562994 | 562995 | 562996 | 562997 | 562998 | 562999 | 563000 | 563001 |
| Order No.: | | | | | Client Sample Ref.: | TP16 | TP24 | TP24 | TP25 | TP25 | TP25 | TP26 | TP26 |
| | | | | | Client Sample ID.: | ES4 | ES1 | ES2 | ES1 | ES2 | ES3 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 1.70 | 0.50 | 1.40 | 0.50 | 1.50 | 2.30 | 0.50 | 1.50 |
| | | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Naphthalene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.46 | | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.20 | | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.18 | | |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.43 | | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.45 | | |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Fluorene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.71 | | |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Azobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 6.2 | | |
| Anthracene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 1.4 | | |
| Carbazole | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.55 | | |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 4.5 | | |
| Pyrene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 3.6 | | |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 1.7 | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 562994 | 562995 | 562996 | 562997 | 562998 | 562999 | 563000 | 563001 |
| Order No.: | | | | Client Sample Ref.: | TP16 | TP24 | TP24 | TP25 | TP25 | TP25 | TP26 | TP26 |
| | | | | Client Sample ID.: | ES4 | ES1 | ES2 | ES1 | ES2 | ES3 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.70 | 0.50 | 1.40 | 0.50 | 1.50 | 2.30 | 0.50 | 1.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Chrysene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 1.9 | | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 1.8 | | |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.48 | | |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.84 | | |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.47 | | |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | 0.60 | | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | | < 0.050 | < 0.050 | | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.12 | < 0.010 | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.020 | < 0.010 | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.040 | < 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.070 | < 0.010 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 1.2 | < 0.010 | 1.3 |
| Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.22 | < 0.010 | 0.14 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.18 | < 0.010 | 0.37 | 1.4 | < 0.010 | 1.3 |
| Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.15 | < 0.010 | 0.24 | 1.1 | < 0.010 | 1.1 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.040 | 0.55 | < 0.010 | 0.15 |
| Chrysene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.050 | 0.54 | < 0.010 | 0.26 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.54 | < 0.010 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.15 | < 0.010 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.28 | < 0.010 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.17 | < 0.010 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.030 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.24 | < 0.010 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | < 0.20 | < 0.20 | 0.33 | < 0.20 | 0.70 | 6.7 | < 0.20 | 4.3 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | 562994 | 562995 | 562996 | 562997 | 562998 | 562999 | 563000 | 563001 |
| Order No.: | | | Client Sample Ref.: | TP16 | TP24 | TP24 | TP25 | TP25 | TP25 | TP26 | TP26 |
| | | | Client Sample ID.: | ES4 | ES1 | ES2 | ES1 | ES2 | ES3 | ES1 | ES2 |
| | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | 1.70 | 0.50 | 1.40 | 0.50 | 1.50 | 2.30 | 0.50 | 1.50 |
| | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 | 09-Jan-2018 |
| | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | | | < 5000 | | | < 5000 | | |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| Picrite | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | | | < 5.0 | | | < 5.0 | | |

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563002 | 563003 | 563004 | 563006 | 563007 | 563008 | 563009 | 563010 |
| Order No.: | | | | Client Sample Ref.: | TP27 | TP27 | TP04 | TP05 | TP05 | TP05 | TP05 | TP10 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES1 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.10 | 1.00 | 0.50 | 0.50 | 1.00 | 2.00 | 2.50 | 0.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | Cement | - | - | - | - | - | | - |
| Asbestos Identification | U | 2192 | % | 0.001 | Chrysotile | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | | No Asbestos Detected |
| Asbestos by Gravimetry | U | 2192 | % | 0.001 | 1.3 | | | | | | | |
| Total Asbestos | N | 2192 | % | 0.001 | 1.3 | | | | | | | |
| Moisture | N | 2030 | % | 0.020 | 13 | 5.1 | 13 | 13 | 9.4 | 7.8 | | 6.6 |
| Gamma Spectrometry (Subcon) | S | | | N/A | See attached | See attached | | | | | | |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 2.8 | 1.9 | 2.6 | 5.3 | 4.8 | 3.0 | | 3.8 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 300 | 44 | 350 | 82 | 180 | 58 | | 34 |
| Barium | U | 2450 | mg/kg | 10 | 46 | < 10 | 63 | 160 | 33 | 20 | | 270 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 3.1 | < 0.10 | 1.5 | 1.3 | 2.2 | 0.96 | | 1.0 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 54 | 5.5 | 17 | 4.4 | 16 | < 2.0 | | 4.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | 17 | < 2.0 | 5.1 | 3.2 | 8.8 | < 2.0 | | 2.4 |
| Copper | U | 2450 | mg/kg | 0.50 | 2600 | 69 | 330 | 370 | 870 | 490 | | 250 |
| Mercury | U | 2450 | mg/kg | 0.10 | 2.2 | < 0.10 | 0.69 | 1.2 | 3.8 | 0.26 | | 0.95 |
| Nickel | U | 2450 | mg/kg | 0.50 | 18 | 2.5 | 10 | 12 | 13 | 4.3 | | 16 |
| Lead | U | 2450 | mg/kg | 0.50 | 4800 | 180 | 6800 | 420 | 1500 | 280 | | 330 |
| Selenium | U | 2450 | mg/kg | 0.20 | 5.8 | 0.40 | 0.64 | 0.38 | 1.4 | < 0.20 | | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 30 | 11 | 30 | 26 | 31 | 20 | | 48 |
| Zinc | U | 2450 | mg/kg | 0.50 | 1600 | 35 | 550 | 530 | 730 | 460 | | 370 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 27 | 3.6 | 14 | 10 | 14 | 5.7 | | 13 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 36 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 280 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | 25 | 1100 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 16 | < 0.10 | 9.5 | 190 | 11000 | < 0.10 | | 56 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 1300 | < 0.10 | | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 16 | < 1.0 | 9.5 | 210 | 14000 | < 1.0 | | 56 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 18 | < 0.10 | | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | 3.8 | < 0.10 | < 0.10 | < 0.10 | 190 | < 0.10 | | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563002 | 563003 | 563004 | 563006 | 563007 | 563008 | 563009 | 563010 |
| Order No.: | | | | Client Sample Ref.: | TP27 | TP27 | TP04 | TP05 | TP05 | TP05 | TP05 | TP10 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES1 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.10 | 1.00 | 0.50 | 0.50 | 1.00 | 2.00 | 2.50 | 0.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 43 | < 0.10 | 5.8 | 8.7 | 660 | < 0.10 | | 3.8 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 120 | < 0.10 | 26 | 220 | 5700 | < 0.10 | | 41 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 940 | < 0.10 | | < 0.10 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 160 | < 1.0 | 32 | 230 | 7500 | < 1.0 | | 45 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | 180 | < 2.0 | 41 | 440 | 21000 | < 2.0 | | 100 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Benzene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Toluene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | | | | < 0.20 | < 0.20 | | |

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| Client: Causeway Geotech Ltd | | | | | Chemtest Job No.: | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | Chemtest Sample ID.: | 563002 | 563003 | 563004 | 563006 | 563007 | 563008 | 563009 | 563010 |
| Order No.: | | | | | Client Sample Ref.: | TP27 | TP27 | TP04 | TP05 | TP05 | TP05 | TP05 | TP10 |
| | | | | | Client Sample ID.: | ES1 | ES2 | ES1 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.10 | 1.00 | 0.50 | 0.50 | 1.00 | 2.00 | 2.50 | 0.50 |
| | | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Styrene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | | | | | < 0.20 | < 0.20 | | |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Phenol | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Isophorone | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563002 | 563003 | 563004 | 563006 | 563007 | 563008 | 563009 | 563010 |
| Order No.: | | | | Client Sample Ref.: | TP27 | TP27 | TP04 | TP05 | TP05 | TP05 | TP05 | TP10 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES1 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.10 | 1.00 | 0.50 | 0.50 | 1.00 | 2.00 | 2.50 | 0.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Naphthalene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | 0.84 | < 0.050 | | < 0.050 |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | 0.71 | < 0.050 | | < 0.050 |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | 0.15 | 1.2 | < 0.050 | | < 0.050 |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | | | < 0.050 | 0.13 | 1.5 | < 0.050 | | < 0.050 |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Fluorene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | 0.23 | 2.1 | < 0.050 | | < 0.050 |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Azobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | | | 2.0 | 2.3 | 17 | < 0.050 | | 0.90 |
| Anthracene | N | 2790 | mg/kg | 0.050 | | | 0.38 | 0.52 | 3.9 | < 0.050 | | 0.28 |
| Carbazole | N | 2790 | mg/kg | 0.050 | | | 0.14 | 0.23 | 1.8 | < 0.050 | | 0.064 |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | | | 3.3 | 3.3 | 14 | < 0.050 | | 1.7 |
| Pyrene | N | 2790 | mg/kg | 0.050 | | | 2.9 | 2.9 | 11 | < 0.050 | | 1.6 |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | 0.077 | < 0.050 | | < 0.050 |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | | | 1.7 | 1.6 | 5.7 | < 0.050 | | 0.99 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563002 | 563003 | 563004 | 563006 | 563007 | 563008 | 563009 | 563010 |
| Order No.: | | | | Client Sample Ref.: | TP27 | TP27 | TP04 | TP05 | TP05 | TP05 | TP05 | TP10 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES1 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.10 | 1.00 | 0.50 | 0.50 | 1.00 | 2.00 | 2.50 | 0.50 |
| | | | | Date Sampled: | 09-Jan-2018 | 09-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Chrysene | N | 2790 | mg/kg | 0.050 | | | 1.7 | 1.5 | 5.6 | < 0.050 | | 0.90 |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | | | 2.2 | 1.9 | 6.0 | < 0.050 | | 1.3 |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | | | 0.66 | 0.49 | 1.5 | < 0.050 | | 0.44 |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | | | 1.0 | 1.1 | 3.0 | < 0.050 | | 0.82 |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | 0.66 | 1.1 | < 0.050 | | 0.50 |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | | | < 0.050 | 0.28 | 0.41 | < 0.050 | | 0.16 |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | | | 0.96 | 0.84 | 1.3 | < 0.050 | | 0.55 |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | < 0.050 |
| Naphthalene | N | 2800 | mg/kg | 0.010 | 0.86 | < 0.010 | 0.27 | 0.64 | 0.88 | < 0.010 | | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | 1.1 | < 0.010 | 0.40 | 0.11 | 0.63 | < 0.010 | | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | 0.28 | < 0.010 | 0.14 | 0.16 | 0.97 | < 0.010 | | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | 0.63 | < 0.010 | 0.20 | 0.27 | 2.0 | < 0.010 | | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 11 | 0.39 | 4.6 | 2.8 | 16 | 0.34 | | 1.1 |
| Anthracene | N | 2800 | mg/kg | 0.010 | 3.6 | 0.080 | 0.79 | 0.65 | 3.5 | 0.050 | | 0.27 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 20 | 0.58 | 6.9 | 4.0 | 18 | 0.36 | | 1.9 |
| Pyrene | N | 2800 | mg/kg | 0.010 | 17 | 0.47 | 5.6 | 3.5 | 15 | 0.31 | | 1.6 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 11 | < 0.010 | 2.7 | 1.7 | 7.0 | 0.14 | | 0.89 |
| Chrysene | N | 2800 | mg/kg | 0.010 | 11 | < 0.010 | 2.9 | 1.8 | 9.2 | 0.11 | | 0.80 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | 13 | < 0.010 | 3.3 | 1.9 | 6.9 | < 0.010 | | 0.95 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | 4.3 | < 0.010 | 1.3 | 0.66 | 2.7 | < 0.010 | | 0.32 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | 10 | < 0.010 | 2.1 | 1.5 | 4.3 | < 0.010 | | 0.73 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | 5.7 | < 0.010 | 1.6 | 0.86 | 1.7 | < 0.010 | | 0.51 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | 0.90 | < 0.010 | 0.31 | 0.13 | 0.48 | < 0.010 | | 0.030 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | 5.2 | < 0.010 | 1.4 | 0.76 | 1.8 | < 0.010 | | 0.41 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | 120 | 1.5 | 35 | 21 | 91 | 1.3 | | 9.5 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 100.00 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 563002 | 563003 | 563004 | 563006 | 563007 | 563008 | 563009 | 563010 |
| Order No.: | | | Client Sample Ref.: | | TP27 | TP27 | TP04 | TP05 | TP05 | TP05 | TP05 | TP10 |
| | | | Client Sample ID.: | | ES1 | ES2 | ES1 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 0.10 | 1.00 | 0.50 | 0.50 | 1.00 | 2.00 | 2.50 | 0.50 |
| | | | Date Sampled: | | 09-Jan-2018 | 09-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 100.00 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | | | < 5000 | < 5000 | < 5000 | < 5000 | > 5000 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 20.00 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 20.00 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563011 | 563012 | 563013 | 563015 | 563017 | 563018 |
| Order No.: | | | | Client Sample Ref.: | TP10 | TP17 | TP17 | TP22 | TP23 | TP23 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES2 | ES2 | ES3 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 2.50 |
| | | | | Date Sampled: | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Asbestos by Gravimetry | U | 2192 | % | 0.001 | | | | | | |
| Total Asbestos | N | 2192 | % | 0.001 | | | | | | |
| Moisture | N | 2030 | % | 0.020 | 3.5 | 5.1 | 5.8 | 3.7 | 4.3 | 12 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | | | | |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 1.6 | 1.5 | 0.87 | 1.3 | 1.2 | 2.5 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 12 | 98 | 89 | 15 | 18 | 48 |
| Barium | U | 2450 | mg/kg | 10 | < 10 | 11 | 35 | < 10 | < 10 | < 10 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 3.0 | 0.19 | 1.8 | < 0.10 | < 0.10 | < 0.10 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | 5.7 | 2.5 | < 2.0 | < 2.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | 3.6 | < 2.0 | < 2.0 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 22 | 51 | 120 | 10 | 19 | 39 |
| Mercury | U | 2450 | mg/kg | 0.10 | 0.11 | 0.31 | 0.65 | 0.10 | 0.40 | < 0.10 |
| Nickel | U | 2450 | mg/kg | 0.50 | 4.8 | 1.7 | 3.7 | 1.5 | 0.90 | 3.9 |
| Lead | U | 2450 | mg/kg | 0.50 | 26 | 64 | 270 | 77 | 11000 | 390 |
| Selenium | U | 2450 | mg/kg | 0.20 | < 0.20 | 0.82 | 1.2 | < 0.20 | < 0.20 | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 22 | 17 | 19 | 16 | 14 | 14 |
| Zinc | U | 2450 | mg/kg | 0.50 | 730 | 95 | 380 | 17 | 14 | 59 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 6.3 | 2.7 | 4.9 | 2.7 | 2.1 | 5.2 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | 18 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | 18 | < 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563011 | 563012 | 563013 | 563015 | 563017 | 563018 |
| Order No.: | | | | Client Sample Ref.: | TP10 | TP17 | TP17 | TP22 | TP23 | TP23 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES2 | ES2 | ES3 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 2.50 |
| | | | | Date Sampled: | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | 35 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | 52 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | 88 | < 1.0 | < 1.0 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | < 2.0 | 110 | < 2.0 | < 2.0 | < 2.0 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | | | | | |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | | | | | |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Benzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Toluene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563011 | 563012 | 563013 | 563015 | 563017 | 563018 |
| Order No.: | | | | Client Sample Ref.: | TP10 | TP17 | TP17 | TP22 | TP23 | TP23 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES2 | ES2 | ES3 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 2.50 |
| | | | | Date Sampled: | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Styrene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | | | | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | | | | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | | | | | |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Phenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Isophorone | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563011 | 563012 | 563013 | 563015 | 563017 | 563018 |
| Order No.: | | | | Client Sample Ref.: | TP10 | TP17 | TP17 | TP22 | TP23 | TP23 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES2 | ES2 | ES3 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 2.50 |
| | | | | Date Sampled: | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Naphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.20 | < 0.050 | < 0.050 | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.11 | < 0.050 | < 0.050 | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.83 | < 0.050 | < 0.050 | |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.23 | < 0.050 | < 0.050 | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.50 | < 0.050 | < 0.050 | |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Fluorene | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.85 | < 0.050 | < 0.050 | |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Azobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | | 0.19 | 14 | < 0.050 | < 0.050 | |
| Anthracene | N | 2790 | mg/kg | 0.050 | | < 0.050 | 2.0 | < 0.050 | < 0.050 | |
| Carbazole | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.73 | < 0.050 | < 0.050 | |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.23 | 13 | < 0.050 | < 0.050 | |
| Pyrene | N | 2790 | mg/kg | 0.050 | | 0.19 | 9.7 | < 0.050 | < 0.050 | |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | | 0.15 | 5.8 | < 0.050 | < 0.050 | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563011 | 563012 | 563013 | 563015 | 563017 | 563018 |
| Order No.: | | | | Client Sample Ref.: | TP10 | TP17 | TP17 | TP22 | TP23 | TP23 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES2 | ES2 | ES3 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 2.50 |
| | | | | Date Sampled: | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| Chrysene | N | 2790 | mg/kg | 0.050 | | 0.19 | 4.9 | < 0.050 | < 0.050 | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.25 | 6.3 | < 0.050 | < 0.050 | |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.074 | 1.8 | < 0.050 | < 0.050 | |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | | 0.14 | 3.6 | < 0.050 | < 0.050 | |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | | 0.095 | 2.1 | < 0.050 | < 0.050 | |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | | < 0.050 | 0.064 | < 0.050 | < 0.050 | |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | | 0.095 | 2.3 | < 0.050 | < 0.050 | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.35 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.40 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.060 | < 0.010 | < 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.29 | < 0.010 | < 0.010 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 5.1 | < 0.010 | 0.16 | < 0.010 |
| Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.81 | < 0.010 | 0.010 | < 0.010 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 5.5 | < 0.010 | 0.14 | < 0.010 |
| Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 4.3 | < 0.010 | 0.11 | < 0.010 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 2.1 | < 0.010 | < 0.010 | < 0.010 |
| Chrysene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 2.4 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 2.6 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.99 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 1.5 | < 0.010 | < 0.010 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 1.4 | < 0.010 | < 0.010 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.23 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 1.1 | < 0.010 | < 0.010 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | < 0.20 | < 0.20 | 29 | < 0.20 | 0.42 | < 0.20 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 | 18-00911 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 563011 | 563012 | 563013 | 563015 | 563017 | 563018 |
| Order No.: | | | Client Sample Ref.: | | TP10 | TP17 | TP17 | TP22 | TP23 | TP23 |
| | | | Client Sample ID.: | | ES2 | ES1 | ES2 | ES2 | ES2 | ES3 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 2.50 |
| | | | Date Sampled: | | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 | 10-Jan-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| Picrite | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | |

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562984 | | | | | | |
| **Sample Ref:** | TP15 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 08-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.9 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.3 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 32 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 10 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.010 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0023 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0027 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.014 | 0.14 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0027 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0041 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.4 | 24 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.65 | 6.5 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 43 | 430 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 81 | 810 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 3.9 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 7.8 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562985 | | | | | | |
| **Sample Ref:** | TP15 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 08-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.28 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | < 0.10 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0090 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0050 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00099 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0090 | 0.090 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0027 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.40 | 4.0 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.4 | 24 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.13 | 1.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 95 | 950 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 140 | 1400 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 4.1 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562986 | | | | | | |
| **Sample Ref:** | TP15 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 08-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.83 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0070 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0030 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0013 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0029 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.94 | 9.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 28 | 280 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 70 | 700 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.0 | 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 3.9 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562987 | | | | | | |
| **Sample Ref:** | TP15 | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 2.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 08-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.52 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.9 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0069 | 0.069 | 0.5 | 2 | 25 |
| Barium | 1450 | U | < 0.0010 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0014 | 0.014 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0014 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 12 | 120 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 23 | 230 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 54 | 540 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.1 | 71 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562988 | | | | | | |
| **Sample Ref:** | TP01 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 7.5 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 7.3 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 330 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 80 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0016 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.014 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00014 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0033 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0021 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.011 | 0.11 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.036 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 3.2 | 32 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.30 | 3.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 76 | 760 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 130 | 1300 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 2.6 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562989 | | | | | | |
| **Sample Ref:** | TP01 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 5.4 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 9.6 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 120 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 52 | 100 | -- | -- |
| pH | 2010 | U | | 7.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.013 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.077 | 0.77 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00013 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0022 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.11 | 1.1 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.014 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 3.2 | 32 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.24 | 2.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 66 | 660 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 110 | 1100 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.5 | 75 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562991 | | | | | | |
| **Sample Ref:** | TP16 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.40 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 10 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 9.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 70 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 13 | 100 | -- | -- |
| pH | 2010 | U | | 7.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.010 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0020 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.016 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0027 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0020 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0049 | 0.049 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0032 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.8 | 18 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 28 | 280 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 57 | 570 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 11 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562992 | | | | | | |
| **Sample Ref:** | TP16 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.26 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.55 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0050 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0040 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0011 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.020 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.11 | 1.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 17 | 170 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 29 | 290 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 3.7 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562994 | | | | | | |
| **Sample Ref:** | TP16 | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 1.70 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.60 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0057 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0016 | 0.016 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.051 | 0.51 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.18 | 1.8 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.73 | 7.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 26 | 260 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 57 | 570 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.2 | 52 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 4.9 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562995 | | | | | | |
| **Sample Ref:** | TP24 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.23 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.6 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0024 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.023 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00087 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.066 | 0.66 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0011 | 0.011 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.063 | 0.63 | 4 | 50 | 200 |
| Chloride | 1220 | U | 7.1 | 71 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 3.1 | 31 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1300 | 13000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1300 | 13000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.1 | 71 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 20 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562996 | | | | | | |
| **Sample Ref:** | TP24 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.40 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | < 0.10 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 73 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0070 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0079 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0012 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0012 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.014 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 9.0 | 90 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.8 | 18 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 240 | 2400 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 330 | 3300 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 10 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562997 | | | | | | |
| **Sample Ref:** | TP25 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.22 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.8 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 5.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0017 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.021 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00070 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.026 | 0.26 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0012 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.040 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.5 | 15 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 3.6 | 36 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1400 | 14000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1400 | 14000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 6.3 | 63 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 14 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562998 | | | | | | |
| **Sample Ref:** | TP25 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.25 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 3.8 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.020 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00063 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.025 | 0.25 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.043 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.9 | 29 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 4.4 | 44 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1400 | 14000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1400 | 14000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 6.5 | 65 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 17 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 562999 | | | | | | |
| **Sample Ref:** | TP25 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.30 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.44 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.89 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 130 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 6.5 | 100 | -- | -- |
| pH | 2010 | U | | 7.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0098 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0022 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.015 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.8 | 18 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.94 | 9.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1100 | 11000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1100 | 11000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 6.5 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563000 | | | | | | |
| **Sample Ref:** | TP26 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.34 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.9 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 5.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.019 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0011 | 0.011 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0025 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0011 | 0.011 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.11 | 1.1 | 4 | 50 | 200 |
| Chloride | 1220 | U | 7.9 | 79 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 3.7 | 37 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1400 | 14000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1400 | 14000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.5 | 75 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 19 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563001 | | | | | | |
| **Sample Ref:** | TP26 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.4 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.99 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 20 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 4.3 | 100 | -- | -- |
| pH | 2010 | U | | 6.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0019 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0059 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0011 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0010 | 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0090 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 3.4 | 34 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 4.5 | 45 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 120 | 1200 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 170 | 1700 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 11 | 110 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.2 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563002 | | | | | | |
| **Sample Ref:** | TP27 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.10 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 2.9 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 7.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 140 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 120 | 100 | -- | -- |
| pH | 2010 | U | | 6.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.016 | 0.16 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.016 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00074 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0019 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.046 | 0.46 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0064 | 0.064 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0032 | 0.032 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0020 | 0.020 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.099 | 0.99 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 4.3 | 43 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1300 | 13000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1400 | 14000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 6.7 | 67 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563003 | | | | | | |
| **Sample Ref:** | TP27 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 09-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.66 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0094 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00027 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0036 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0013 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0013 | 0.013 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.029 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.72 | 7.2 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 680 | 6800 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 700 | 7000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.9 | 59 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.1 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563004 | | | | | | |
| **Sample Ref:** | TP04 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.1 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.8 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 43 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 35 | 100 | -- | -- |
| pH | 2010 | U | | 11.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.040 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0064 | 0.064 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.011 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0064 | 0.064 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.015 | 0.15 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0015 | 0.015 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.016 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 7.4 | 74 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.46 | 4.6 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 850 | 8500 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 2000 | 20000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563006 | | | | | | |
| **Sample Ref:** | TP05 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.44 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.3 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 150 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 21 | 100 | -- | -- |
| pH | 2010 | U | | 8.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.021 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0087 | 0.087 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0086 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0030 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0038 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0034 | 0.034 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0011 | 0.011 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0053 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.4 | 24 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.27 | 2.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 85 | 850 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 47 | 470 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.6 | 76 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563007 | | | | | | |
| **Sample Ref:** | TP05 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 5.2 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 8.8 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 19000 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 91 | 100 | -- | -- |
| pH | 2010 | U | | 8.2 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.017 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.026 | 0.26 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.015 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0011 | 0.011 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0015 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0045 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0065 | 0.065 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0083 | 0.083 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0042 | 0.042 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.43 | 4.3 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.2 | 12 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.83 | 8.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1300 | 13000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1100 | 11000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 3.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 9.4 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563008 | | | | | | |
| **Sample Ref:** | TP05 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.12 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.014 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0099 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00018 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.061 | 0.61 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0031 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0026 | 0.026 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.048 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 3.5 | 35 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.18 | 1.8 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 54 | 540 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 42 | 420 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 7.8 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563010 | | | | | | |
| **Sample Ref:** | TP10 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.35 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.71 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 37 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 9.5 | 100 | -- | -- |
| pH | 2010 | U | | 9.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.018 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0020 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0075 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0065 | 0.065 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0025 | 0.025 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0056 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 32 | 320 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.15 | 1.5 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 16 | 160 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 110 | 1100 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.3 | 53 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 6.6 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563011 | | | | | | |
| **Sample Ref:** | TP10 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | < 0.10 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0050 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0084 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00024 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0028 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0016 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0019 | 0.019 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.038 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 15 | 150 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.10 | 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 28 | 280 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 80 | 800 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 3.5 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563012 | | | | | | |
| **Sample Ref:** | TP17 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.45 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0060 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0047 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00016 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0015 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0011 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.057 | 0.57 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.3 | 13 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.093 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 480 | 4800 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 560 | 5600 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.1 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563013 | | | | | | |
| **Sample Ref:** | TP17 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.31 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 92 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 29 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0060 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0079 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00019 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0017 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0011 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0023 | 0.023 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.032 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.6 | 16 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.13 | 1.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 160 | 1600 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 190 | 1900 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.8 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563015 | | | | | | |
| **Sample Ref:** | TP22 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.14 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0082 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0043 | 0.043 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.034 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.2 | 22 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.12 | 1.2 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 53 | 530 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 65 | 650 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 3.7 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563017 | | | | | | |
| **Sample Ref:** | TP23 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.27 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0050 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0031 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.010 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00023 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0011 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0013 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.010 | 0.10 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.055 | 0.55 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.4 | 24 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.14 | 1.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 880 | 8800 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 890 | 8900 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 4.3 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-00911 | | | | | | |
| **Chemtest Sample ID:** | 563018 | | | | | | |
| **Sample Ref:** | TP23 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 10-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.23 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0029 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0053 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0015 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.025 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.9 | 19 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.27 | 2.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 190 | 1900 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 240 | 2400 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.8 | 58 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |
| 1920 | Phenols in Waters by HPLC | Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded. | Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection. |
| 2010 | pH Value of Soils | pH | pH Meter |
| 2015 | Acid Neutralisation Capacity | Acid Reserve | Titration |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2185 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2325 | Sulphide in Soils | Sulphide | Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2610 | Loss on Ignition | loss on ignition (LOI) | Determination of the proportion by mass that is lost from a soil by ignition at 550°C. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40 | Dichloromethane extraction / GC-FID |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2790 | Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS | Semi-volatile organic compounds(cf. USEPA Method 8270) | Acetone/Hexane extraction / GC-MS |
| 2800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS | Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene* | Dichloromethane extraction / GC-MS |
| 2815 | Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS | ICES7 PCB congeners | Acetone/Hexane extraction / GC-MS |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

SOCOTEC

# Analysis of Soil Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12<br>Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0048Rev1 |
| Customer Reference: | 18-00911 |
| Quote Number: | ENR-ANU-9202 |
| PO Number: | 16544 |
| Samples Received: | 18 January 2018 |
| Sample Condition: | Satisfactory, Ambient |
| Analysis Completed: | 29 January 2018 |
| Report Author: | Kiran |
| Author's Name: | Kiran Bala |
| Job Title: | Analyst |
| Approved By: | Charlene Hunston |
| Approver's name: | Charlene Hunston |
| Job Title: | Senior Analyst |
| Report Date: | 05 February 2018 |

SOCOTEC

This is a revised report, supplementary to 18-0048 as denoted by the suffix 'Rev1'. The report has been reissued to include sample depths and ID references as requested by the customer. This report supersedes the previous issue.

## Sample Summary

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 562995 – TP24 ES1@0.50 | RW0546 | Soil | 09/01/2018 12:00 |
| 562997 – TP25 ES1@0.50 | RW0547 | Soil | 09/01/2018 12:00 |
| 562998 – TP25 ES2@1.50 | RW0548 | Soil | 09/01/2018 12:00 |
| 563000 – TP26 ES1@0.50 | RW0549 | Soil | 09/01/2018 12:00 |
| 563001 – TP26 ES2@1.50 | RW0550 | Soil | 09/01/2018 12:00 |
| 563002 – TP27 ES1@0.10 | RW0551 | Soil | 09/01/2018 12:00 |
| 563003 – TP27 ES2@1.00 | RW0552 | Soil | 09/01/2018 12:00 |

## Experimental

### Gamma Spectrometry

Oven dried samples were analysed using method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Results

Results are presented in the following tables.

An asterisk "*" indicates that the analysis is not covered under the UKAS accreditation of the laboratory with UKAS 1015. Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| 562995 – TP24 ES1@0.50 | RW0546 | < 31 | < 39 | < 3.5 | < 3.6 | < 3.9 | < 3.4 | 640 ± 60 | < 40 | < 5.6 |
| 562997 – TP25 ES1@0.50 | RW0547 | < 31 | < 41 | < 3.5 | < 3.7 | < 3.9 | < 3.4 | 520 ± 60 | < 44 | < 5.7 |
| 562998 – TP25 ES2@1.50 | RW0548 | < 33 | < 41 | < 3.8 | < 3.7 | < 4.2 | < 3.5 | 660 ± 70 | < 44 | < 5.9 |
| 563000 – TP26 ES1@0.50 | RW0549 | < 29 | < 41 | < 3.0 | < 3.9 | < 3.7 | < 3.0 | 520 ± 60 | < 38 | < 7.0 |
| 563001 – TP26 ES2@1.50 | RW0550 | < 9.8 | 90 ± 20 | < 1.2 | < 1.3 | 2.6 ± 0.9 | 2.8 ± 1 | < 28 | < 15 | 9.9 ± 1.9 |
| 563002 – TP27 ES1@0.10 | RW0551 | < 14 | 220 ± 40 | < 1.6 | < 1.8 | < 1.5 | 6.4 ± 1.6 | < 62 | < 20 | 21 ± 3 |
| 563003 – TP27 ES2@1.00 | RW0552 | < 11 | 200 ± 30 | < 1.3 | < 1.4 | < 1.1 | < 1.3 | < 28 | < 14 | 9.0 ± 1.9 |

**Notes:**

1. Results are presented as $Bq.Kg^{-1}$ of dried and homogenised samples and are decay corrected to the sampling date.
2. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
3. Results above the LoD are reported with expanded (2σ) uncertainties based on a total uncertainty budget.
4. 1σ uncertainties are rounded to 1 significant figure; results and 2σ uncertainties are rounded to the same precision.
5. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.

UKAS TESTING
1015

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| 562995 – TP24 ES1@0.50 | RW0546 | 540 ± 40 | 590 ± 40 | < 130 | 800 ± 90 | < 14 | < 420 | < 83 | < 17 | < 7.7 |
| 562997 – TP25 ES1@0.50 | RW0547 | 520 ± 40 | 550 ± 40 | < 120 | 760 ± 90 | < 14 | < 420 | < 80 | < 18 | < 7.5 |
| 562998 – TP25 ES2@1.50 | RW0548 | 530 ± 40 | 580 ± 40 | < 130 | 780 ± 90 | < 14 | < 430 | < 79 | < 18 | < 7.4 |
| 563000 – TP26 ES1@0.50 | RW0549 | 560 ± 40 | 630 ± 50 | < 120 | 810 ± 90 | < 12 | < 330 | < 75 | < 18 | < 7.4 |
| 563001 – TP26 ES2@1.50 | RW0550 | 10 ± 2 | 13 ± 2 | < 34 | < 21 | < 5.3 | < 120 | < 30 | < 1.3 | < 2.9 |
| 563002 – TP27 ES1@0.10 | RW0551 | 87 ± 8 | 97 ± 8 | < 53 | 160 ± 30 | 22 ± 5 | < 150 | < 67 | < 8.1 | < 8.2 |
| 563003 – TP27 ES2@1.00 | RW0552 | 7 ± 2 | 9.7 ± 1.9 | < 28 | < 20 | < 5.3 | < 130 | < 28 | < 1.3 | < 2.7 |

**Notes:**

1. Analysis marked with an asterisk is not UKAS accredited.
2. Results are presented as $Bq.Kg^{-1}$ of dried and homogenised samples and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Results above the LoD are reported with expanded (2σ) uncertainties based on a total uncertainty budget.
5. 1σ uncertainties are rounded to 1 significant figure; results and 2σ uncertainties are rounded to the same precision.
6. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
7. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.

UKAS TESTING
1015

SOCOTEC

# Analysis of Soil Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12<br>Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0119Rev2 |
| Customer Reference: | 18-00911 |
| Quote Number: | ENR-ANU-9052 |
| PO Number: | 16589 |
| Samples Received: | 08 February 2018 |
| Sample Condition: | Satisfactory, Ambient |
| Analysis Completed: | 13 February 2018 |
| Report Author: | Kiran |
| Author's Name: | Kiran Bala |
| Job Title: | Analyst |
| Approved By: | CHunston. |
| Approver's name: | Charlene Hunston |
| Job Title: | Senior Analyst |
| Report Date: | 09 March 2018 |

SOCOTEC

This is a revised report, supplementary to 18-0119 and 18-0119Rev1 as denoted by the suffix 'Rev2'. The report has been reissued to include sample depths and ID references as requested by the customer. This report supersedes any previous issues.

## Sample Summary

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 562996 – TP24 ES2@1.40m | RW1017 | Soil (Sandy) | 09/01/2018 12:00 |
| 562999 – TP25 ES3@2.30m | RW1018 | Soil (Sandy) | 09/01/2018 12:00 |

## Experimental

### Gamma Spectrometry

Oven dried samples were analysed using method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Results

Results are presented in the following tables.

An asterisk "*" indicates that the analysis is not covered under the UKAS accreditation of the laboratory with UKAS 1015. Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| 562996 – TP24 ES2@1.40m | RW1017 | < 13 | 110 ± 20 | < 1.4 | < 1.4 | < 1.3 | 5.6 ± 1.2 | 67 ± 14 | < 16 | 19 ± 2 |
| 562999 – TP25 ES3@2.30m | RW1018 | < 14 | 230 ± 40 | < 1.6 | < 1.5 | < 1.5 | 6.4 ± 1.4 | 94 ± 16 | < 20 | 21 ± 2 |

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| 562996 – TP24 ES2@1.40m | RW1017 | 39 ± 4 | 45 ± 3 | < 22 | 70 ± 16 | 19 ± 3 | < 150 | < 28 | < 5.2 | < 2.6 |
| 562999 – TP25 ES3@2.30m | RW1018 | 67 ± 5 | 73 ± 5 | < 26 | 110 ± 20 | 20 ± 4 | < 170 | < 31 | < 5.8 | < 3.0 |

**Notes:**

1. Analysis marked with an asterisk is not UKAS accredited.
2. Results are presented as $Bq.Kg^{-1}$ of dried and homogenised samples and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Results above the LoD are reported with expanded (2σ) uncertainties based on a total uncertainty budget.
5. 1σ uncertainties are rounded to 1 significant figure; results and 2σ uncertainties are rounded to the same precision.
6. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
7. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.

UKAS TESTING
1015

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-01051-3 | | |
| **Initial Date of Issue:** | 06-Feb-2018 | **Date of Re-Issue:** | 14-Feb-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 15-Jan-2018 |
| **Order No.:** | | **Date Instructed:** | 17-Jan-2018 |
| **No. of Samples:** | 26 | | |
| **Turnaround (Wkdays):** | 18 | **Results Due:** | 09-Feb-2018 |
| **Date Approved:** | 14-Feb-2018 | | |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563794 | 563796 | 563797 | 563798 | 563799 | 563800 | 563801 | 563802 |
| Order No.: | | | | Client Sample Ref.: | TP18 | TP18 | TP6 | TP6 | TP7 | TP7 | TP8 | TP8 |
| | | | | Client Sample ID.: | ES1 | ES3 | ES1 | ES2 | ES1 | ES2 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.00 |
| | | | | Date Sampled: | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 7.3 | 4.0 | 10 | 4.4 | 5.5 | 11 | 12 | 9.3 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 3.6 | 1.3 | 4.5 | 4.5 | 3.3 | 21 | 2.8 | 9.6 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 55 | 22 | 260 | 130 | 26 | 270 | 110 | 330 |
| Barium | U | 2450 | mg/kg | 10 | 47 | < 10 | 28 | 150 | 62 | 32 | 170 | 28 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.87 | 0.69 | 3.1 | 0.46 | 0.20 | 4.2 | 1.2 | 4.7 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 7.5 | < 2.0 | 22 | 5.9 | < 2.0 | 21 | 8.5 | 18 |
| Antimony | N | 2450 | mg/kg | 2.0 | 4.4 | < 2.0 | 12 | 3.4 | < 2.0 | 13 | 6.4 | 13 |
| Copper | U | 2450 | mg/kg | 0.50 | 920 | 140 | 1900 | 440 | 74 | 1600 | 550 | 2200 |
| Mercury | U | 2450 | mg/kg | 0.10 | 0.62 | 0.11 | 2.3 | 0.20 | 0.14 | 2.2 | 1.2 | 1.9 |
| Nickel | U | 2450 | mg/kg | 0.50 | 14 | 3.4 | 16 | 11 | 25 | 23 | 14 | 23 |
| Lead | U | 2450 | mg/kg | 0.50 | 1400 | 210 | 2500 | 370 | 75 | 2200 | 940 | 2200 |
| Selenium | U | 2450 | mg/kg | 0.20 | 0.68 | < 0.20 | 2.1 | 0.25 | < 0.20 | 1.9 | 0.84 | 1.7 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 51 | 20 | 39 | 23 | 34 | 50 | 39 | 57 |
| Zinc | U | 2450 | mg/kg | 0.50 | 310 | 590 | 930 | 300 | 90 | 1400 | 440 | 1500 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 920 | 4.2 | 14 | 12 | 18 | 19 | 14 | 16 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 12 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | 48 | < 0.10 | 6.2 | < 0.10 | < 0.10 | 11 | < 0.10 | 100 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 230 | < 0.10 | 39 | < 0.10 | < 0.10 | 65 | 48 | 440 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 1400 | < 0.10 | 300 | < 0.10 | < 0.10 | 530 | 230 | 3500 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | 160 | < 0.10 | 12 | < 0.10 | < 0.10 | 28 | < 0.10 | 420 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 1800 | < 1.0 | 360 | < 1.0 | < 1.0 | 630 | 280 | 4500 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 3.2 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | 3.2 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 1.8 | < 0.10 | 49 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 36 | < 0.10 | 12 | < 0.10 | < 0.10 | 36 | 23 | 190 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 250 | < 0.10 | 190 | < 0.10 | < 0.10 | 510 | 490 | 2400 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | 12 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 290 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563794 | 563796 | 563797 | 563798 | 563799 | 563800 | 563801 | 563802 |
| Order No.: | | | | Client Sample Ref.: | TP18 | TP18 | TP6 | TP6 | TP7 | TP7 | TP8 | TP8 |
| | | | | Client Sample ID.: | ES1 | ES3 | ES1 | ES2 | ES1 | ES2 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.00 |
| | | | | Date Sampled: | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 300 | < 1.0 | 200 | < 1.0 | < 1.0 | 540 | 520 | 2900 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | 2100 | < 2.0 | 560 | < 2.0 | < 2.0 | 1200 | 800 | 7400 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | | | | | | | < 0.50 |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Benzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Toluene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Styrene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563794 | 563796 | 563797 | 563798 | 563799 | 563800 | 563801 | 563802 |
| Order No.: | | | | Client Sample Ref.: | TP18 | TP18 | TP6 | TP6 | TP7 | TP7 | TP8 | TP8 |
| | | | | Client Sample ID.: | ES1 | ES3 | ES1 | ES2 | ES1 | ES2 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.00 |
| | | | | Date Sampled: | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | | | | | | | < 0.20 |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Phenol | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Isophorone | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 563794 | 563796 | 563797 | 563798 | 563799 | 563800 | 563801 | 563802 |
| Order No.: | | | | | Client Sample Ref.: | TP18 | TP18 | TP6 | TP6 | TP7 | TP7 | TP8 | TP8 |
| | | | | | Client Sample ID.: | ES1 | ES3 | ES1 | ES2 | ES1 | ES2 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.00 |
| | | | | | Date Sampled: | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Naphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Fluorene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Azobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.78 | | 1.2 |
| Anthracene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.18 | | 0.28 |
| Carbazole | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | 0.077 |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 1.2 | | 1.5 |
| Pyrene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 1.0 | | 1.2 |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.57 | | 0.63 |
| Chrysene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.64 | | 0.61 |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 563794 | 563796 | 563797 | 563798 | 563799 | 563800 | 563801 | 563802 |
| Order No.: | | | | | Client Sample Ref.: | TP18 | TP18 | TP6 | TP6 | TP7 | TP7 | TP8 | TP8 |
| | | | | | Client Sample ID.: | ES1 | ES3 | ES1 | ES2 | ES1 | ES2 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.00 |
| | | | | | Date Sampled: | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.64 | | 0.62 |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.23 | | 0.21 |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.34 | | 0.39 |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.18 | | 0.19 |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.056 | | 0.066 |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | 0.20 | | 0.20 |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | | < 0.050 | | < 0.050 | < 0.050 | | < 0.050 |
| Naphthalene | N | 2800 | mg/kg | 0.010 | | 0.16 | < 0.010 | 0.58 | 0.20 | < 0.010 | 0.64 | 1.8 | 0.59 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | | 0.12 | < 0.010 | 0.12 | 0.020 | < 0.010 | 0.18 | 0.27 | 0.12 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | | 0.080 | < 0.010 | 0.26 | 0.040 | < 0.010 | 0.43 | 0.59 | 0.24 |
| Fluorene | N | 2800 | mg/kg | 0.010 | | 0.30 | < 0.010 | 0.45 | 0.070 | < 0.010 | 0.74 | 0.69 | 0.41 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | | 3.3 | < 0.010 | 4.6 | 0.88 | < 0.010 | 7.7 | 7.5 | 4.1 |
| Anthracene | N | 2800 | mg/kg | 0.010 | | 0.69 | < 0.010 | 0.94 | 0.19 | < 0.010 | 1.9 | 1.6 | 0.92 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | | 3.3 | < 0.010 | 5.7 | 1.2 | < 0.010 | 9.6 | 9.7 | 5.1 |
| Pyrene | N | 2800 | mg/kg | 0.010 | | 2.4 | < 0.010 | 4.5 | 0.88 | < 0.010 | 7.8 | 7.9 | 4.2 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | | 1.1 | < 0.010 | 1.9 | 0.41 | < 0.010 | 3.9 | 4.0 | 1.9 |
| Chrysene | N | 2800 | mg/kg | 0.010 | | 1.1 | < 0.010 | 2.7 | 0.49 | < 0.010 | 4.8 | 4.5 | 2.6 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | | 0.99 | < 0.010 | 1.8 | 0.46 | < 0.010 | 3.8 | 4.7 | 1.8 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | | 0.48 | < 0.010 | 0.69 | 0.19 | < 0.010 | 1.6 | 1.8 | 0.83 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | | 0.73 | < 0.010 | 0.98 | 0.38 | < 0.010 | 2.7 | 3.1 | 1.2 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | | 0.37 | < 0.010 | 0.47 | 0.24 | < 0.010 | 1.2 | 1.8 | 0.54 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | | 0.010 | < 0.010 | 0.010 | 0.030 | < 0.010 | 0.24 | 0.47 | 0.14 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | | 0.30 | < 0.010 | 0.41 | 0.20 | < 0.010 | 1.1 | 1.7 | 0.56 |
| Coronene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | | 15 | < 0.20 | 26 | 5.9 | < 0.20 | 48 | 52 | 25 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | 563794 | 563796 | 563797 | 563798 | 563799 | 563800 | 563801 | 563802 |
| Order No.: | | | Client Sample Ref.: | TP18 | TP18 | TP6 | TP6 | TP7 | TP7 | TP8 | TP8 |
| | | | Client Sample ID.: | ES1 | ES3 | ES1 | ES2 | ES1 | ES2 | ES1 | ES2 |
| | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | 0.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.00 |
| | | | Date Sampled: | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 | 12-Jan-2018 |
| | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 | | < 5000 | < 5000 | < 5000 | < 5000 | | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | | < 5.0 |

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563803 | 563804 | 563805 | 563806 | 563807 | 563808 | 563809 | 563810 |
| Order No.: | | | | Client Sample Ref.: | TP8 | TP20 | TP20 | TP9 | TP9 | TP9 | TP9 | TP19 |
| | | | | Client Sample ID.: | ES3 | ES1 | ES2 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 2.00 | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.70 | 0.50 |
| | | | | Date Sampled: | 12-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - | | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 9.1 | 5.8 | 6.0 | 11 | 8.8 | 8.8 | | 6.6 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 1.9 | 2.8 | 1.5 | 1.2 | 2.8 | 0.84 | | 2.2 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 37 | 39 | 47 | 340 | 130 | 280 | | 120 |
| Barium | U | 2450 | mg/kg | 10 | < 10 | 150 | 170 | 280 | 450 | 87 | | 510 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.28 | 0.41 | 0.50 | 2.5 | 2.3 | 18 | | 2.7 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | 6.4 | 7.4 | 23 | 13 | 64 | | 18 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | 2.5 | 2.9 | 18 | 10 | 17 | | 7.3 |
| Copper | U | 2450 | mg/kg | 0.50 | 130 | 160 | 200 | 1700 | 600 | 3200 | | 500 |
| Mercury | U | 2450 | mg/kg | 0.10 | < 0.10 | 0.47 | 0.61 | 9.8 | 2.4 | 50 | | 3.2 |
| Nickel | U | 2450 | mg/kg | 0.50 | 4.3 | 8.6 | 9.1 | 23 | 20 | 31 | | 23 |
| Lead | U | 2450 | mg/kg | 0.50 | 110 | 690 | 750 | 3500 | 1400 | 2200 | | 950 |
| Selenium | U | 2450 | mg/kg | 0.20 | < 0.20 | 0.37 | 0.31 | 3.6 | 1.5 | 3.6 | | 0.97 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 21 | 36 | 40 | 44 | 40 | 38 | | 40 |
| Zinc | U | 2450 | mg/kg | 0.50 | 120 | 180 | 230 | 660 | 650 | 9200 | | 920 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 6.3 | 7.3 | 8.5 | 32 | 14 | 11 | | 15 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | 21 | < 0.10 | 27 | < 0.10 | 19 | | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | 21 | < 1.0 | 27 | < 1.0 | 19 | | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | 3.7 | < 0.10 | 3.8 | < 0.10 | | 1.3 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | 2.0 | 3.3 | 2.9 | 3.4 | 2.0 | | 5.0 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | 61 | 7.9 | 65 | 9.2 | 66 | | 7.7 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | 1.7 | < 0.10 | 1.4 | < 0.10 | | 0.73 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563803 | 563804 | 563805 | 563806 | 563807 | 563808 | 563809 | 563810 |
| Order No.: | | | | Client Sample Ref.: | TP8 | TP20 | TP20 | TP9 | TP9 | TP9 | TP9 | TP19 |
| | | | | Client Sample ID.: | ES3 | ES1 | ES2 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 2.00 | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.70 | 0.50 |
| | | | | Date Sampled: | 12-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | 63 | 17 | 68 | 18 | 68 | | 15 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | 84 | 17 | 95 | 18 | 88 | | 15 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | | | < 0.50 | < 0.50 | | | |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Benzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Toluene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Styrene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563803 | 563804 | 563805 | 563806 | 563807 | 563808 | 563809 | 563810 |
| Order No.: | | | | Client Sample Ref.: | TP8 | TP20 | TP20 | TP9 | TP9 | TP9 | TP9 | TP19 |
| | | | | Client Sample ID.: | ES3 | ES1 | ES2 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 2.00 | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.70 | 0.50 |
| | | | | Date Sampled: | 12-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | | | < 0.20 | < 0.20 | | | |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Phenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Isophorone | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 563803 | 563804 | 563805 | 563806 | 563807 | 563808 | 563809 | 563810 |
| Order No.: | | | | | Client Sample Ref.: | TP8 | TP20 | TP20 | TP9 | TP9 | TP9 | TP9 | TP19 |
| | | | | | Client Sample ID.: | ES3 | ES1 | ES2 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 2.00 | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.70 | 0.50 |
| | | | | | Date Sampled: | 12-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Naphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | 0.53 | < 0.050 | < 0.050 | | | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | 0.23 | < 0.050 | < 0.050 | | | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | | 0.053 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | | 0.085 | < 0.050 | 0.64 | < 0.050 | < 0.050 | | | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | 0.43 | < 0.050 | < 0.050 | | | |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Fluorene | N | 2790 | mg/kg | 0.050 | | 0.17 | 0.053 | 0.69 | 0.066 | < 0.050 | | | |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Azobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | | 1.9 | 0.89 | 8.9 | 0.79 | 0.27 | | | |
| Anthracene | N | 2790 | mg/kg | 0.050 | | 0.43 | 0.19 | 1.7 | 0.22 | < 0.050 | | | |
| Carbazole | N | 2790 | mg/kg | 0.050 | | 0.14 | 0.064 | 0.80 | < 0.050 | < 0.050 | | | |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | | 1.9 | 1.1 | 9.2 | 1.0 | 0.58 | | | |
| Pyrene | N | 2790 | mg/kg | 0.050 | | 1.6 | 0.85 | 7.3 | 0.97 | 0.37 | | | |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | | 0.88 | 0.48 | 4.0 | 0.51 | 0.29 | | | |
| Chrysene | N | 2790 | mg/kg | 0.050 | | 0.80 | 0.46 | 3.5 | 0.49 | 0.34 | | | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563803 | 563804 | 563805 | 563806 | 563807 | 563808 | 563809 | 563810 |
| Order No.: | | | | Client Sample Ref.: | TP8 | TP20 | TP20 | TP9 | TP9 | TP9 | TP9 | TP19 |
| | | | | Client Sample ID.: | ES3 | ES1 | ES2 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 2.00 | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.70 | 0.50 |
| | | | | Date Sampled: | 12-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.92 | 0.55 | 3.9 | 0.65 | 0.47 | | |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.30 | 0.20 | 1.1 | 0.22 | 0.14 | | |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | | 0.55 | 0.37 | 2.5 | 0.44 | 0.35 | | |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | | 0.26 | 0.17 | 1.1 | 0.22 | 0.20 | | |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | | 0.096 | < 0.050 | 0.44 | 0.066 | 0.11 | | |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | | 0.28 | 0.17 | 1.3 | 0.23 | 0.31 | | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | < 0.010 | 0.43 | 0.47 | 4.7 | 0.37 | 0.46 | | 0.31 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | < 0.010 | 0.17 | 0.16 | 1.1 | 0.27 | 0.18 | | 0.16 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | < 0.010 | 0.69 | 0.27 | 2.7 | 0.20 | 0.10 | | 0.16 |
| Fluorene | N | 2800 | mg/kg | 0.010 | < 0.010 | 0.98 | 0.37 | 3.7 | 0.29 | 0.15 | | 0.24 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | < 0.010 | 10 | 5.2 | 39 | 4.1 | 2.8 | | 3.4 |
| Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | 2.4 | 1.1 | 8.5 | 1.1 | 0.70 | | 0.77 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | 9.4 | 6.2 | 43 | 6.9 | 5.3 | | 5.3 |
| Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | 7.1 | 4.8 | 35 | 5.7 | 4.4 | | 4.3 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | 3.7 | 2.6 | 19 | 3.1 | 2.6 | | 2.4 |
| Chrysene | N | 2800 | mg/kg | 0.010 | < 0.010 | 4.1 | 2.9 | 20 | 3.4 | 2.9 | | 2.7 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | 3.8 | 2.9 | 20 | 3.8 | 3.9 | | 2.9 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | 1.4 | 1.0 | 7.2 | 1.4 | 1.5 | | 0.97 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | 2.8 | 2.1 | 16 | 3.0 | 3.3 | | 2.2 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | 1.7 | 1.3 | 9.7 | 2.0 | 2.7 | | 1.4 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | 0.37 | 0.24 | 2.6 | 0.47 | 0.57 | | 0.30 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | < 0.010 | 1.5 | 1.1 | 8.2 | 1.8 | 2.5 | | 1.3 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | < 0.20 | 51 | 33 | 240 | 38 | 34 | | 29 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 100.00 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 563803 | 563804 | 563805 | 563806 | 563807 | 563808 | 563809 | 563810 |
| Order No.: | | | Client Sample Ref.: | | TP8 | TP20 | TP20 | TP9 | TP9 | TP9 | TP9 | TP19 |
| | | | Client Sample ID.: | | ES3 | ES1 | ES2 | ES1 | ES2 | ES3 | ES4 | ES1 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 2.00 | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.70 | 0.50 |
| | | | Date Sampled: | | 12-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 100.00 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | > 5000 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 20.00 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 20.00 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563811 | 563812 | 563813 | 563815 | 563816 | 563817 | 563818 | 563819 |
| Order No.: | | | | Client Sample Ref.: | TP19 | TP11 | TP11 | TP11 | TP12 | TP12 | TP12 | TP13 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES4 | ES1 | ES2 | ES3 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.20 | 1.50 | 0.50 | 1.50 | 2.30 | 0.60 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 3.7 | 6.7 | 5.2 | | 3.1 | 7.6 | 11 | 5.8 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | 0.50 | < 0.50 | | < 0.50 | < 0.50 | 2.1 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 3.2 | 1.9 | 1.3 | | 1.6 | 1.8 | 1.5 | 1.3 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 35 | 110 | 50 | | 38 | 84 | 270 | 21 |
| Barium | U | 2450 | mg/kg | 10 | 44 | 500 | 370 | | 140 | 520 | 240 | 89 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.32 | 1.6 | 0.59 | | 0.45 | 0.82 | 0.66 | 0.30 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | 13 | 5.3 | | 2.6 | 14 | 6.4 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | 9.0 | 3.4 | | 3.3 | 11 | 12 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 170 | 490 | 180 | | 100 | 390 | 270 | 110 |
| Mercury | U | 2450 | mg/kg | 0.10 | 0.32 | 1.3 | 0.43 | | 2.7 | 1.0 | 55 | 1.2 |
| Nickel | U | 2450 | mg/kg | 0.50 | 4.1 | 15 | 39 | | 23 | 21 | 8.8 | 7.7 |
| Lead | U | 2450 | mg/kg | 0.50 | 120 | 1100 | 300 | | 640 | 1300 | 7500 | 200 |
| Selenium | U | 2450 | mg/kg | 0.20 | 0.20 | 0.95 | 0.30 | | 0.27 | 2.0 | 85 | 1.2 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 20 | 35 | 33 | | 31 | 21 | 16 | 24 |
| Zinc | U | 2450 | mg/kg | 0.50 | 99 | 500 | 200 | | 170 | 380 | 190 | 120 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 5.1 | 13 | 25 | | 15 | 7.7 | 7.4 | 7.5 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | 22 | < 0.10 | | < 0.10 | 28 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | 22 | < 1.0 | | < 1.0 | 28 | < 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | 3.1 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | 1.7 | 1.7 | | < 0.10 | < 0.10 | 3.6 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | 91 | 3.6 | | < 0.10 | 32 | 12 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | | < 0.10 | < 0.10 | 1.8 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563811 | 563812 | 563813 | 563815 | 563816 | 563817 | 563818 | 563819 |
| Order No.: | | | | Client Sample Ref.: | TP19 | TP11 | TP11 | TP11 | TP12 | TP12 | TP12 | TP13 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES4 | ES1 | ES2 | ES3 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.20 | 1.50 | 0.50 | 1.50 | 2.30 | 0.60 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | 93 | 5.3 | | < 1.0 | 32 | 20 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | 110 | 5.3 | | < 2.0 | 60 | 20 | < 2.0 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | | | | | | | |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Benzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Toluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Styrene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | | | | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563811 | 563812 | 563813 | 563815 | 563816 | 563817 | 563818 | 563819 |
| Order No.: | | | | Client Sample Ref.: | TP19 | TP11 | TP11 | TP11 | TP12 | TP12 | TP12 | TP13 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES4 | ES1 | ES2 | ES3 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.20 | 1.50 | 0.50 | 1.50 | 2.30 | 0.60 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | | | | | | | |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Phenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Isophorone | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563811 | 563812 | 563813 | 563815 | 563816 | 563817 | 563818 | 563819 |
| Order No.: | | | | Client Sample Ref.: | TP19 | TP11 | TP11 | TP11 | TP12 | TP12 | TP12 | TP13 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES4 | ES1 | ES2 | ES3 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.20 | 1.50 | 0.50 | 1.50 | 2.30 | 0.60 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Naphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Fluorene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Azobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | | 1.1 | < 0.050 | | < 0.050 | 0.55 | 0.79 | 0.17 |
| Anthracene | N | 2790 | mg/kg | 0.050 | | 0.27 | < 0.050 | | < 0.050 | 0.097 | 0.16 | < 0.050 |
| Carbazole | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | | 1.7 | < 0.050 | | < 0.050 | 1.0 | 1.8 | 0.29 |
| Pyrene | N | 2790 | mg/kg | 0.050 | | 1.6 | < 0.050 | | < 0.050 | 0.88 | 1.1 | 0.24 |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | | 0.80 | < 0.050 | | < 0.050 | 0.49 | 0.71 | 0.14 |
| Chrysene | N | 2790 | mg/kg | 0.050 | | 0.76 | < 0.050 | | < 0.050 | 0.54 | 0.89 | 0.14 |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563811 | 563812 | 563813 | 563815 | 563816 | 563817 | 563818 | 563819 |
| Order No.: | | | | Client Sample Ref.: | TP19 | TP11 | TP11 | TP11 | TP12 | TP12 | TP12 | TP13 |
| | | | | Client Sample ID.: | ES2 | ES1 | ES2 | ES4 | ES1 | ES2 | ES3 | ES1 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 1.50 | 0.50 | 1.20 | 1.50 | 0.50 | 1.50 | 2.30 | 0.60 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.87 | < 0.050 | | < 0.050 | 0.73 | 1.4 | 0.18 |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | | 0.29 | < 0.050 | | < 0.050 | 0.21 | 0.29 | < 0.050 |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | | 0.51 | < 0.050 | | < 0.050 | 0.47 | 0.32 | 0.096 |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | | 0.27 | < 0.050 | | < 0.050 | 0.23 | 0.32 | < 0.050 |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | | 0.086 | < 0.050 | | < 0.050 | 0.065 | 0.12 | < 0.050 |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | | 0.28 | < 0.050 | | < 0.050 | 0.27 | 0.27 | < 0.050 |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | | < 0.050 | < 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Naphthalene | N | 2800 | mg/kg | 0.010 | 0.15 | 0.23 | 0.27 | | 0.17 | 0.28 | 0.20 | 0.050 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | < 0.010 | 0.15 | 0.060 | | 0.030 | 0.18 | 0.95 | 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | < 0.010 | 0.080 | 0.12 | | 0.020 | 0.040 | < 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | 0.090 | 0.14 | 0.17 | | 0.050 | 0.070 | 0.030 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 1.0 | 2.5 | 2.0 | | 0.98 | 2.2 | 3.0 | 0.23 |
| Anthracene | N | 2800 | mg/kg | 0.010 | 0.20 | 0.51 | 0.42 | | 0.15 | 0.37 | 0.70 | 0.030 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 1.1 | 4.1 | 2.3 | | 1.4 | 3.5 | 8.0 | 0.44 |
| Pyrene | N | 2800 | mg/kg | 0.010 | 0.90 | 3.4 | 1.9 | | 1.2 | 2.5 | 4.0 | 0.34 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 0.39 | 1.9 | 0.78 | | 0.46 | 1.3 | 3.0 | 0.060 |
| Chrysene | N | 2800 | mg/kg | 0.010 | 0.40 | 2.2 | 1.0 | | 0.58 | 1.6 | 5.5 | 0.10 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.37 | 2.2 | 0.92 | | 0.70 | 1.8 | 7.0 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.12 | 0.74 | 0.26 | | < 0.010 | 0.64 | 2.5 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | 0.29 | 1.4 | 0.50 | | 0.28 | 0.96 | 1.6 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | 0.18 | 0.72 | 0.19 | | 0.090 | 0.62 | 3.1 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | 0.010 | 0.030 | 0.030 | | < 0.010 | 0.070 | 0.59 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | 0.18 | 0.72 | 0.20 | | 0.10 | 0.56 | 2.3 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | 5.4 | 21 | 11 | | 6.2 | 17 | 42 | 1.3 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 100.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 563811 | 563812 | 563813 | 563815 | 563816 | 563817 | 563818 | 563819 |
| Order No.: | | | Client Sample Ref.: | | TP19 | TP11 | TP11 | TP11 | TP12 | TP12 | TP12 | TP13 |
| | | | Client Sample ID.: | | ES2 | ES1 | ES2 | ES4 | ES1 | ES2 | ES3 | ES1 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 1.50 | 0.50 | 1.20 | 1.50 | 0.50 | 1.50 | 2.30 | 0.60 |
| | | | Date Sampled: | | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 | 11-Jan-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 100.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 | < 5000 | < 5000 | > 5000 | < 5000 | < 5000 | < 5000 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 1000.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 20.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 20.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 200.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563820 | 563821 |
| Order No.: | | | | Client Sample Ref.: | TP21 | TP21 |
| | | | | Client Sample ID.: | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| ACM Type | U | 2192 | | N/A | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 8.0 | 7.4 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 1.3 | 1.5 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 160 | 86 |
| Barium | U | 2450 | mg/kg | 10 | 380 | 240 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 3.3 | 2.0 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 22 | 10 |
| Antimony | N | 2450 | mg/kg | 2.0 | 27 | 20 |
| Copper | U | 2450 | mg/kg | 0.50 | 920 | 390 |
| Mercury | U | 2450 | mg/kg | 0.10 | 1.7 | 1.6 |
| Nickel | U | 2450 | mg/kg | 0.50 | 14 | 10 |
| Lead | U | 2450 | mg/kg | 0.50 | 2000 | 1500 |
| Selenium | U | 2450 | mg/kg | 0.20 | 8.6 | 2.9 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 20 | 17 |
| Zinc | U | 2450 | mg/kg | 0.50 | 610 | 440 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 8.5 | 7.6 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563820 | 563821 |
| Order No.: | | | | Client Sample Ref.: | TP21 | TP21 |
| | | | | Client Sample ID.: | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | < 2.0 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 0.20 | | |
| Chloromethane | N | 2760 | µg/kg | 0.20 | | |
| Vinyl Chloride | N | 2760 | µg/kg | 0.20 | | |
| Bromomethane | N | 2760 | µg/kg | 0.20 | | |
| Chloroethane | N | 2760 | µg/kg | 0.20 | | |
| Trichlorofluoromethane | N | 2760 | µg/kg | 0.20 | | |
| 1,1-Dichloroethene | N | 2760 | µg/kg | 0.20 | | |
| Trans 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | |
| 1,1-Dichloroethane | N | 2760 | µg/kg | 0.20 | | |
| cis 1,2-Dichloroethene | N | 2760 | µg/kg | 0.20 | | |
| Bromochloromethane | N | 2760 | µg/kg | 0.50 | | |
| Trichloromethane | N | 2760 | µg/kg | 0.20 | | |
| 1,1,1-Trichloroethane | N | 2760 | µg/kg | 0.20 | | |
| Tetrachloromethane | N | 2760 | µg/kg | 0.20 | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 0.20 | | |
| Benzene | N | 2760 | µg/kg | 0.20 | | |
| 1,2-Dichloroethane | N | 2760 | µg/kg | 0.20 | | |
| Trichloroethene | N | 2760 | µg/kg | 0.20 | | |
| 1,2-Dichloropropane | N | 2760 | µg/kg | 0.20 | | |
| Dibromomethane | N | 2760 | µg/kg | 0.20 | | |
| Bromodichloromethane | N | 2760 | µg/kg | 0.20 | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | |
| Toluene | N | 2760 | µg/kg | 0.20 | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 0.20 | | |
| 1,1,2-Trichloroethane | N | 2760 | µg/kg | 0.20 | | |
| Tetrachloroethene | N | 2760 | µg/kg | 0.20 | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 0.20 | | |
| Dibromochloromethane | N | 2760 | µg/kg | 0.20 | | |
| 1,2-Dibromoethane | N | 2760 | µg/kg | 0.20 | | |
| Chlorobenzene | N | 2760 | µg/kg | 0.20 | | |
| 1,1,1,2-Tetrachloroethane | N | 2760 | µg/kg | 0.20 | | |
| Ethylbenzene | N | 2760 | µg/kg | 0.20 | | |
| m & p-Xylene | N | 2760 | µg/kg | 0.20 | | |
| o-Xylene | N | 2760 | µg/kg | 0.20 | | |
| Styrene | N | 2760 | µg/kg | 0.20 | | |
| Tribromomethane | N | 2760 | µg/kg | 0.20 | | |

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563820 | 563821 |
| Order No.: | | | | Client Sample Ref.: | TP21 | TP21 |
| | | | | Client Sample ID.: | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Isopropylbenzene | N | 2760 | µg/kg | 0.20 | | |
| Bromobenzene | N | 2760 | µg/kg | 0.20 | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 0.20 | | |
| N-Propylbenzene | N | 2760 | µg/kg | 0.20 | | |
| 2-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | |
| 1,3,5-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 0.20 | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 0.20 | | |
| 1,2,4-Trimethylbenzene | N | 2760 | µg/kg | 0.20 | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 0.20 | | |
| 1,3-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 0.20 | | |
| 1,4-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | |
| N-Butylbenzene | N | 2760 | µg/kg | 0.20 | | |
| 1,2-Dichlorobenzene | N | 2760 | µg/kg | 0.20 | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 0.20 | | |
| 1,2,4-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 0.20 | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 0.20 | | |
| Methyl Tert-Butyl Ether | N | 2760 | µg/kg | 0.20 | | |
| N-Nitrosodimethylamine | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Phenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2-Chlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Bis-(2-Chloroethyl)Ether | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 1,3-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 1,2-Dichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2-Methylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Bis(2-Chloroisopropyl)Ether | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Hexachloroethane | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| N-Nitrosodi-n-propylamine | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 4-Methylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Nitrobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Isophorone | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Bis(2-Chloroethoxy)Methane | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2,4-Dichlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563820 | 563821 |
| Order No.: | | | | Client Sample Ref.: | TP21 | TP21 |
| | | | | Client Sample ID.: | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| 1,2,4-Trichlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Naphthalene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Hexachlorobutadiene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 4-Chloro-3-Methylphenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2-Methylnaphthalene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2,4,6-Trichlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2,4,5-Trichlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2-Chloronaphthalene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2-Nitroaniline | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Acenaphthylene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Dimethylphthalate | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2,6-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Acenaphthene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Dibenzofuran | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 4-Chlorophenylphenylether | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2,4-Dinitrotoluene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Fluorene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Diethyl Phthalate | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 4-Nitroaniline | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Azobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| 4-Bromophenylphenyl Ether | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Hexachlorobenzene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Pentachlorophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Phenanthrene | N | 2790 | mg/kg | 0.050 | 0.28 | 0.14 |
| Anthracene | N | 2790 | mg/kg | 0.050 | 0.065 | < 0.050 |
| Carbazole | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Di-N-Butyl Phthalate | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Fluoranthene | N | 2790 | mg/kg | 0.050 | 0.51 | 0.22 |
| Pyrene | N | 2790 | mg/kg | 0.050 | 0.44 | 0.15 |
| Butylbenzyl Phthalate | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Benzo[a]anthracene | N | 2790 | mg/kg | 0.050 | 0.26 | 0.12 |
| Chrysene | N | 2790 | mg/kg | 0.050 | 0.27 | 0.11 |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Di-N-Octyl Phthalate | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 563820 | 563821 |
| Order No.: | | | | Client Sample Ref.: | TP21 | TP21 |
| | | | | Client Sample ID.: | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 |
| | | | | Date Sampled: | 11-Jan-2018 | 11-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Benzo[b]fluoranthene | N | 2790 | mg/kg | 0.050 | 0.36 | 0.14 |
| Benzo[k]fluoranthene | N | 2790 | mg/kg | 0.050 | 0.11 | 0.054 |
| Benzo[a]pyrene | N | 2790 | mg/kg | 0.050 | 0.25 | 0.086 |
| Indeno(1,2,3-c,d)Pyrene | N | 2790 | mg/kg | 0.050 | 0.11 | < 0.050 |
| Dibenz(a,h)Anthracene | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Benzo[g,h,i]perylene | N | 2790 | mg/kg | 0.050 | 0.12 | < 0.050 |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.050 | < 0.050 | < 0.050 |
| Naphthalene | N | 2800 | mg/kg | 0.010 | 0.090 | 0.10 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | 0.040 | 0.030 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | 0.040 | 0.020 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 0.88 | 1.1 |
| Anthracene | N | 2800 | mg/kg | 0.010 | 0.12 | 0.050 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 1.1 | 1.0 |
| Pyrene | N | 2800 | mg/kg | 0.010 | 0.82 | 0.47 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 0.27 | 0.13 |
| Chrysene | N | 2800 | mg/kg | 0.010 | 0.37 | 0.26 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.30 | 0.23 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.060 | 0.050 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | 0.14 | 0.060 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | 0.060 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | 0.070 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | 4.4 | 3.5 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-01051 | 18-01051 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 563820 | 563821 |
| Order No.: | | | Client Sample Ref.: | | TP21 | TP21 |
| | | | Client Sample ID.: | | ES1 | ES2 |
| | | | Sample Type: | | SOIL | SOIL |
| | | | Top Depth (m): | | 0.50 | 1.50 |
| | | | Date Sampled: | | 11-Jan-2018 | 11-Jan-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 | < 5.0 |

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563794 | | | | | | |
| **Sample Ref:** | TP18 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 2.6 2.5 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 47 47 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 2100 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 15 | 100 | -- | -- |
| pH | 2010 | U | | 3.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.011 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0012 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.039 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0013 | 0.013 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.14 | 1.4 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0094 | 0.094 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.27 | 2.7 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.23 | 2.3 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.5 | 15 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.31 | 3.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1000 | 10000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 990 | 9900 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 2.6 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 7.3 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563796 | | | | | | |
| **Sample Ref:** | TP18 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.42 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 5.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.015 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.032 | 0.32 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.27 | 2.7 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0061 | 0.061 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.043 | 0.43 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.15 | 1.5 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 2.1 | 21 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 240 | 2400 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 260 | 2600 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 4.0 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563797 | | | | | | |
| **Sample Ref:** | TP6 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 4.4 2.6 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 12 13 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 9400 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 26 | 100 | -- | -- |
| pH | 2010 | U | | 5.2 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0030 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.016 | 0.16 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.014 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0033 | 0.033 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.014 | 0.14 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0026 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.017 | 0.17 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.096 | 0.96 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0020 | 0.020 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 2.1 | 21 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.3 | 23 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.1 | 11 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1300 | 13000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1200 | 12000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 10 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563798 | | | | | | |
| **Sample Ref:** | TP6 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.40 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.99 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 5.7 | 100 | -- | -- |
| pH | 2010 | U | | 5.9 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0070 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0065 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00024 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0015 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0017 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0073 | 0.073 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.18 | 1.8 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.30 | 3.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 230 | 2300 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 240 | 2400 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 4.4 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563799 | | | | | | |
| **Sample Ref:** | TP7 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.66 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.2 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.014 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0016 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0010 | 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.017 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.14 | 1.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 28 | 280 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 30 | 300 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 4.2 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.5 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Chemtest Sample ID:** | 563800 | | | | | | |
| **Sample Ref:** | TP7 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 3.2 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 6.7 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 12 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 48 | 100 | -- | -- |
| pH | 2010 | U | | 6.2 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0070 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0079 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00028 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0011 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.020 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.11 | 1.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 190 | 1900 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 270 | 2700 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 11 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563801 | | | | | | |
| **Sample Ref:** | TP8 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 3.1 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 1300 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 52 | 100 | -- | -- |
| pH | 2010 | U | | 6.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.013 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00022 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0024 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0014 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.045 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.52 | 5.2 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 870 | 8700 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 870 | 8700 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563802 | | | | | | |
| **Sample Ref:** | TP8 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 3.1 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 6.6 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 4200 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 25 | 100 | -- | -- |
| pH | 2010 | U | | 5.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0050 | 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.012 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0088 | 0.088 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.018 | 0.18 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.017 | 0.17 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.026 | 0.26 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0013 | 0.013 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 3.1 | 31 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.1 | 21 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 2.1 | 21 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1200 | 12000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1100 | 11000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 2.9 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 9.3 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563803 | | | | | | |
| **Sample Ref:** | TP8 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | < 0.10 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 4.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0030 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.017 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0031 | 0.031 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.081 | 0.81 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0035 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0053 | 0.053 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.91 | 9.1 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.20 | 2.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 140 | 1400 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 150 | 1500 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 9.1 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563804 | | | | | | |
| **Sample Ref:** | TP20 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.40 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.83 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 23 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 51 | 100 | -- | -- |
| pH | 2010 | U | | 7.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0048 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00015 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0077 | 0.077 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0015 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0030 | 0.030 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.049 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.0 | 20 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.19 | 1.9 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 20 | 200 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 21 | 210 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.3 | 53 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.8 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563805 | | | | | | |
| **Sample Ref:** | TP20 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.60 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.1 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 17 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 33 | 100 | -- | -- |
| pH | 2010 | U | | 7.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.011 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0095 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0035 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0018 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0047 | 0.047 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0088 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.18 | 1.8 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 8.3 | 83 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 24 | 240 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 4.2 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 6.0 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563806 | | | | | | |
| **Sample Ref:** | TP9 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.8 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 3.3 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 140 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 240 | 100 | -- | -- |
| pH | 2010 | U | | 6.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.012 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.011 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00012 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0019 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0013 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.025 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.7 | 17 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.15 | 1.5 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 260 | 2600 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 330 | 3300 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 11 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Chemtest Sample ID:** | 563807 | | | | | | |
| **Sample Ref:** | TP9 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 2.3 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 3.0 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 18 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 38 | 100 | -- | -- |
| pH | 2010 | U | | 7.9 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0022 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.011 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0022 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0036 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0021 | 0.021 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0018 | 0.018 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.013 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.3 | 13 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.21 | 2.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 100 | 1000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 150 | 1500 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 8.8 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563808 | | | | | | |
| **Sample Ref:** | TP9 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 16 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 13 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 50 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 34 | 100 | -- | -- |
| pH | 2010 | U | | 6.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0070 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0040 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.012 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00032 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0049 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0017 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0011 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0043 | 0.043 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.016 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.8 | 18 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.33 | 3.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 33 | 330 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 71 | 710 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 4.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 8.8 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563810 | | | | | | |
| **Sample Ref:** | TP19 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 2.3 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 3.1 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 15 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 29 | 100 | -- | -- |
| pH | 2010 | U | | 7.8 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.010 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0090 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0021 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0022 | 0.022 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0051 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.5 | 15 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.22 | 2.2 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 13 | 130 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 29 | 290 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 4.3 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 6.6 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563811 | | | | | | |
| **Sample Ref:** | TP19 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.13 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 5.3 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.011 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0036 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0054 | 0.054 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0012 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0034 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 4.9 | 49 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 12 | 120 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 17 | 170 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 3.6 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 3.7 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563812 | | | | | | |
| **Sample Ref:** | TP11 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 2.3 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.2 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 80 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 21 | 100 | -- | -- |
| pH | 2010 | U | | 8.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.016 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0011 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.017 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0043 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0025 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0020 | 0.020 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0069 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.44 | 4.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 88 | 880 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 150 | 1500 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.5 | 55 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 6.7 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563813 | | | | | | |
| **Sample Ref:** | TP11 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.20 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 0.64 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.0 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 11 | 100 | -- | -- |
| pH | 2010 | U | | 7.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0050 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0053 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0062 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.2 | 12 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.23 | 2.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 100 | 1000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 150 | 1500 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.2 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563816 | | | | | | |
| **Sample Ref:** | TP12 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 0.54 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.3 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 6.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.016 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0045 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | < 0.0010 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.17 | 1.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 52 | 520 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 91 | 910 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 3.3 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 3.1 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563817 | | | | | | |
| **Sample Ref:** | TP12 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| **Determinand** | **SOP** | **Accred.** | **Units** | | | | |
| Total Organic Carbon | 2625 | U | % | 4.2 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.3 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 24 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 17 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.012 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0031 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.020 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00017 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0041 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0062 | 0.062 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0047 | 0.047 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0024 | 0.024 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.074 | 0.74 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.7 | 17 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.67 | 6.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 75 | 750 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 84 | 840 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.2 | 72 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 7.6 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563818 | | | | | | |
| **Sample Ref:** | TP12 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.30 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 4.9 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 3.8 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 20 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 42 | 100 | -- | -- |
| pH | 2010 | U | | 7.2 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0050 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0020 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.040 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00037 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0017 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0012 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.074 | 0.74 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0013 | 0.013 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0012 | 0.012 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.074 | 0.74 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.9 | 19 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.17 | 1.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 710 | 7100 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 740 | 7400 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.4 | 74 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 11 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563819 | | | | | | |
| **Sample Ref:** | TP13 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.60 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.8 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.48 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.011 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0070 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0017 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0030 | 0.030 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0054 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.1 | 21 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.42 | 4.2 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 49 | 490 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 48 | 480 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 4.1 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 5.8 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563820 | | | | | | |
| **Sample Ref:** | TP21 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.28 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.41 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 4.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0060 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.013 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0011 | 0.011 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.013 | 0.13 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0018 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0010 | 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0021 | 0.021 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.097 | 0.97 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.6 | 16 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.70 | 7.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 490 | 4900 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 580 | 5800 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | < 2.5 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 8.0 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01051 | | | | | | |
| **Chemtest Sample ID:** | 563821 | | | | | | |
| **Sample Ref:** | TP21 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 11-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.23 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.14 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 3.3 | 100 | -- | -- |
| pH | 2010 | U | | 7.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0090 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0024 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.018 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0048 | 0.048 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0056 | 0.056 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0037 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0016 | 0.016 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0016 | 0.016 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.33 | 3.3 | 4 | 50 | 200 |
| Chloride | 1220 | U | 22 | 220 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.5 | 15 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 900 | 9000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 920 | 9200 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 3.1 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 7.4 |

**Waste Acceptance Criteria**

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

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |
| 1920 | Phenols in Waters by HPLC | Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded. | Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection. |
| 2010 | pH Value of Soils | pH | pH Meter |
| 2015 | Acid Neutralisation Capacity | Acid Reserve | Titration |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2325 | Sulphide in Soils | Sulphide | Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2610 | Loss on Ignition | loss on ignition (LOI) | Determination of the proportion by mass that is lost from a soil by ignition at 550°C. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40 | Dichloromethane extraction / GC-FID |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. |
| 2790 | Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS | Semi-volatile organic compounds(cf. USEPA Method 8270) | Acetone/Hexane extraction / GC-MS |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS | Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene* | Dichloromethane extraction / GC-MS |
| 2815 | Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS | ICES7 PCB congeners | Acetone/Hexane extraction / GC-MS |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

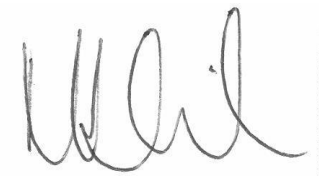
2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Certificate of Analysis

## Report No.: 18-68448-1

**Issue No.:** **1**
**Date of Issue** **01/02/2018**

| | |
|---|---|
| Customer Details: | Chemtest, Depot Road, Newmarket, Suffolk, CB8 0AL |
| Customer Contact: | Phil Hellier |
| Customer Order No.: | 16546 |
| Customer Reference: | 18-01051 |
| Quotation Reference: | 180119/02 |
| Description: | 23 soil samples |
| Date Received: | 18/01/2018 |
| Date Started: | 19/01/2018 |
| Date Completed: | 01/02/2018 |
| Test Methods: | Details available on request (refer to SOP code against relevant result/s) |
| Notes: | None |



Approved By: **Matthew Hickson, Laboratory Manager**

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service.
This certificate shall not be reproduced except in full without the prior written approval of the laboratory.
Observations and interpretations are outside of the scope of UKAS accreditation.
Results reported herein relate only to the items supplied to the laboratory for testing.

UKAS TESTING 1663

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

RPS Mountainheath Limited, Registered in England No. 2772276, a wholly-owned subsidiary of RPS Consulting Services Ltd.
A member of the RPS Group plc. Terms and conditions apply - copy on request

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Results Summary

**Report No.: 18-68448-1**

Customer Reference: 18-01051

Customer Order No: 16546

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Customer Sample No** | | | | | | **563794** | **563797** | **563798** | **563799** | **563800** | **563802** | **563804** | **563805** | **563806** | **563807** | **563808** | **563809** | **563810** | **563811** | **563812** | **563813** |
| Customer Sample ID | | | | | | TP18 | TP06 | TP06 | TP07 | TP07 | TP08 | TP20 | TP20 | TP09 | TP09 | TP09 | TP09 | TP19 | TP19 | TP11 | TP11 |
| RPS Sample No | | | | | | 351744 | 351745 | 351746 | 351747 | 351748 | 351749 | 351750 | 351751 | 351752 | 351753 | 351754 | 351755 | 351756 | 351757 | 351758 | 351759 |
| **Sample Type** | | | | | | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** |
| Sample Depth (m) | | | | | | 0.50m | 0.50m | 1.50m | 0.50m | 1.50m | 1.00m | 0.50m | 1.50m | 0.50m | 1.50m | 2.50m | 1.70m | 0.50m | 1.50m | 0.50m | 1.20m |
| Sampling Date | | | | | | 12/01/2018 | 12/01/2018 | 12/01/2018 | 12/01/2018 | 12/01/2018 | 12/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 |
| **Determinand** | **CAS No** | **Codes** | **SOP** | **Units** | **RL** | | | | | | | | | | | | | | | | |
| description of removed material | | N | in house | n/a | | Stones | Stones | Stones | Stones | Stones | Stones | Stones | Stones | Stones | Stones | Stones | | Stones | Stones | Stones | Stones |
| soil type | | N | in house | n/a | | Type 3 | Type 3 | Type 3 | Type 3 | Type 4 | Type 3 | Type 3 | Type 3 | Type 3 | Type 3 | Type 3 | Other type | Type 3 | Type 3 | Type 3 | Type 3 |
| weight of removed material | | N | in house | g | | 27.7 | 6.7 | 38.7 | 25.5 | 32.6 | 25.7 | 38.4 | 20.3 | 10.1 | 9.9 | 30.9 | S/C | 33.6 | 53.1 | 27.8 | 91.3 |
| 2,4,6-trinitrophenol (picric acid) | 88-89-1 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4-dinitrotoluene | 121-14-2 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,6-dinitrotoluene | 606-20-2 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| ethylene glycol dinitrate (EGDN) | 628-96-2 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cyclotetramethylenetetranitramine (HMX) | 2691-41-0 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| hexanitrostilbene (HNS) | 20062-22-0 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 100.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| nitrocellulose (NC) | 9004-70-0 | U | 376 | mg/kg | 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | > 5000 | < 5000 | < 5000 | < 5000 | < 5000 |
| nitroglycerine (NG) | 55-63-0 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| pentaerythritol tetranitrate (PETN) | 78-11-5 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 1000.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| picrite | 556-88-7 | M | 375 | mg/kg as DW | 5 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 20.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 |
| cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX) | 121-82-4 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4,6-trinitrotoluene (TNT) | 118-96-7 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 100.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| trinitro-2,4,6-phenylmethylnitramine (tetryl) | 479-45-8 | M | 375 | mg/kg as DW | 5 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Results Summary

**Report No.: 18-68448-1**

Customer Reference: 18-01051

Customer Order No: 16546

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Customer Sample No** | | **563815** | **563816** | **563817** | **563818** | **563819** | **563820** | **563821** |
| | | | | Customer Sample ID | | TP11 | TP12 | TP12 | TP12 | TP13 | TP21 | TP21 |
| | | | | RPS Sample No | | 351760 | 351761 | 351762 | 351763 | 351764 | 351765 | 351766 |
| | | | | **Sample Type** | | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** | **SOIL** |
| | | | | Sample Depth (m) | | 1.50m | 0.50m | 1.50m | 2.30m | 0.60m | 0.50m | 1.50m |
| | | | | Sampling Date | | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 | 11/01/2018 |
| **Determinand** | **CAS No** | **Codes** | **SOP** | **Units** | **RL** | | | | | | | |
| description of removed material | | N | in house | n/a | | | Stones | Stones | Stones | Stones | Stones | Stones |
| soil type | | N | in house | n/a | | Other type | Type 3 | Type 3 | Type 3 | Type 3 | Type 3 | Type 3 |
| weight of removed material | | N | in house | g | | S/C | 88.8 | 12.6 | 1.3 | 11.1 | 16.5 | 7.9 |
| 2,4,6-trinitrophenol (picric acid) | 88-89-1 | M | 375 | mg/kg as DW | 5 | < 20.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4-dinitrotoluene | 121-14-2 | M | 375 | mg/kg as DW | 5 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,6-dinitrotoluene | 606-20-2 | M | 375 | mg/kg as DW | 5 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| ethylene glycol dinitrate (EGDN) | 628-96-2 | M | 375 | mg/kg as DW | 5 | < 1000.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cyclotetramethylenetetranitramine (HMX) | 2691-41-0 | M | 375 | mg/kg as DW | 5 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| hexanitrostilbene (HNS) | 20062-22-0 | M | 375 | mg/kg as DW | 5 | < 100.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| nitrocellulose (NC) | 9004-70-0 | U | 376 | mg/kg | 5000 | > 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 |
| nitroglycerine (NG) | 55-63-0 | M | 375 | mg/kg as DW | 5 | < 1000.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| pentaerythritol tetranitrate (PETN) | 78-11-5 | M | 375 | mg/kg as DW | 5 | < 1000.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| picrite | 556-88-7 | M | 375 | mg/kg as DW | 5 | < 20.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 | < 5.00 |
| cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX) | 121-82-4 | M | 375 | mg/kg as DW | 5 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4,6-trinitrotoluene (TNT) | 118-96-7 | M | 375 | mg/kg as DW | 5 | < 100.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| trinitro-2,4,6-phenylmethylnitramine (tetryl) | 479-45-8 | M | 375 | mg/kg as DW | 5 | < 200.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

**Report No.: 18-68448-1**
Customer Reference: 18-01051
Customer Order No: 16546

## Comments

| RPS Sample Number | Customer Number | Sample Comments |
|---|---|---|
| 351748 | 563800 | Response for NG observed in this sample. However, it was below the reporting limit for this method. |
| 351752 | 563806 | Responses for NG and EGDN were observed in this sample. However these were below the reporting limits for these methods. |
| 351755 | 563809 | The sample was positive for Nitrocellulose. In addition, a flame test was performed on this sample, and it burned vigorously. The combination of these findings indicates that this material is pure gun cotton. As such it was not suitable for drying and grinding, and the nature of the sample matrix meant significant dilutions were required to perform chemical analyses. |
| 351760 | 563815 | The sample was positive for Nitrocellulose. In addition, a flame test was performed on this sample, and it burned vigorously. The combination of these findings indicates that this material is pure gun cotton. As such it was not suitable for drying and grinding, and the nature of the sample matrix meant significant dilutions were required to perform chemical analyses. |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Deviating Samples

**Report No.: 18-68448-1**

Customer Reference: 18-01051

Customer Order No: 16546

Our policy on Deviating Samples and reference list of Holding Times applied can be supplied on request. These have been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).
RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling, and it is possible that samples submitted may be declared to be deviating.
Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be invalid. The reason for a sample being declared to be deviating is indicated below.
Where no sampling date was supplied, samples have been declared to be deviating. However, if a date of sampling can be supplied, the results may be reissued with the deviating sample status removed.
Where the sample container used was unsuitable, the appropriate Holding Time was exceeded, or the sample is flagged as deviating for some other reason, re-sampling/re-submisson may be required.

| RPS No. | Customer No. | Customer ID | Date Sampled | Containers Received | Deviating Sample | Reason for Sample Deviation |
|---|---|---|---|---|---|---|
| 351744 | 563794 | | 12/01/2018 | 500ml plastic container | No | |
| 351745 | 563797 | | 12/01/2018 | 500ml plastic container | No | |
| 351746 | 563798 | | 12/01/2018 | 500ml plastic container | No | |
| 351747 | 563799 | | 12/01/2018 | 500ml plastic container | No | |
| 351748 | 563800 | | 12/01/2018 | 500ml plastic container | No | |
| 351749 | 563802 | | 12/01/2018 | 500ml plastic container | No | |
| 351750 | 563804 | | 11/01/2018 | 500ml plastic container | No | |
| 351751 | 563805 | | 11/01/2018 | 500ml plastic container | No | |
| 351752 | 563806 | | 11/01/2018 | 500ml plastic container | No | |
| 351753 | 563807 | | 11/01/2018 | 500ml plastic container | No | |
| 351754 | 563808 | | 11/01/2018 | 500ml plastic container | No | |
| 351755 | 563809 | | 11/01/2018 | 500ml plastic container | No | |
| 351756 | 563810 | | 11/01/2018 | 500ml plastic container | No | |
| 351757 | 563811 | | 11/01/2018 | 500ml plastic container | No | |
| 351758 | 563812 | | 11/01/2018 | 500ml plastic container | No | |
| 351759 | 563813 | | 11/01/2018 | 500ml plastic container | No | |
| 351760 | 563815 | | 11/01/2018 | 500ml plastic container | No | |
| 351761 | 563816 | | 11/01/2018 | 500ml plastic container | No | |
| 351762 | 563817 | | 11/01/2018 | 500ml plastic container | No | |
| 351763 | 563818 | | 11/01/2018 | 500ml plastic container | No | |
| 351764 | 563819 | | 11/01/2018 | 500ml plastic container | No | |
| 351765 | 563820 | | 11/01/2018 | 500ml plastic container | No | |
| 351766 | 563821 | | 11/01/2018 | 500ml plastic container | No | |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Report Information

### Key to Report Codes

| | |
|---|---|
| U | UKAS Accredited |
| M | MCERTS Accredited |
| N | Not accredited |
| S | Subcontracted to approved laboratory |
| US | Subcontracted to approved laboratory UKAS Accredited for the test |
| MS | Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test |
| SI | Subcontracted to internal RPS Group laboratory |
| USI | Subcontracted to internal RPS Group laboratory UKAS Accredited for the test |
| MSI | Subcontracted to internal RPS Group laboratory MCERTS/UKAS Accredited for the test |
| I/S (in results) | Insufficient Sample |
| U/S (in results) | Unsuitable Sample |
| S/C (in results) | See Comments |
| ND (in results) | Not Detected |
| DW (in units) | Results are expressed on a dry weight basis |

Where the dry solids value of a sample is low (<50%), reporting limits are automatically raised for all determinants analysed on an as-received basis.

### Soil Typing

| | |
|---|---|
| Type 1 | Clay - Brown |
| Type 2 | Clay - Grey/Black |
| Type 3 | Sand |
| Type 4 | Top Soil (Standard) |
| Type 5 | Top Soil (High Peat) |
| Type 6 | Made Ground (>50% Clay) |
| Type 7 | Made Ground (>50% Sand) |
| Type 8 | Made Ground (>50% Top Soil) |
| Type X | Other (outside of MCERTS scope) |

### MCERTS Notes

| | |
|---|---|
| Note 1 | This test report shall not be reproduced except in full, without written approval of the Laboratory. |
| Note 2 | All results for soil samples are reported based on the dry weight of soil which has been air-dried in open, shallow trays at temperatures below 30°C and subsequently ground and sieved to pass through a nominal 710µm aperture sieve. Prior to grinding, any material which is retained on a sieve of mesh size 4.75mm is discarded. In most cases, analysis is carried out directly on these prepared soils. |
| Note 3 | Unless otherwise stated, results are not corrected for analytical recoveries. |
| Note 4 | All samples were received in good condition unless otherwise stated. Results provided by the Laboratory are based on samples submitted by clients. Once submitted, samples requiring analysis are stored at 5 ± 3°C. The Laboratory cannot be held responsible for the storage, condition or preservation of samples prior to arrival. |
| Note 5 | Samples were taken by the customer and, unless otherwise stated, sampling locations were not supplied. |
| Note 6 | Soil descriptions are given in order to provide a log of sample matrices submitted and are not intended as full geological descriptions. |
| Note 7 | Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. |

### Sample Retention and Disposal

Samples will generally* be retained for the following times prior to disposal:

| | |
|---|---|
| Perishables, e.g. foodstuffs | 1 month (if frozen) from the issue date of this report |
| Waters | 2 weeks from the issue date of this report |
| Other Liquids | 1 month from the issue date of this report |
| Solids (including Soils) | 1 month from the issue date of this report |

*Sample retention may be subject to agreement with the customer for particular projects

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-01350-3 | | |
| **Initial Date of Issue:** | 26-Feb-2018 | **Date of Re-Issue:** | 19-Mar-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 - Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 17-Jan-2018 |
| **Order No.:** | | **Date Instructed:** | 25-Jan-2018 |
| **No. of Samples:** | 10 | | |
| **Turnaround (Wkdays):** | 26 | **Results Due:** | 01-Mar-2018 |
| **Date Approved:** | 19-Mar-2018 | **Subcon Results Due:** | 15-Feb-2018 |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

# Bulk Identification Certificate

| | | | |
|---|---|---|---|
| **Client:** | Causeway Geotech Ltd | **Your Ref.:** | |
| **Site Address:** | | **Project:** | 17-1455 - Arklow WWTW Land GI |
| **Date Sampled:** | 15-Jan-2018 | **Job Number:** | 18-01350 |
| **Date Received:** | 17-Jan-2018 | **No Samples:** | |
| | | **Date Reported:** | 26-Feb-2018 |

| Sample No. | Sample Ref. | Description | SOP | Accred. | Laboratory | Material | Result |
|---|---|---|---|---|---|---|---|
| **565028** | ES3 | TP3A | 2185 | U | COVENTRY | Cement | Chrysotile |

**The in-house procedure SOP2185 is in accordance with the requirements of Appendix 2 of the Analyst Guide (HSG 248).**

**The results relate only to items tested as supplied by the client.**

**Comments and interpretations are beyond the scope of UKAS accreditation.**

**Samples associated with asbestos in building surveys are retained for six months (HSG 264 refers)**

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 565019 | 565020 | 565021 | 565022 | 565023 | 565024 | 565025 | 565026 |
| Order No.: | | | | Client Sample Ref.: | TP2 | TP2 | TP2 | TP2 | TP3A | TP3A | TP14 | TP14 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.20 | 1.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 |
| | | | | Date Sampled: | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | Fibres/Clumps | - | - | lagging | lagging | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | Chrysotile | No Asbestos Detected | No Asbestos Detected | Chrysotile Crocidolite | Chrysotile | No Asbestos Detected | No Asbestos Detected |
| Asbestos by Gravimetry | U | 2192 | % | 0.001 | | 0.090 | | | 4.5 | 0.025 | | |
| Total Asbestos | N | 2192 | % | 0.001 | | 0.090 | | | 4.5 | 0.025 | | |
| Moisture | N | 2030 | % | 0.020 | 9.7 | 11 | 12 | 12 | 12 | 12 | 19 | 13 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 37 | 50 | 39 | 7.7 | 3.7 | 0.96 | 1.7 | 1.1 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 360 | 61 | 880 | 160 | 100 | 70 | 310 | 44 |
| Barium | U | 2450 | mg/kg | 10 | 80 | 130 | 280 | 51 | 330 | 210 | 370 | 29 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 6.5 | 0.68 | 0.18 | < 0.10 | 5.5 | 5.1 | 22 | 0.71 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 25 | 7.5 | 8.5 | 3.8 | 9.4 | 3.9 | 22 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | 19 | 2.5 | 30 | 7.6 | 5.5 | 3.0 | 11 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 2500 | 470 | 290 | 55 | 330 | 280 | 2500 | 100 |
| Mercury | U | 2450 | mg/kg | 0.10 | 1.5 | 0.63 | 1.2 | 0.14 | 1.0 | 0.69 | 1.9 | 0.15 |
| Nickel | U | 2450 | mg/kg | 0.50 | 25 | 27 | 2.9 | < 0.50 | 57 | 30 | 18 | 1.7 |
| Lead | U | 2450 | mg/kg | 0.50 | 2900 | 520 | 5700 | 210 | 1700 | 760 | 2200 | 200 |
| Selenium | U | 2450 | mg/kg | 0.20 | 1.7 | 0.20 | 2.5 | 0.64 | 0.78 | 0.44 | 2.7 | 2.4 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 79 | 89 | 12 | 8.4 | 75 | 31 | 29 | 12 |
| Zinc | U | 2450 | mg/kg | 0.50 | 1100 | 210 | 92 | 25 | 4000 | 2700 | 6100 | 210 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 120 | 27 | 3.4 | 2.8 | 27 | 16 | 15 | 4.0 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | 5.0 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | 8.7 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | 3.4 | 25 | 1.0 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | 12 | 50 | 13 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 170 | 2200 | 110 | 12 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 1100 | 24000 | 1500 | 140 | 24 | < 0.10 | 24 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | 42 | 3300 | 97 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 1300 | 30000 | 1700 | 150 | 24 | < 1.0 | 24 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | 30 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | 100 | 4.2 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | 4.2 | 1100 | 55 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 66 | 2400 | 260 | 40 | 11 | 6.6 | 21 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 565019 | 565020 | 565021 | 565022 | 565023 | 565024 | 565025 | 565026 |
| Order No.: | | | | | Client Sample Ref.: | TP2 | TP2 | TP2 | TP2 | TP3A | TP3A | TP14 | TP14 |
| | | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.50 | 1.20 | 1.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 |
| | | | | | Date Sampled: | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | | 1500 | 24000 | 2000 | 260 | 65 | 46 | 140 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | | < 0.10 | 3700 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | | 1600 | 31000 | 2300 | 310 | 77 | 53 | 160 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | | 2900 | 61000 | 4100 | 460 | 100 | 53 | 180 | < 2.0 |
| N-Nitrosodimethylamine | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Phenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2-Chlorophenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Bis-(2-Chloroethyl)Ether | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 1,3-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 1,2-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2-Methylphenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Bis(2-Chloroisopropyl)Ether | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Hexachloroethane | N | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| N-Nitrosodi-n-propylamine | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 4-Methylphenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Nitrobenzene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Isophorone | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Bis(2-Chloroethoxy)Methane | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2,4-Dichlorophenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 1,2,4-Trichlorobenzene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Naphthalene | U | 2790 | mg/kg | 0.50 | | | 1.3 | | | < 0.50 | < 0.50 | < 0.50 | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Hexachlorobutadiene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 4-Chloro-3-Methylphenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2-Methylnaphthalene | U | 2790 | mg/kg | 0.50 | | | 4.1 | | | < 0.50 | < 0.50 | < 0.50 | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2,4,6-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2,4,5-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2-Chloronaphthalene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2-Nitroaniline | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Acenaphthylene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Dimethylphthalate | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| 2,6-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | |
| Acenaphthene | U | 2790 | mg/kg | 0.50 | | | < 0.50 | | | < 0.50 | < 0.50 | 1.5 | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 565019 | 565020 | 565021 | 565022 | 565023 | 565024 | 565025 | 565026 |
| Order No.: | | | | | Client Sample Ref.: | TP2 | TP2 | TP2 | TP2 | TP3A | TP3A | TP14 | TP14 |
| | | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.50 | 1.20 | 1.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 |
| | | | | | Date Sampled: | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Dibenzofuran | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | 1.4 | | |
| 4-Chlorophenylphenylether | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| 2,4-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Fluorene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | 1.5 | | |
| Diethyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| 4-Nitroaniline | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Azobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| 4-Bromophenylphenyl Ether | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Hexachlorobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Phenanthrene | U | 2790 | mg/kg | 0.50 | | 5.2 | | | 3.2 | 2.6 | 18 | | |
| Anthracene | U | 2790 | mg/kg | 0.50 | | 0.56 | | | 0.68 | 0.57 | 4.2 | | |
| Carbazole | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | 1.8 | | |
| Di-N-Butyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Fluoranthene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 6.7 | 5.3 | 20 | | |
| Pyrene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 6.0 | 4.4 | 17 | | |
| Butylbenzyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Benzo[a]anthracene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 3.0 | 2.6 | 10 | | |
| Chrysene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 3.8 | 2.3 | 10 | | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Di-N-Octyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | < 0.50 | < 0.50 | < 0.50 | | |
| Benzo[b]fluoranthene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 4.6 | 4.5 | 9.9 | | |
| Benzo[k]fluoranthene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 1.4 | 1.2 | 4.2 | | |
| Benzo[a]pyrene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 2.3 | 2.3 | 5.3 | | |
| Indeno(1,2,3-c,d)Pyrene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 2.0 | 2.0 | 4.5 | | |
| Dibenz(a,h)Anthracene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 0.82 | 0.88 | 2.3 | | |
| Benzo[g,h,i]perylene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | | 2.2 | 2.4 | 4.5 | | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | 1.8 | 1.3 | 2.5 | < 0.010 | 0.49 | 0.61 | 0.42 | < 0.010 | |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | 0.97 | < 0.010 | 0.72 | < 0.010 | 0.27 | 0.92 | 0.58 | < 0.010 | |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | 0.88 | < 0.010 | 1.2 | < 0.010 | 0.19 | 0.20 | 0.080 | < 0.010 | |
| Fluorene | N | 2800 | mg/kg | 0.010 | 1.4 | < 0.010 | 2.0 | < 0.010 | 0.26 | 0.49 | 0.27 | < 0.010 | |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 6.8 | 4.1 | 19 | 0.20 | 5.4 | 10 | 4.5 | < 0.010 | |
| Anthracene | N | 2800 | mg/kg | 0.010 | 2.3 | 0.58 | 5.3 | 0.040 | 0.89 | 1.7 | 1.2 | < 0.010 | |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 6.0 | 1.5 | 20 | 0.25 | 7.3 | 18 | 8.6 | < 0.010 | |
| Pyrene | N | 2800 | mg/kg | 0.010 | 5.6 | 4.5 | 14 | 0.16 | 6.6 | 16 | 8.2 | < 0.010 | |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 2.4 | 0.23 | 8.4 | < 0.010 | 2.2 | 7.7 | 3.6 | < 0.010 | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 | 18-01350 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 565019 | 565020 | 565021 | 565022 | 565023 | 565024 | 565025 | 565026 |
| Order No.: | | | | | Client Sample Ref.: | TP2 | TP2 | TP2 | TP2 | TP3A | TP3A | TP14 | TP14 |
| | | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES1 | ES2 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.50 | 1.20 | 1.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 |
| | | | | | Date Sampled: | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 | 15-Jan-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Chrysene | N | 2800 | mg/kg | 0.010 | | 2.5 | < 0.010 | 8.7 | < 0.010 | 2.6 | 9.9 | 4.1 | < 0.010 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | | 2.7 | 0.020 | 8.3 | < 0.010 | 2.9 | 12 | 4.9 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | | 1.4 | < 0.010 | 3.6 | < 0.010 | 1.1 | 4.3 | 1.8 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | | 1.8 | < 0.010 | 7.6 | < 0.010 | 1.9 | 8.4 | 3.1 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | | 1.2 | 0.010 | 3.5 | < 0.010 | 1.1 | 5.8 | 2.1 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | | 0.78 | < 0.010 | 1.1 | < 0.010 | < 0.010 | 1.0 | 0.25 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | | 1.3 | < 0.010 | 2.9 | < 0.010 | 0.86 | 5.8 | 2.1 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | | 40 | 12 | 110 | 0.65 | 34 | 100 | 46 | < 0.20 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | | < 5000 | < 5000 | | < 5000 | < 5000 | < 5000 | < 5000 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | | < 5.0 | < 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01350 |
|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 565027 |
| Order No.: | | | | Client Sample Ref.: | TP14 |
| | | | | Client Sample ID.: | ES3 |
| | | | | Sample Type: | SOIL |
| | | | | Top Depth (m): | 1.60 |
| | | | | Date Sampled: | 15-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | |
| ACM Type | U | 2192 | | N/A | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected |
| Asbestos by Gravimetry | U | 2192 | % | 0.001 | |
| Total Asbestos | N | 2192 | % | 0.001 | |
| Moisture | N | 2030 | % | 0.020 | 38 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | 0.80 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | 1.1 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 1.5 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 500 |
| Barium | U | 2450 | mg/kg | 10 | 54 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 1.2 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 30 |
| Antimony | N | 2450 | mg/kg | 2.0 | 32 |
| Copper | U | 2450 | mg/kg | 0.50 | 1200 |
| Mercury | U | 2450 | mg/kg | 0.10 | 19 |
| Nickel | U | 2450 | mg/kg | 0.50 | 20 |
| Lead | U | 2450 | mg/kg | 0.50 | 8300 |
| Selenium | U | 2450 | mg/kg | 0.20 | 46 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 38 |
| Zinc | U | 2450 | mg/kg | 0.50 | 400 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 12 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | 0.50 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | 4.3 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 6.3 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01350 |
|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 565027 |
| Order No.: | | | | Client Sample Ref.: | TP14 |
| | | | | Client Sample ID.: | ES3 |
| | | | | Sample Type: | SOIL |
| | | | | Top Depth (m): | 1.60 |
| | | | | Date Sampled: | 15-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 18 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 29 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | 29 |
| N-Nitrosodimethylamine | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Phenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2-Chlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2-Methylphenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Hexachloroethane | N | 2790 | mg/kg | 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 4-Methylphenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Nitrobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Isophorone | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2,4-Dichlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Naphthalene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.50 | < 0.50 |
| Hexachlorobutadiene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2-Methylnaphthalene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2-Chloronaphthalene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2-Nitroaniline | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Acenaphthylene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Dimethylphthalate | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Acenaphthene | U | 2790 | mg/kg | 0.50 | < 0.50 |

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01350 |
|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 565027 |
| Order No.: | | | | Client Sample Ref.: | TP14 |
| | | | | Client Sample ID.: | ES3 |
| | | | | Sample Type: | SOIL |
| | | | | Top Depth (m): | 1.60 |
| | | | | Date Sampled: | 15-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.50 | < 0.50 |
| Dibenzofuran | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Fluorene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Diethyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 4-Nitroaniline | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.50 | < 0.50 |
| Azobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Hexachlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Pentachlorophenol | N | 2790 | mg/kg | 0.50 | < 0.50 |
| Phenanthrene | U | 2790 | mg/kg | 0.50 | 2.7 |
| Anthracene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Carbazole | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Fluoranthene | U | 2790 | mg/kg | 0.50 | 4.6 |
| Pyrene | U | 2790 | mg/kg | 0.50 | 3.3 |
| Butylbenzyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Benzo[a]anthracene | U | 2790 | mg/kg | 0.50 | 1.7 |
| Chrysene | U | 2790 | mg/kg | 0.50 | 2.8 |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Benzo[b]fluoranthene | U | 2790 | mg/kg | 0.50 | 3.2 |
| Benzo[k]fluoranthene | U | 2790 | mg/kg | 0.50 | 0.98 |
| Benzo[a]pyrene | U | 2790 | mg/kg | 0.50 | 1.0 |
| Indeno(1,2,3-c,d)Pyrene | U | 2790 | mg/kg | 0.50 | 1.1 |
| Dibenz(a,h)Anthracene | U | 2790 | mg/kg | 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | U | 2790 | mg/kg | 0.50 | 1.0 |
| Naphthalene | N | 2800 | mg/kg | 0.010 | 1.6 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | 0.51 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | 0.27 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 7.9 |
| Anthracene | N | 2800 | mg/kg | 0.010 | 0.99 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 11 |
| Pyrene | N | 2800 | mg/kg | 0.010 | 8.3 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 3.5 |

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-01350 |
|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 565027 |
| Order No.: | | | | Client Sample Ref.: | TP14 |
| | | | | Client Sample ID.: | ES3 |
| | | | | Sample Type: | SOIL |
| | | | | Top Depth (m): | 1.60 |
| | | | | Date Sampled: | 15-Jan-2018 |
| | | | | Asbestos Lab: | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | |
| Chrysene | N | 2800 | mg/kg | 0.010 | 5.9 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | 6.6 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | 2.5 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | 2.7 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | 2.8 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | 0.55 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | 2.7 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | 57 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | < 5.0 |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 |

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565019 | | | | | | |
| **Sample Ref:** | TP2 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.3 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.8 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 1600 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 40 | 100 | -- | -- |
| pH | 2010 | U | | 7.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.040 | 0.40 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.034 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0034 | 0.034 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0068 | 0.068 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.052 | 0.52 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.011 | 0.11 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.028 | 0.28 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.15 | 1.5 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0083 | 0.083 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 1.4 | 14 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.6 | 16 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1200 | 12000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1200 | 12000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 15 | 150 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 9.7 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565020 | | | | | | |
| **Sample Ref:** | TP2 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.20 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 27 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 44 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 57000 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 12 | 100 | -- | -- |
| pH | 2010 | U | | 6.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.013 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0034 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.019 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00014 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0043 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0039 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0041 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.016 | 0.16 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0025 | 0.025 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.014 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.8 | 18 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.50 | 5.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 160 | 1600 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 240 | 2400 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 24 | 240 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 11 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565021 | | | | | | |
| **Sample Ref:** | TP2 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.6 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.9 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 880 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 110 | 100 | -- | -- |
| pH | 2010 | U | | 5.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0043 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.043 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00060 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.014 | 0.14 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0066 | 0.066 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 1.2 | 12 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0030 | 0.030 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.080 | 0.80 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.41 | 4.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 90 | 900 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 120 | 1200 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 18 | 180 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565022 | | | | | | |
| **Sample Ref:** | TP2 | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 2.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.34 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0098 | 0.098 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.020 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00012 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0034 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0078 | 0.078 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.011 | 0.11 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.023 | 0.23 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0016 | 0.016 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.10 | 1.0 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.13 | 1.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 29 | 290 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 33 | 330 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 11 | 110 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565023 | | | | | | |
| **Sample Ref:** | TP3A | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 5.0 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 6.5 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 89 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 34 | 100 | -- | -- |
| pH | 2010 | U | | 7.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.021 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00016 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0012 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0024 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0032 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0092 | 0.092 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.052 | 0.52 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.52 | 5.2 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 130 | 1300 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 190 | 1900 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 11 | 110 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565024 | | | | | | |
| **Sample Ref:** | TP3A | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 4.3 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.5 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 61 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 100 | 100 | -- | -- |
| pH | 2010 | U | | 7.8 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0070 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0019 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.022 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0017 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0044 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0032 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.028 | 0.28 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.055 | 0.55 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.95 | 9.5 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 52 | 520 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 85 | 850 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 11 | 110 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565025 | | | | | | |
| **Sample Ref:** | TP14 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 2.1 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.8 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 51 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 46 | 100 | -- | -- |
| pH | 2010 | U | | 8.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0083 | 0.083 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.035 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00027 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.030 | 0.30 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0014 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0017 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.080 | 0.80 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.086 | 0.86 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.13 | 1.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 5.8 | 58 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 32 | 320 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 10 | 100 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 19 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565026 | | | | | | |
| **Sample Ref:** | TP14 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.11 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0050 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0032 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0080 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0071 | 0.071 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0011 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.054 | 0.54 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.013 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.080 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1.0 | 10 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 12 | 120 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 6.1 | 61 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-01350 | | | | | | |
| **Chemtest Sample ID:** | 565027 | | | | | | |
| **Sample Ref:** | TP14 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 1.60 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 15-Jan-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 26 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 26 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 23 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 57 | 100 | -- | -- |
| pH | 2010 | U | | 4.9 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.016 | 0.16 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.064 | 0.64 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0017 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.026 | 0.26 | 2 | 50 | 100 |
| Mercury | 1450 | U | 0.00095 | 0.0095 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0023 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.45 | 4.5 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0019 | 0.019 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0028 | 0.028 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.023 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 1.4 | 14 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.080 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 22 | 220 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 42 | 420 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 6.8 | 68 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 38 |

**Waste Acceptance Criteria**

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

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |
| 1920 | Phenols in Waters by HPLC | Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded. | Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection. |
| 2010 | pH Value of Soils | pH | pH Meter |
| 2015 | Acid Neutralisation Capacity | Acid Reserve | Titration |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2185 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2325 | Sulphide in Soils | Sulphide | Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2610 | Loss on Ignition | loss on ignition (LOI) | Determination of the proportion by mass that is lost from a soil by ignition at 550°C. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40 | Dichloromethane extraction / GC-FID |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2790 | Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS | Semi-volatile organic compounds(cf. USEPA Method 8270) | Acetone/Hexane extraction / GC-MS |
| 2800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS | Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene* | Dichloromethane extraction / GC-MS |
| 2815 | Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS | ICES7 PCB congeners | Acetone/Hexane extraction / GC-MS |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-04058-2 | | |
| **Initial Date of Issue:** | 12-Mar-2018 | **Date of Re-Issue:** | 21-Mar-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 12-Feb-2018 |
| **Order No.:** | | **Date Instructed:** | 22-Feb-2018 |
| **No. of Samples:** | 4 | | |
| **Turnaround (Wkdays):** | 17 | **Results Due:** | 16-Mar-2018 |
| **Date Approved:** | 16-Mar-2018 | **Subcon Results Due:** | 15-Mar-2018 |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-04058 | 18-04058 | 18-04058 | 18-04058 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 577747 | 577748 | 577749 | 577750 |
| Order No.: | | | | Client Sample Ref.: | BH20 | BH20 | BH20 | BH20 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.00 | 2.00 | 3.00 |
| | | | | Date Sampled: | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 11 | 14 | 14 | 18 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] 7.9 | [B] < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 1.3 | 1.2 | 1.1 | 0.85 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 13 | 10 | 3.4 | 7.7 |
| Barium | U | 2450 | mg/kg | 10 | 44 | < 10 | 38 | 120 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.67 | 1.1 | < 0.10 | 0.13 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 75 | 540 | 13 | 23 |
| Mercury | U | 2450 | mg/kg | 0.10 | 0.17 | < 0.10 | 0.33 | 0.17 |
| Nickel | U | 2450 | mg/kg | 0.50 | 9.4 | 7.0 | 5.0 | 25 |
| Lead | U | 2450 | mg/kg | 0.50 | 740 | 170 | 25 | 33 |
| Selenium | U | 2450 | mg/kg | 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 17 | 15 | 9.7 | 23 |
| Zinc | U | 2450 | mg/kg | 0.50 | 260 | 470 | 28 | 52 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 13 | 6.4 | 6.6 | 20 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | [B] 21 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | [B] 140 | [B] 24 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | [B] 1200 | [B] 200 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | [B] 140 | [B] 2.6 | [B] < 0.10 | [B] < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | [B] 1500 | [B] 230 | [B] < 1.0 | [B] < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | [B] 11 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | [B] 44 | [B] 12 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | [B] 550 | [B] 120 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | [B] 36 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | [B] 640 | [B] 130 | [B] < 1.0 | [B] < 1.0 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-04058 | 18-04058 | 18-04058 | 18-04058 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 577747 | 577748 | 577749 | 577750 |
| Order No.: | | | Client Sample Ref.: | | BH20 | BH20 | BH20 | BH20 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 0.50 | 1.00 | 2.00 | 3.00 |
| | | | Date Sampled: | | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | [B] 2100 | [B] 350 | [B] < 2.0 | [B] < 2.0 |
| N-Nitrosodimethylamine | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Phenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2-Chlorophenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Bis-(2-Chloroethyl)Ether | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 1,3-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 1,2-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2-Methylphenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Bis(2-Chloroisopropyl)Ether | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Hexachloroethane | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| N-Nitrosodi-n-propylamine | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 4-Methylphenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Nitrobenzene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Isophorone | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Bis(2-Chloroethoxy)Methane | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2,4-Dichlorophenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 1,2,4-Trichlorobenzene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Naphthalene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Hexachlorobutadiene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 4-Chloro-3-Methylphenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2-Methylnaphthalene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2,4,6-Trichlorophenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2,4,5-Trichlorophenol | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2-Chloronaphthalene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2-Nitroaniline | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Acenaphthylene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Dimethylphthalate | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2,6-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Acenaphthene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Dibenzofuran | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 4-Chlorophenylphenylether | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2,4-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-04058 | 18-04058 | 18-04058 | 18-04058 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 577747 | 577748 | 577749 | 577750 |
| Order No.: | | | | Client Sample Ref.: | BH20 | BH20 | BH20 | BH20 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.00 | 2.00 | 3.00 |
| | | | | Date Sampled: | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Fluorene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Diethyl Phthalate | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 4-Nitroaniline | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Azobenzene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| 4-Bromophenylphenyl Ether | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Hexachlorobenzene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Pentachlorophenol | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Phenanthrene | U | 2790 | mg/kg | 0.50 | [B] 1.5 | [B] 2.1 | [B] < 0.50 | [B] < 0.50 |
| Anthracene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Carbazole | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Di-N-Butyl Phthalate | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Fluoranthene | U | 2790 | mg/kg | 0.50 | [B] 1.7 | [B] 2.0 | [B] < 0.50 | [B] < 0.50 |
| Pyrene | U | 2790 | mg/kg | 0.50 | [B] 1.5 | [B] 1.6 | [B] < 0.50 | [B] < 0.50 |
| Butylbenzyl Phthalate | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Benzo[a]anthracene | U | 2790 | mg/kg | 0.50 | [B] 0.76 | [B] 0.93 | [B] < 0.50 | [B] < 0.50 |
| Chrysene | U | 2790 | mg/kg | 0.50 | [B] 0.89 | [B] 0.92 | [B] < 0.50 | [B] < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Di-N-Octyl Phthalate | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Benzo[b]fluoranthene | U | 2790 | mg/kg | 0.50 | [B] 0.76 | [B] 0.92 | [B] < 0.50 | [B] < 0.50 |
| Benzo[k]fluoranthene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Benzo[a]pyrene | U | 2790 | mg/kg | 0.50 | [B] 0.62 | [B] 0.72 | [B] < 0.50 | [B] < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Dibenz(a,h)Anthracene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Benzo[g,h,i]perylene | U | 2790 | mg/kg | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Naphthalene | N | 2800 | mg/kg | 0.010 | 0.68 | 1.3 | 0.21 | 0.32 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | 0.12 | 0.060 | 0.020 | 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | 0.18 | 0.51 | 0.030 | 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | 0.28 | 0.55 | 0.050 | 0.020 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 2.9 | 4.7 | 0.49 | 0.12 |
| Anthracene | N | 2800 | mg/kg | 0.010 | 0.61 | 1.0 | 0.080 | 0.030 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 3.0 | 4.0 | 0.47 | 0.090 |
| Pyrene | N | 2800 | mg/kg | 0.010 | 2.6 | 3.4 | 0.56 | 0.13 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 1.3 | 1.6 | 0.27 | < 0.010 |
| Chrysene | N | 2800 | mg/kg | 0.010 | 1.7 | 1.8 | 0.61 | < 0.010 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | 1.2 | 1.8 | < 0.010 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.53 | 0.64 | < 0.010 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | 0.77 | 1.1 | 0.18 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | 0.42 | 0.69 | < 0.010 | < 0.010 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-04058 | 18-04058 | 18-04058 | 18-04058 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 577747 | 577748 | 577749 | 577750 |
| Order No.: | | | Client Sample Ref.: | | BH20 | BH20 | BH20 | BH20 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 0.50 | 1.00 | 2.00 | 3.00 |
| | | | Date Sampled: | | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 | 07-Feb-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | 0.080 | 0.11 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | 0.32 | 0.59 | < 0.010 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | 17 | 24 | 3.0 | 0.73 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 | < 5000 | < 5000 | < 5000 |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Picrite | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04058 | | | | | | |
| **Chemtest Sample ID:** | 577747 | | | | | | |
| **Sample Ref:** | BH20 | | | | | | |
| **Sample ID:** | | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 07-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 3.3 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | [B] < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | [B] 310 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 17 | 100 | -- | -- |
| pH | 2010 | U | | 7.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.046 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0019 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.014 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00016 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0053 | 0.053 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0074 | 0.074 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0040 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0014 | 0.014 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.052 | 0.52 | 4 | 50 | 200 |
| Chloride | 1220 | U | 4.3 | 43 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.37 | 3.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 12 | 120 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1300 | 13000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 8.6 | 86 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 11 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04058 | | | | | | |
| **Chemtest Sample ID:** | 577748 | | | | | | |
| **Sample Ref:** | BH20 | | | | | | |
| **Sample ID:** | | | | | | | |
| **Top Depth(m):** | 1.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 07-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.9 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.2 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | [B] < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | [B] 110 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 24 | 100 | -- | -- |
| pH | 2010 | U | | 11.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.19 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0049 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.022 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0056 | 0.056 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.028 | 0.28 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0099 | 0.099 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0012 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0017 | 0.017 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.023 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 8.4 | 84 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.91 | 9.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1400 | 14000 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 1500 | 15000 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 10 | 100 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 14 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04058 | | | | | | |
| **Chemtest Sample ID:** | 577749 | | | | | | |
| **Sample Ref:** | BH20 | | | | | | |
| **Sample ID:** | | | | | | | |
| **Top Depth(m):** | 2.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 07-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.6 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | [B] < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | [B] < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 2.8 | 100 | -- | -- |
| pH | 2010 | U | | 11.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.12 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0027 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.016 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0013 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.016 | 0.16 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0036 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0044 | 0.044 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.015 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 8.9 | 89 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.44 | 4.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 740 | 7400 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 760 | 7600 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.3 | 73 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 14 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04058 | | | | | | |
| **Chemtest Sample ID:** | 577750 | | | | | | |
| **Sample Ref:** | BH20 | | | | | | |
| **Sample ID:** | | | | | | | |
| **Top Depth(m):** | 3.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 07-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.47 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.54 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | [B] < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | [B] < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.021 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0067 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0089 | 0.089 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.013 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 3.6 | 36 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.39 | 3.9 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 180 | 1800 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 190 | 1900 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.5 | 55 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 18 |

**Waste Acceptance Criteria**

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

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 577747 | BH20 | | 07-Feb-2018 | B | Amber Glass 250ml |
| 577747 | BH20 | | 07-Feb-2018 | B | Amber Glass 60ml |
| 577747 | BH20 | | 07-Feb-2018 | B | Plastic Tub 500g |
| 577748 | BH20 | | 07-Feb-2018 | B | Amber Glass 250ml |
| 577748 | BH20 | | 07-Feb-2018 | B | Amber Glass 60ml |
| 577748 | BH20 | | 07-Feb-2018 | B | Plastic Tub 500g |
| 577749 | BH20 | | 07-Feb-2018 | B | Amber Glass 250ml |
| 577749 | BH20 | | 07-Feb-2018 | B | Amber Glass 60ml |
| 577749 | BH20 | | 07-Feb-2018 | B | Plastic Tub 500g |
| 577750 | BH20 | | 07-Feb-2018 | B | Amber Glass 250ml |
| 577750 | BH20 | | 07-Feb-2018 | B | Amber Glass 60ml |
| 577750 | BH20 | | 07-Feb-2018 | B | Plastic Tub 500g |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |
| 1920 | Phenols in Waters by HPLC | Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded. | Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection. |
| 2010 | pH Value of Soils | pH | pH Meter |
| 2015 | Acid Neutralisation Capacity | Acid Reserve | Titration |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2325 | Sulphide in Soils | Sulphide | Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2610 | Loss on Ignition | loss on ignition (LOI) | Determination of the proportion by mass that is lost from a soil by ignition at 550°C. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40 | Dichloromethane extraction / GC-FID |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. |
| 2790 | Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS | Semi-volatile organic compounds(cf. USEPA Method 8270) | Acetone/Hexane extraction / GC-MS |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS | Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene* | Dichloromethane extraction / GC-MS |
| 2815 | Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS | ICES7 PCB congeners | Acetone/Hexane extraction / GC-MS |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-04450-4 | | |
| **Initial Date of Issue:** | 16-Mar-2018 | **Date of Re-Issue:** | 15-May-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 15-Feb-2018 |
| **Order No.:** | | **Date Instructed:** | 22-Feb-2018 |
| **No. of Samples:** | 8 | | |
| **Turnaround (Wkdays):** | 55 | **Results Due:** | 14-May-2018 |
| **Date Approved:** | 15-May-2018 | | |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 579614 | 579615 | 579616 | 579617 | 579618 | 579619 | 579620 | 579622 |
| Order No.: | | | | Client Sample Ref.: | BH06A | BH06A | BH06A | BH06A | BH07 | BH07 | BH07 | BH07 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES3 | ES5 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 | 2.00 | 3.00 | 0.50 | 1.50 | 2.50 | 4.50 |
| | | | | Date Sampled: | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 10 | 13 | 17 | 13 | 6.5 | 10 | 9.7 | 15 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | N | 2325 | mg/kg | 0.50 | 2.5 | 1.5 | 7.1 | 2.4 | 1.4 | 1.4 | 4.1 | 3.7 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 79 | 40 | 63 | 26 | 31 | 28 | 24 | 21 |
| Barium | U | 2450 | mg/kg | 10 | 120 | 38 | 260 | < 10 | 190 | 50 | 42 | < 10 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 3.5 | 2.9 | 8.8 | 2.6 | 0.57 | 0.30 | 0.45 | 0.55 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 4.2 | < 2.0 | 7.2 | < 2.0 | 2.4 | < 2.0 | < 2.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | 2.1 | < 2.0 | 2.1 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 370 | 95 | 640 | 120 | 150 | 100 | 26 | 15 |
| Mercury | U | 2450 | mg/kg | 0.10 | 0.89 | < 0.10 | < 0.10 | 0.10 | 1.6 | 0.14 | 0.46 | 0.31 |
| Nickel | U | 2450 | mg/kg | 0.50 | 27 | 9.6 | 46 | 9.7 | 20 | 16 | 0.62 | 2.9 |
| Lead | U | 2450 | mg/kg | 0.50 | 430 | 98 | 930 | 95 | 250 | 140 | 38 | 16 |
| Selenium | U | 2450 | mg/kg | 0.20 | 0.35 | 0.65 | 0.28 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 120 | 15 | 52 | 23 | 48 | 30 | 17 | 8.2 |
| Zinc | U | 2450 | mg/kg | 0.50 | 1300 | 2200 | 3100 | 290 | 310 | 280 | 190 | 230 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 17 | 5.3 | 19 | 14 | 12 | 16 | 12 | 4.7 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | 6.3 | 39 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 6.3 | 39 | < 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | 0.12 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | 8.0 | < 0.10 | 13 | < 0.10 | 1.0 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | 20 | < 0.10 | 44 | < 0.10 | 40 | 100 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | 0.55 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 579614 | 579615 | 579616 | 579617 | 579618 | 579619 | 579620 | 579622 |
| Order No.: | | | | Client Sample Ref.: | BH06A | BH06A | BH06A | BH06A | BH07 | BH07 | BH07 | BH07 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES3 | ES5 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 | 2.00 | 3.00 | 0.50 | 1.50 | 2.50 | 4.50 |
| | | | | Date Sampled: | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | 28 | < 1.0 | 58 | < 1.0 | 41 | 100 | < 1.0 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | 28 | < 2.0 | 58 | < 2.0 | 47 | 140 | < 2.0 | < 2.0 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Chloromethane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Vinyl Chloride | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Bromomethane | U | 2760 | µg/kg | 20 | | | | | < 20 | < 20 | | |
| Chloroethane | N | 2760 | µg/kg | 2.0 | | | | | < 2.0 | < 2.0 | | |
| Trichlorofluoromethane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,1-Dichloroethene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Trans 1,2-Dichloroethene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,1-Dichloroethane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| cis 1,2-Dichloroethene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Bromochloromethane | N | 2760 | µg/kg | 5.0 | | | | | < 5.0 | < 5.0 | | |
| Trichloromethane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,1,1-Trichloroethane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Tetrachloromethane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Benzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,2-Dichloroethane | U | 2760 | µg/kg | 2.0 | | | | | < 2.0 | < 2.0 | | |
| Trichloroethene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,2-Dichloropropane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Dibromomethane | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Bromodichloromethane | U | 2760 | µg/kg | 5.0 | | | | | < 5.0 | < 5.0 | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 10 | | | | | < 10 | < 10 | | |
| Toluene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 10 | | | | | < 10 | < 10 | | |
| 1,1,2-Trichloroethane | U | 2760 | µg/kg | 10 | | | | | < 10 | < 10 | | |
| Tetrachloroethene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 2.0 | | | | | < 2.0 | < 2.0 | | |
| Dibromochloromethane | N | 2760 | µg/kg | 10 | | | | | < 10 | < 10 | | |
| 1,2-Dibromoethane | U | 2760 | µg/kg | 5.0 | | | | | < 5.0 | < 5.0 | | |
| Chlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,1,1,2-Tetrachloroethane | U | 2760 | µg/kg | 2.0 | | | | | < 2.0 | < 2.0 | | |
| Ethylbenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| m & p-Xylene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| o-Xylene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Styrene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Tribromomethane | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 579614 | 579615 | 579616 | 579617 | 579618 | 579619 | 579620 | 579622 |
| Order No.: | | | | Client Sample Ref.: | BH06A | BH06A | BH06A | BH06A | BH07 | BH07 | BH07 | BH07 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES3 | ES5 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 | 2.00 | 3.00 | 0.50 | 1.50 | 2.50 | 4.50 |
| | | | | Date Sampled: | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Isopropylbenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Bromobenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 50 | | | | | < 50 | < 50 | | |
| N-Propylbenzene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 2-Chlorotoluene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,3,5-Trimethylbenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,2,4-Trimethylbenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,3-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,4-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| N-Butylbenzene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,2-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 50 | | | | | < 50 | < 50 | | |
| 1,2,4-Trichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 2.0 | | | | | < 2.0 | < 2.0 | | |
| Methyl Tert-Butyl Ether | U | 2760 | µg/kg | 1.0 | | | | | < 1.0 | < 1.0 | | |
| N-Nitrosodimethylamine | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Phenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2-Chlorophenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Bis-(2-Chloroethyl)Ether | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 1,3-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 1,2-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2-Methylphenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Bis(2-Chloroisopropyl)Ether | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Hexachloroethane | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| N-Nitrosodi-n-propylamine | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 4-Methylphenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Nitrobenzene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Isophorone | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Bis(2-Chloroethoxy)Methane | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2,4-Dichlorophenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 579614 | 579615 | 579616 | 579617 | 579618 | 579619 | 579620 | 579622 |
| Order No.: | | | | Client Sample Ref.: | BH06A | BH06A | BH06A | BH06A | BH07 | BH07 | BH07 | BH07 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES3 | ES5 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 | 2.00 | 3.00 | 0.50 | 1.50 | 2.50 | 4.50 |
| | | | | Date Sampled: | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| 1,2,4-Trichlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Naphthalene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Hexachlorobutadiene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 4-Chloro-3-Methylphenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2-Methylnaphthalene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2,4,6-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2,4,5-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2-Chloronaphthalene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2-Nitroaniline | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Acenaphthylene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Dimethylphthalate | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2,6-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Acenaphthene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Dibenzofuran | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 4-Chlorophenylphenylether | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2,4-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Fluorene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Diethyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 4-Nitroaniline | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Azobenzene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| 4-Bromophenylphenyl Ether | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Hexachlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Phenanthrene | U | 2790 | mg/kg | 0.50 | | | | | 1.5 | < 0.50 | | |
| Anthracene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Carbazole | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Di-N-Butyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Fluoranthene | U | 2790 | mg/kg | 0.50 | | | | | 1.7 | < 0.50 | | |
| Pyrene | U | 2790 | mg/kg | 0.50 | | | | | 1.6 | < 0.50 | | |
| Butylbenzyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Benzo[a]anthracene | U | 2790 | mg/kg | 0.50 | | | | | 0.94 | < 0.50 | | |
| Chrysene | U | 2790 | mg/kg | 0.50 | | | | | 0.89 | < 0.50 | | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 579614 | 579615 | 579616 | 579617 | 579618 | 579619 | 579620 | 579622 |
| Order No.: | | | | Client Sample Ref.: | BH06A | BH06A | BH06A | BH06A | BH07 | BH07 | BH07 | BH07 |
| | | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES3 | ES5 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 0.50 | 1.50 | 2.00 | 3.00 | 0.50 | 1.50 | 2.50 | 4.50 |
| | | | | Date Sampled: | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Di-N-Octyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Benzo[b]fluoranthene | U | 2790 | mg/kg | 0.50 | | | | | 0.98 | < 0.50 | | |
| Benzo[k]fluoranthene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Benzo[a]pyrene | U | 2790 | mg/kg | 0.50 | | | | | 0.83 | < 0.50 | | |
| Indeno(1,2,3-c,d)Pyrene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Dibenz(a,h)Anthracene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Benzo[g,h,i]perylene | U | 2790 | mg/kg | 0.50 | | | | | < 0.50 | < 0.50 | | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | 0.20 | < 0.010 | 0.78 | < 0.010 | 0.44 | 0.26 | < 0.010 | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | 0.010 | < 0.010 | 0.16 | < 0.010 | 0.21 | 0.11 | < 0.010 | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | 0.010 | < 0.010 | 0.22 | < 0.010 | 0.13 | 0.080 | < 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | 0.010 | < 0.010 | 0.51 | < 0.010 | 0.20 | 0.13 | < 0.010 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 0.61 | 0.050 | 4.4 | < 0.010 | 2.5 | 0.58 | < 0.010 | < 0.010 |
| Anthracene | N | 2800 | mg/kg | 0.010 | 0.060 | < 0.010 | 1.6 | < 0.010 | 0.61 | 0.21 | < 0.010 | < 0.010 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 0.65 | 0.070 | 3.7 | < 0.010 | 4.0 | 0.83 | < 0.010 | < 0.010 |
| Pyrene | N | 2800 | mg/kg | 0.010 | 0.51 | 0.060 | 3.3 | < 0.010 | 3.3 | 0.74 | < 0.010 | < 0.010 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 0.15 | < 0.010 | 3.2 | < 0.010 | 1.5 | 0.32 | < 0.010 | < 0.010 |
| Chrysene | N | 2800 | mg/kg | 0.010 | 0.17 | < 0.010 | 3.1 | < 0.010 | 1.9 | 0.22 | < 0.010 | < 0.010 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.12 | < 0.010 | 2.5 | < 0.010 | 1.8 | 0.23 | < 0.010 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.030 | < 0.010 | 0.84 | < 0.010 | 0.71 | 0.27 | < 0.010 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | 0.050 | < 0.010 | 2.5 | < 0.010 | 1.2 | 0.63 | < 0.010 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.89 | < 0.010 | 0.74 | 0.16 | < 0.010 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.11 | < 0.010 | 0.12 | 0.010 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | 0.91 | < 0.010 | 0.71 | 0.17 | < 0.010 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | 2.6 | < 0.20 | 29 | < 0.20 | 20 | 5.0 | < 0.20 | < 0.20 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 | 18-04450 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | 579614 | 579615 | 579616 | 579617 | 579618 | 579619 | 579620 | 579622 |
| Order No.: | | | Client Sample Ref.: | BH06A | BH06A | BH06A | BH06A | BH07 | BH07 | BH07 | BH07 |
| | | | Client Sample ID.: | ES1 | ES2 | ES3 | ES4 | ES1 | ES2 | ES3 | ES5 |
| | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | 0.50 | 1.50 | 2.00 | 3.00 | 0.50 | 1.50 | 2.50 | 4.50 |
| | | | Date Sampled: | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 12-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 | 13-Feb-2018 |
| | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | | | | | < 5000 | < 5000 | | |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| Picrite | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | | | | | < 5.0 | < 5.0 | | |

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579614 | | | | | | |
| **Sample Ref:** | BH06A | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 2.6 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 3.7 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 25 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 2.4 | 100 | -- | -- |
| pH | 2010 | U | | 8.0 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.014 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.015 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0017 | 0.017 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0011 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0033 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0013 | 0.013 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.18 | 1.8 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.87 | 8.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 920 | 9200 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 980 | 9800 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 13 | 130 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 10 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579615 | | | | | | |
| **Sample Ref:** | BH06A | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.34 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.80 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0029 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.022 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0017 | 0.017 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0031 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.65 | 6.5 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.7 | 17 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 360 | 3600 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 440 | 4400 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 9.6 | 96 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579616 | | | | | | |
| **Sample Ref:** | BH06A | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 18 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 12 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 44 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 29 | 100 | -- | -- |
| pH | 2010 | U | | 7.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.026 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0025 | 0.025 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0016 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0011 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 1.1 | 11 | 4 | 50 | 200 |
| Chloride | 1220 | U | 2.0 | 20 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.8 | 18 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 130 | 1300 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 240 | 2400 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 8.7 | 87 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 17 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579617 | | | | | | |
| **Sample Ref:** | BH06A | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 3.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 12-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.60 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.2 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 6.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0032 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0017 | 0.017 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.058 | 0.58 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.13 | 1.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 28 | 280 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 45 | 450 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 13 | 130 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579618 | | | | | | |
| **Sample Ref:** | BH07 | | | | | | |
| **Sample ID:** | ES1 | | | | | | |
| **Top Depth(m):** | 0.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 13-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.84 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.1 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 88 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 20 | 100 | -- | -- |
| pH | 2010 | U | | 10.1 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.042 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0063 | 0.063 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.014 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.015 | 0.15 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0052 | 0.052 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.017 | 0.17 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.015 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 15 | 150 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.37 | 3.7 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 16 | 160 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 72 | 720 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 44 | 440 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 6.5 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579619 | | | | | | |
| **Sample Ref:** | BH07 | | | | | | |
| **Sample ID:** | ES2 | | | | | | |
| **Top Depth(m):** | 1.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 13-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.38 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 58 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 4.9 | 100 | -- | -- |
| pH | 2010 | U | | 8.9 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0045 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0075 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0083 | 0.083 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0043 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0064 | 0.064 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0070 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 4.1 | 41 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.25 | 2.5 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 8.5 | 85 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 48 | 480 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 21 | 210 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 10 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579620 | | | | | | |
| **Sample Ref:** | BH07 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 13-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.2 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 9.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.010 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0026 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0048 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0034 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0017 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0015 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0016 | 0.016 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0039 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 16 | 160 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.50 | 5.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 18 | 180 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 170 | 1700 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 6.9 | 69 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 9.7 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-04450 | | | | | | |
| **Chemtest Sample ID:** | 579622 | | | | | | |
| **Sample Ref:** | BH07 | | | | | | |
| **Sample ID:** | ES5 | | | | | | |
| **Top Depth(m):** | 4.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 13-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.23 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.016 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0027 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0021 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0018 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | < 0.0010 | < 0.010 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0016 | 0.016 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0058 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 4.6 | 46 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.20 | 2.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 9.7 | 97 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 57 | 570 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.1 | 51 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 15 |

**Waste Acceptance Criteria**

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

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |
| 1920 | Phenols in Waters by HPLC | Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded. | Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection. |
| 2010 | pH Value of Soils | pH | pH Meter |
| 2015 | Acid Neutralisation Capacity | Acid Reserve | Titration |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2325 | Sulphide in Soils | Sulphide | Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2610 | Loss on Ignition | loss on ignition (LOI) | Determination of the proportion by mass that is lost from a soil by ignition at 550°C. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40 | Dichloromethane extraction / GC-FID |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. |
| 2790 | Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS | Semi-volatile organic compounds(cf. USEPA Method 8270) | Acetone/Hexane extraction / GC-MS |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS | Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene* | Dichloromethane extraction / GC-MS |
| 2815 | Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS | ICES7 PCB congeners | Acetone/Hexane extraction / GC-MS |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-05269-2 | | |
| **Initial Date of Issue:** | 15-Mar-2018 | **Date of Re-Issue:** | 21-Mar-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Lucy Peaker<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 - Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 22-Feb-2018 |
| **Order No.:** | | **Date Instructed:** | 27-Feb-2018 |
| **No. of Samples:** | 13 | | |
| **Turnaround (Wkdays):** | 16 | **Results Due:** | 20-Mar-2018 |
| **Date Approved:** | 20-Mar-2018 | **Subcon Results Due:** | 20-Mar-2018 |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 583354 | 583355 | 583364 | 583365 | 583366 | 583367 | 583368 | 583369 |
| Order No.: | | | | Client Sample Ref.: | BH10B | BH10B | BH18 | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 | ES5 | ES6 | ES7 | ES8 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 3.00 | 4.00 | 2.50 | 3.50 | 4.50 | 5.50 | 6.50 | 7.50 |
| | | | | Date Sampled: | 19-Feb-2018 | 19-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 6.4 | 13 | 14 | 15 | 14 | 7.7 | 13 | 12 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 0.54 | 6.3 | 0.76 | < 0.50 | 11 | 1.4 | 1.7 | 0.89 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 19 | 11 | 9.4 | 8.4 | 13 | 25 | 9.9 | 10 |
| Barium | U | 2450 | mg/kg | 10 | 48 | 21 | 12 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.21 | 0.59 | 0.13 | 0.16 | 0.71 | 0.24 | 1.7 | 1.5 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | 3.3 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 82 | 210 | 21 | 25 | 120 | 110 | 61 | 48 |
| Mercury | U | 2450 | mg/kg | 0.10 | < 0.10 | 0.19 | < 0.10 | < 0.10 | 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Nickel | U | 2450 | mg/kg | 0.50 | 6.9 | 2.1 | 4.7 | 4.3 | 10 | 16 | 14 | 12 |
| Lead | U | 2450 | mg/kg | 0.50 | 110 | 100 | 32 | 30 | 75 | 19 | 6.2 | 5.4 |
| Selenium | U | 2450 | mg/kg | 0.20 | < 0.20 | 0.27 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 17 | < 5.0 | 16 | 12 | 13 | 19 | 13 | 15 |
| Zinc | U | 2450 | mg/kg | 0.50 | 91 | 140 | 100 | 180 | 370 | 420 | 1200 | 870 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 10 | 3.4 | 5.7 | 4.2 | 11 | 18 | 11 | 10 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 583354 | 583355 | 583364 | 583365 | 583366 | 583367 | 583368 | 583369 |
| Order No.: | | | | Client Sample Ref.: | BH10B | BH10B | BH18 | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 | ES5 | ES6 | ES7 | ES8 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 3.00 | 4.00 | 2.50 | 3.50 | 4.50 | 5.50 | 6.50 | 7.50 |
| | | | | Date Sampled: | 19-Feb-2018 | 19-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Chloromethane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Vinyl Chloride | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Bromomethane | U | 2760 | µg/kg | 20 | < 20 | | < 20 | | < 20 | | | |
| Chloroethane | N | 2760 | µg/kg | 2.0 | < 2.0 | | < 2.0 | | < 2.0 | | | |
| Trichlorofluoromethane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,1-Dichloroethene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Trans 1,2-Dichloroethene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,1-Dichloroethane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| cis 1,2-Dichloroethene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Bromochloromethane | N | 2760 | µg/kg | 5.0 | < 5.0 | | < 5.0 | | < 5.0 | | | |
| Trichloromethane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,1,1-Trichloroethane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Tetrachloromethane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Benzene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,2-Dichloroethane | U | 2760 | µg/kg | 2.0 | < 2.0 | | < 2.0 | | < 2.0 | | | |
| Trichloroethene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,2-Dichloropropane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Dibromomethane | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Bromodichloromethane | U | 2760 | µg/kg | 5.0 | < 5.0 | | < 5.0 | | < 5.0 | | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 10 | < 10 | | < 10 | | < 10 | | | |
| Toluene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 10 | < 10 | | < 10 | | < 10 | | | |
| 1,1,2-Trichloroethane | U | 2760 | µg/kg | 10 | < 10 | | < 10 | | < 10 | | | |
| Tetrachloroethene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 2.0 | < 2.0 | | < 2.0 | | < 2.0 | | | |
| Dibromochloromethane | N | 2760 | µg/kg | 10 | < 10 | | < 10 | | < 10 | | | |
| 1,2-Dibromoethane | U | 2760 | µg/kg | 5.0 | < 5.0 | | < 5.0 | | < 5.0 | | | |
| Chlorobenzene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,1,1,2-Tetrachloroethane | U | 2760 | µg/kg | 2.0 | < 2.0 | | < 2.0 | | < 2.0 | | | |
| Ethylbenzene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| m & p-Xylene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| o-Xylene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Styrene | U | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Tribromomethane | N | 2760 | µg/kg | 1.0 | < 1.0 | | < 1.0 | | < 1.0 | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 583354 | 583355 | 583364 | 583365 | 583366 | 583367 | 583368 | 583369 |
| Order No.: | | | | | Client Sample Ref.: | BH10B | BH10B | BH18 | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 | ES5 | ES6 | ES7 | ES8 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 3.00 | 4.00 | 2.50 | 3.50 | 4.50 | 5.50 | 6.50 | 7.50 |
| | | | | | Date Sampled: | 19-Feb-2018 | 19-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Isopropylbenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Bromobenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 50 | | < 50 | | < 50 | | < 50 | | | |
| N-Propylbenzene | N | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 2-Chlorotoluene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,3,5-Trimethylbenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,2,4-Trimethylbenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,3-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,4-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| N-Butylbenzene | N | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,2-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 50 | | < 50 | | < 50 | | < 50 | | | |
| 1,2,4-Trichlorobenzene | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 2.0 | | < 2.0 | | < 2.0 | | < 2.0 | | | |
| Methyl Tert-Butyl Ether | U | 2760 | µg/kg | 1.0 | | < 1.0 | | < 1.0 | | < 1.0 | | | |
| N-Nitrosodimethylamine | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Phenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2-Chlorophenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Bis-(2-Chloroethyl)Ether | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 1,3-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 1,2-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2-Methylphenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Bis(2-Chloroisopropyl)Ether | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Hexachloroethane | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| N-Nitrosodi-n-propylamine | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 4-Methylphenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Nitrobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Isophorone | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Bis(2-Chloroethoxy)Methane | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2,4-Dichlorophenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 583354 | 583355 | 583364 | 583365 | 583366 | 583367 | 583368 | 583369 |
| Order No.: | | | | | Client Sample Ref.: | BH10B | BH10B | BH18 | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 | ES5 | ES6 | ES7 | ES8 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 3.00 | 4.00 | 2.50 | 3.50 | 4.50 | 5.50 | 6.50 | 7.50 |
| | | | | | Date Sampled: | 19-Feb-2018 | 19-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 1,2,4-Trichlorobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Naphthalene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Hexachlorobutadiene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 4-Chloro-3-Methylphenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2-Methylnaphthalene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2,4,6-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2,4,5-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2-Chloronaphthalene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2-Nitroaniline | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Acenaphthylene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Dimethylphthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2,6-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Acenaphthene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Dibenzofuran | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 4-Chlorophenylphenylether | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2,4-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Fluorene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Diethyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 4-Nitroaniline | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Azobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| 4-Bromophenylphenyl Ether | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Hexachlorobenzene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Phenanthrene | U | 2790 | mg/kg | 0.50 | | 0.65 | | < 0.50 | | < 0.50 | | | |
| Anthracene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Carbazole | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Di-N-Butyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Fluoranthene | U | 2790 | mg/kg | 0.50 | | 1.8 | | < 0.50 | | < 0.50 | | | |
| Pyrene | U | 2790 | mg/kg | 0.50 | | 1.7 | | < 0.50 | | < 0.50 | | | |
| Butylbenzyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Benzo[a]anthracene | U | 2790 | mg/kg | 0.50 | | 0.82 | | < 0.50 | | < 0.50 | | | |
| Chrysene | U | 2790 | mg/kg | 0.50 | | 0.85 | | < 0.50 | | < 0.50 | | | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| Client: Causeway Geotech Ltd | | | | | Chemtest Job No.: | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | Chemtest Sample ID.: | 583354 | 583355 | 583364 | 583365 | 583366 | 583367 | 583368 | 583369 |
| Order No.: | | | | | Client Sample Ref.: | BH10B | BH10B | BH18 | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 | ES5 | ES6 | ES7 | ES8 |
| | | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | | Top Depth (m): | 3.00 | 4.00 | 2.50 | 3.50 | 4.50 | 5.50 | 6.50 | 7.50 |
| | | | | | Date Sampled: | 19-Feb-2018 | 19-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Di-N-Octyl Phthalate | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Benzo[b]fluoranthene | U | 2790 | mg/kg | 0.50 | | 0.80 | | < 0.50 | | < 0.50 | | | |
| Benzo[k]fluoranthene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Benzo[a]pyrene | U | 2790 | mg/kg | 0.50 | | 0.63 | | < 0.50 | | < 0.50 | | | |
| Indeno(1,2,3-c,d)Pyrene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Dibenz(a,h)Anthracene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Benzo[g,h,i]perylene | U | 2790 | mg/kg | 0.50 | | < 0.50 | | < 0.50 | | < 0.50 | | | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | | 0.79 | 0.22 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Anthracene | N | 2800 | mg/kg | 0.010 | | 0.12 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | | 0.55 | 0.19 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Pyrene | N | 2800 | mg/kg | 0.010 | | 0.64 | 0.19 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Chrysene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | | 0.15 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | | 0.14 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | | 0.020 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | | 0.17 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | | 2.6 | 0.60 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | | | | |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | | | | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | | | | |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | | | | |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | < 5.0 | | < 5.0 | < 5.0 | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 583354 | 583355 | 583364 | 583365 | 583366 | 583367 | 583368 | 583369 |
| Order No.: | | | Client Sample Ref.: | | BH10B | BH10B | BH18 | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | Client Sample ID.: | | ES3 | ES4 | ES3 | ES4 | ES5 | ES6 | ES7 | ES8 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 3.00 | 4.00 | 2.50 | 3.50 | 4.50 | 5.50 | 6.50 | 7.50 |
| | | | Date Sampled: | | 19-Feb-2018 | 19-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | | | | |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | < 5000 | | < 5000 | < 5000 | | | | |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | < 5.0 | | < 5000.00 | < 5.0 | | | | |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | | | | |
| Picrite | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | | | | |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | | | | |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | | | | |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | < 5.0 | | < 5.0 | < 5.0 | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 583370 | 583371 | 583372 | 583373 | 583374 |
| Order No.: | | | | Client Sample Ref.: | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | Client Sample ID.: | ES9 | ES10 | ES11 | ES12 | ES13 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 8.50 | 9.50 | 10.50 | 11.50 | 12.50 |
| | | | | Date Sampled: | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 13 | 18 | 16 | 14 | 18 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 1.2 | 0.82 | 1.2 | 1.3 | 1.6 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 10 | 8.6 | 9.1 | 8.7 | 12 |
| Barium | U | 2450 | mg/kg | 10 | < 10 | < 10 | < 10 | < 10 | 53 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 0.34 | 0.17 | < 0.10 | < 0.10 | 0.14 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 11 | 5.3 | 2.5 | 2.4 | 26 |
| Mercury | U | 2450 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Nickel | U | 2450 | mg/kg | 0.50 | 6.4 | 3.6 | 3.2 | 3.7 | 37 |
| Lead | U | 2450 | mg/kg | 0.50 | 2.3 | 1.9 | 1.6 | 1.7 | 19 |
| Selenium | U | 2450 | mg/kg | 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 13 | 11 | 10 | 11 | 40 |
| Zinc | U | 2450 | mg/kg | 0.50 | 140 | 30 | 14 | 15 | 78 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 7.4 | 5.8 | 5.0 | 5.0 | 36 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 583370 | 583371 | 583372 | 583373 | 583374 |
| Order No.: | | | | Client Sample Ref.: | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | Client Sample ID.: | ES9 | ES10 | ES11 | ES12 | ES13 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 8.50 | 9.50 | 10.50 | 11.50 | 12.50 |
| | | | | Date Sampled: | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dichlorodifluoromethane | N | 2760 | µg/kg | 1.0 | | | | | |
| Chloromethane | U | 2760 | µg/kg | 1.0 | | | | | |
| Vinyl Chloride | U | 2760 | µg/kg | 1.0 | | | | | |
| Bromomethane | U | 2760 | µg/kg | 20 | | | | | |
| Chloroethane | N | 2760 | µg/kg | 2.0 | | | | | |
| Trichlorofluoromethane | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,1-Dichloroethene | U | 2760 | µg/kg | 1.0 | | | | | |
| Trans 1,2-Dichloroethene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,1-Dichloroethane | U | 2760 | µg/kg | 1.0 | | | | | |
| cis 1,2-Dichloroethene | U | 2760 | µg/kg | 1.0 | | | | | |
| Bromochloromethane | N | 2760 | µg/kg | 5.0 | | | | | |
| Trichloromethane | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,1,1-Trichloroethane | U | 2760 | µg/kg | 1.0 | | | | | |
| Tetrachloromethane | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,1-Dichloropropene | N | 2760 | µg/kg | 1.0 | | | | | |
| Benzene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,2-Dichloroethane | U | 2760 | µg/kg | 2.0 | | | | | |
| Trichloroethene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,2-Dichloropropane | U | 2760 | µg/kg | 1.0 | | | | | |
| Dibromomethane | U | 2760 | µg/kg | 1.0 | | | | | |
| Bromodichloromethane | U | 2760 | µg/kg | 5.0 | | | | | |
| cis-1,3-Dichloropropene | N | 2760 | µg/kg | 10 | | | | | |
| Toluene | U | 2760 | µg/kg | 1.0 | | | | | |
| Trans-1,3-Dichloropropene | N | 2760 | µg/kg | 10 | | | | | |
| 1,1,2-Trichloroethane | U | 2760 | µg/kg | 10 | | | | | |
| Tetrachloroethene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,3-Dichloropropane | N | 2760 | µg/kg | 2.0 | | | | | |
| Dibromochloromethane | N | 2760 | µg/kg | 10 | | | | | |
| 1,2-Dibromoethane | U | 2760 | µg/kg | 5.0 | | | | | |
| Chlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,1,1,2-Tetrachloroethane | U | 2760 | µg/kg | 2.0 | | | | | |
| Ethylbenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| m & p-Xylene | U | 2760 | µg/kg | 1.0 | | | | | |
| o-Xylene | U | 2760 | µg/kg | 1.0 | | | | | |
| Styrene | U | 2760 | µg/kg | 1.0 | | | | | |
| Tribromomethane | N | 2760 | µg/kg | 1.0 | | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 583370 | 583371 | 583372 | 583373 | 583374 |
| Order No.: | | | | Client Sample Ref.: | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | Client Sample ID.: | ES9 | ES10 | ES11 | ES12 | ES13 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 8.50 | 9.50 | 10.50 | 11.50 | 12.50 |
| | | | | Date Sampled: | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Isopropylbenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| Bromobenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,2,3-Trichloropropane | N | 2760 | µg/kg | 50 | | | | | |
| N-Propylbenzene | N | 2760 | µg/kg | 1.0 | | | | | |
| 2-Chlorotoluene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,3,5-Trimethylbenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| 4-Chlorotoluene | N | 2760 | µg/kg | 1.0 | | | | | |
| Tert-Butylbenzene | N | 2760 | µg/kg | 1.0 | | | | | |
| 1,2,4-Trimethylbenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| Sec-Butylbenzene | N | 2760 | µg/kg | 1.0 | | | | | |
| 1,3-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| 4-Isopropyltoluene | N | 2760 | µg/kg | 1.0 | | | | | |
| 1,4-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| N-Butylbenzene | N | 2760 | µg/kg | 1.0 | | | | | |
| 1,2-Dichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| 1,2-Dibromo-3-Chloropropane | N | 2760 | µg/kg | 50 | | | | | |
| 1,2,4-Trichlorobenzene | U | 2760 | µg/kg | 1.0 | | | | | |
| Hexachlorobutadiene | N | 2760 | µg/kg | 1.0 | | | | | |
| 1,2,3-Trichlorobenzene | N | 2760 | µg/kg | 2.0 | | | | | |
| Methyl Tert-Butyl Ether | U | 2760 | µg/kg | 1.0 | | | | | |
| N-Nitrosodimethylamine | U | 2790 | mg/kg | 0.50 | | | | | |
| Phenol | U | 2790 | mg/kg | 0.50 | | | | | |
| 2-Chlorophenol | U | 2790 | mg/kg | 0.50 | | | | | |
| Bis-(2-Chloroethyl)Ether | U | 2790 | mg/kg | 0.50 | | | | | |
| 1,3-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.50 | | | | | |
| 1,2-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | |
| 2-Methylphenol | U | 2790 | mg/kg | 0.50 | | | | | |
| Bis(2-Chloroisopropyl)Ether | U | 2790 | mg/kg | 0.50 | | | | | |
| Hexachloroethane | N | 2790 | mg/kg | 0.50 | | | | | |
| N-Nitrosodi-n-propylamine | U | 2790 | mg/kg | 0.50 | | | | | |
| 4-Methylphenol | U | 2790 | mg/kg | 0.50 | | | | | |
| Nitrobenzene | U | 2790 | mg/kg | 0.50 | | | | | |
| Isophorone | U | 2790 | mg/kg | 0.50 | | | | | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.50 | | | | | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.50 | | | | | |
| Bis(2-Chloroethoxy)Methane | U | 2790 | mg/kg | 0.50 | | | | | |
| 2,4-Dichlorophenol | U | 2790 | mg/kg | 0.50 | | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 583370 | 583371 | 583372 | 583373 | 583374 |
| Order No.: | | | | Client Sample Ref.: | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | Client Sample ID.: | ES9 | ES10 | ES11 | ES12 | ES13 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 8.50 | 9.50 | 10.50 | 11.50 | 12.50 |
| | | | | Date Sampled: | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| 1,2,4-Trichlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | |
| Naphthalene | U | 2790 | mg/kg | 0.50 | | | | | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.50 | | | | | |
| Hexachlorobutadiene | U | 2790 | mg/kg | 0.50 | | | | | |
| 4-Chloro-3-Methylphenol | U | 2790 | mg/kg | 0.50 | | | | | |
| 2-Methylnaphthalene | U | 2790 | mg/kg | 0.50 | | | | | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.50 | | | | | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.50 | | | | | |
| 2,4,6-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | | | | |
| 2,4,5-Trichlorophenol | U | 2790 | mg/kg | 0.50 | | | | | |
| 2-Chloronaphthalene | U | 2790 | mg/kg | 0.50 | | | | | |
| 2-Nitroaniline | U | 2790 | mg/kg | 0.50 | | | | | |
| Acenaphthylene | U | 2790 | mg/kg | 0.50 | | | | | |
| Dimethylphthalate | U | 2790 | mg/kg | 0.50 | | | | | |
| 2,6-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | | | | |
| Acenaphthene | U | 2790 | mg/kg | 0.50 | | | | | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.50 | | | | | |
| Dibenzofuran | U | 2790 | mg/kg | 0.50 | | | | | |
| 4-Chlorophenylphenylether | U | 2790 | mg/kg | 0.50 | | | | | |
| 2,4-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | | | | | |
| Fluorene | U | 2790 | mg/kg | 0.50 | | | | | |
| Diethyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | |
| 4-Nitroaniline | U | 2790 | mg/kg | 0.50 | | | | | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.50 | | | | | |
| Azobenzene | U | 2790 | mg/kg | 0.50 | | | | | |
| 4-Bromophenylphenyl Ether | U | 2790 | mg/kg | 0.50 | | | | | |
| Hexachlorobenzene | U | 2790 | mg/kg | 0.50 | | | | | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.50 | | | | | |
| Phenanthrene | U | 2790 | mg/kg | 0.50 | | | | | |
| Anthracene | U | 2790 | mg/kg | 0.50 | | | | | |
| Carbazole | U | 2790 | mg/kg | 0.50 | | | | | |
| Di-N-Butyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | |
| Fluoranthene | U | 2790 | mg/kg | 0.50 | | | | | |
| Pyrene | U | 2790 | mg/kg | 0.50 | | | | | |
| Butylbenzyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | |
| Benzo[a]anthracene | U | 2790 | mg/kg | 0.50 | | | | | |
| Chrysene | U | 2790 | mg/kg | 0.50 | | | | | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.50 | | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 583370 | 583371 | 583372 | 583373 | 583374 |
| Order No.: | | | | Client Sample Ref.: | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | | Client Sample ID.: | ES9 | ES10 | ES11 | ES12 | ES13 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 8.50 | 9.50 | 10.50 | 11.50 | 12.50 |
| | | | | Date Sampled: | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Di-N-Octyl Phthalate | U | 2790 | mg/kg | 0.50 | | | | | |
| Benzo[b]fluoranthene | U | 2790 | mg/kg | 0.50 | | | | | |
| Benzo[k]fluoranthene | U | 2790 | mg/kg | 0.50 | | | | | |
| Benzo[a]pyrene | U | 2790 | mg/kg | 0.50 | | | | | |
| Indeno(1,2,3-c,d)Pyrene | U | 2790 | mg/kg | 0.50 | | | | | |
| Dibenz(a,h)Anthracene | U | 2790 | mg/kg | 0.50 | | | | | |
| Benzo[g,h,i]perylene | U | 2790 | mg/kg | 0.50 | | | | | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Chrysene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | | | | |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | | | | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | | | | |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | | | | |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | | | | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-05269 | 18-05269 | 18-05269 | 18-05269 | 18-05269 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 583370 | 583371 | 583372 | 583373 | 583374 |
| Order No.: | | | Client Sample Ref.: | | BH18 | BH18 | BH18 | BH18 | BH18 |
| | | | Client Sample ID.: | | ES9 | ES10 | ES11 | ES12 | ES13 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 8.50 | 9.50 | 10.50 | 11.50 | 12.50 |
| | | | Date Sampled: | | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 | 16-Feb-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | | | | | |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | | | | | |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | | | | | |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | | | | | |
| Picrite | S | | mg/kg | 5.00 | | | | | |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | | | | | |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | | | | | |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | | | | | |

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583354 | | | | | | |
| **Sample Ref:** | BH10B | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 3.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 19-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.69 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 2.6 | 100 | -- | -- |
| pH | 2010 | U | | 8.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.034 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.014 | 0.14 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0056 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.014 | 0.14 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0035 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.019 | 0.19 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0026 | 0.026 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0034 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 3.0 | 30 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.14 | 1.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 5.2 | 52 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 37 | 370 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 16 | 160 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 6.4 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583355 | | | | | | |
| **Sample Ref:** | BH10B | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 4.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 19-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.46 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.8 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0060 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0070 | 0.070 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0049 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0019 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0099 | 0.099 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0048 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0017 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.018 | 0.18 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0058 | 0.058 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.018 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.10 | 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 1.5 | 15 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 18 | 180 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 16 | 160 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583364 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.34 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 22 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 9.2 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0030 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0028 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0024 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0014 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0034 | 0.034 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | < 0.0010 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 5.7 | 57 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.11 | 1.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 2.1 | 21 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 37 | 370 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.8 | 78 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 14 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583365 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 3.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.24 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.42 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0027 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0037 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0064 | 0.064 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0072 | 0.072 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.034 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 27 | 270 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.13 | 1.3 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 5.6 | 56 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 85 | 850 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 10 | 100 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 15 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583366 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES5 | | | | | | |
| **Top Depth(m):** | 4.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.56 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.7 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.2 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0028 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.013 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.00015 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0062 | 0.062 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.012 | 0.12 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0013 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0072 | 0.072 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.012 | 0.12 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.053 | 0.53 | 4 | 50 | 200 |
| Chloride | 1220 | U | 51 | 510 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.14 | 1.4 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 12 | 120 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 120 | 1200 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 13 | 130 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 14 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583367 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES6 | | | | | | |
| **Top Depth(m):** | 5.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.93 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.3 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0080 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0036 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0014 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0020 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.010 | 0.10 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.012 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 6.6 | 66 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.083 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 4.9 | 49 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 26 | 260 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 15 | 150 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 7.7 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583368 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES7 | | | | | | |
| **Top Depth(m):** | 6.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.0 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.5 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0011 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.012 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0035 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0050 | 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0035 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.012 | 0.12 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.039 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 26 | 260 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.60 | 6.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 5.7 | 57 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 60 | 600 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 11 | 110 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583369 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES8 | | | | | | |
| **Top Depth(m):** | 7.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.61 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0030 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0076 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0017 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0055 | 0.055 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0046 | 0.046 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0092 | 0.092 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.027 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 62 | 620 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.088 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 11 | 110 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 150 | 1500 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 9.2 | 92 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583370 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES9 | | | | | | |
| **Top Depth(m):** | 8.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.43 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0087 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0024 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0024 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0013 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0024 | 0.024 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.017 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 94 | 940 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.085 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 15 | 150 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 220 | 2200 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 13 | 130 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 13 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583371 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES10 | | | | | | |
| **Top Depth(m):** | 9.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.24 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.8 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0040 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0012 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.015 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0049 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0044 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0024 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.010 | 0.10 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0015 | 0.015 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.023 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 170 | 1700 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.093 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 25 | 250 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 370 | 3700 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 12 | 120 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 18 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583372 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES11 | | | | | | |
| **Top Depth(m):** | 10.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.22 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.9 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0030 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0013 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.011 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0048 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0031 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0013 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0079 | 0.079 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0018 | 0.018 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.033 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 220 | 2200 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.11 | 1.1 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 32 | 320 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 450 | 4500 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 11 | 110 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 16 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583373 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES12 | | | | | | |
| **Top Depth(m):** | 11.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | < 0.20 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.29 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.8 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0030 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0014 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0068 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0049 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0025 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0014 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0041 | 0.041 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | 0.0016 | 0.016 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.14 | 1.4 | 4 | 50 | 200 |
| Chloride | 1220 | U | 150 | 1500 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.088 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 22 | 220 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 310 | 3100 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 13 | 130 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 14 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05269 | | | | | | |
| **Chemtest Sample ID:** | 583374 | | | | | | |
| **Sample Ref:** | BH18 | | | | | | |
| **Sample ID:** | ES13 | | | | | | |
| **Top Depth(m):** | 12.50 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 16-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.51 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 4.9 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.6 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.065 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0022 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.017 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0052 | 0.052 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0040 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0036 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.011 | 0.11 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.021 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 47 | 470 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.084 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 8.0 | 80 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 130 | 1300 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 19 | 190 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 18 |

**Waste Acceptance Criteria**

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

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |
| 1920 | Phenols in Waters by HPLC | Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded. | Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection. |
| 2010 | pH Value of Soils | pH | pH Meter |
| 2015 | Acid Neutralisation Capacity | Acid Reserve | Titration |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2325 | Sulphide in Soils | Sulphide | Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2610 | Loss on Ignition | loss on ignition (LOI) | Determination of the proportion by mass that is lost from a soil by ignition at 550°C. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40 | Dichloromethane extraction / GC-FID |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. |
| 2790 | Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS | Semi-volatile organic compounds(cf. USEPA Method 8270) | Acetone/Hexane extraction / GC-MS |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS | Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene* | Dichloromethane extraction / GC-MS |
| 2815 | Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS | ICES7 PCB congeners | Acetone/Hexane extraction / GC-MS |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-05585-2 | | |
| **Initial Date of Issue:** | 15-Mar-2018 | **Date of Re-Issue:** | 21-Mar-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 - Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 26-Feb-2018 |
| **Order No.:** | | **Date Instructed:** | 01-Mar-2018 |
| **No. of Samples:** | 4 | | |
| **Turnaround (Wkdays):** | 14 | **Results Due:** | 20-Mar-2018 |
| **Date Approved:** | 20-Mar-2018 | **Subcon Results Due:** | 22-Mar-2018 |

**Approved By:**




**Details:** Glynn Harvey, Laboratory Manager
Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05585 | 18-05585 | 18-05585 | 18-05585 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 584684 | 584685 | 584690 | 584691 |
| Order No.: | | | | Client Sample Ref.: | BH8 | BH8 | BH9 | BH9 |
| | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 2.00 | 3.00 | 3.00 | 4.00 |
| | | | | Date Sampled: | 22-Feb-2018 | 22-Feb-2018 | 21-Feb-2018 | 21-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| ACM Type | U | 2192 | | N/A | - | - | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.020 | 12 | 16 | 15 | 17 |
| Cyanide (Complex) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Cyanide (Free) | U | 2300 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphide (Easily Liberatable) | U | 2325 | mg/kg | 0.50 | 5.1 | 4.3 | 18 | 24 |
| Arsenic | U | 2450 | mg/kg | 1.0 | 120 | 37 | 46 | 51 |
| Barium | U | 2450 | mg/kg | 10 | 89 | 18 | 160 | 38 |
| Cadmium | U | 2450 | mg/kg | 0.10 | 5.8 | 2.0 | 1.1 | 3.9 |
| Molybdenum | U | 2450 | mg/kg | 2.0 | 11 | 2.6 | 4.0 | < 2.0 |
| Antimony | N | 2450 | mg/kg | 2.0 | 3.4 | < 2.0 | 11 | < 2.0 |
| Copper | U | 2450 | mg/kg | 0.50 | 800 | 190 | 170 | 190 |
| Mercury | U | 2450 | mg/kg | 0.10 | 0.18 | < 0.10 | 0.80 | 0.14 |
| Nickel | U | 2450 | mg/kg | 0.50 | 12 | 4.9 | 28 | 10 |
| Lead | U | 2450 | mg/kg | 0.50 | 600 | 250 | 710 | 190 |
| Selenium | U | 2450 | mg/kg | 0.20 | 0.25 | < 0.20 | 1.5 | < 0.20 |
| Vanadium | U | 2450 | mg/kg | 5.0 | 23 | 13 | 25 | 19 |
| Zinc | U | 2450 | mg/kg | 0.50 | 2000 | 670 | 330 | 310 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 1.0 | 10 | 4.8 | 11 | 11 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Aliphatic TPH >C5-C6 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C6-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aliphatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Aromatic TPH >C5-C7 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C7-C8 | N | 2680 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Aromatic TPH >C8-C10 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 2680 | mg/kg | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05585 | 18-05585 | 18-05585 | 18-05585 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 584684 | 584685 | 584690 | 584691 |
| Order No.: | | | | Client Sample Ref.: | BH8 | BH8 | BH9 | BH9 |
| | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 2.00 | 3.00 | 3.00 | 4.00 |
| | | | | Date Sampled: | 22-Feb-2018 | 22-Feb-2018 | 21-Feb-2018 | 21-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Total Aromatic Hydrocarbons | N | 2680 | mg/kg | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Total Petroleum Hydrocarbons | N | 2680 | mg/kg | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| N-Nitrosodimethylamine | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Phenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2-Chlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Bis-(2-Chloroethyl)Ether | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 1,3-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 1,4-Dichlorobenzene | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 1,2-Dichlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2-Methylphenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Bis(2-Chloroisopropyl)Ether | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Hexachloroethane | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| N-Nitrosodi-n-propylamine | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 4-Methylphenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Nitrobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Isophorone | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2-Nitrophenol | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2,4-Dimethylphenol | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Bis(2-Chloroethoxy)Methane | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2,4-Dichlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 1,2,4-Trichlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Naphthalene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 4-Chloroaniline | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Hexachlorobutadiene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 4-Chloro-3-Methylphenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2-Methylnaphthalene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 4-Nitrophenol | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Hexachlorocyclopentadiene | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2,4,6-Trichlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2,4,5-Trichlorophenol | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2-Chloronaphthalene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2-Nitroaniline | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Acenaphthylene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Dimethylphthalate | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2,6-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Acenaphthene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 3-Nitroaniline | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Dibenzofuran | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | **Chemtest Job No.:** | 18-05585 | 18-05585 | 18-05585 | 18-05585 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | **Chemtest Sample ID.:** | 584684 | 584685 | 584690 | 584691 |
| Order No.: | | | | Client Sample Ref.: | BH8 | BH8 | BH9 | BH9 |
| | | | | Client Sample ID.: | ES3 | ES4 | ES3 | ES4 |
| | | | | Sample Type: | SOIL | SOIL | SOIL | SOIL |
| | | | | Top Depth (m): | 2.00 | 3.00 | 3.00 | 4.00 |
| | | | | Date Sampled: | 22-Feb-2018 | 22-Feb-2018 | 21-Feb-2018 | 21-Feb-2018 |
| | | | | Asbestos Lab: | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| 4-Chlorophenylphenylether | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2,4-Dinitrotoluene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Fluorene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Diethyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 4-Nitroaniline | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 2-Methyl-4,6-Dinitrophenol | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Azobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| 4-Bromophenylphenyl Ether | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Hexachlorobenzene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Pentachlorophenol | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Phenanthrene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | 1.1 | |
| Anthracene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | 0.71 | |
| Carbazole | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Di-N-Butyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Fluoranthene | U | 2790 | mg/kg | 0.50 | 0.98 | < 0.50 | 1.9 | |
| Pyrene | U | 2790 | mg/kg | 0.50 | 0.77 | < 0.50 | 1.7 | |
| Butylbenzyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Benzo[a]anthracene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | 0.66 | |
| Chrysene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | 0.85 | |
| Bis(2-Ethylhexyl)Phthalate | N | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Di-N-Octyl Phthalate | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Benzo[b]fluoranthene | U | 2790 | mg/kg | 0.50 | 0.64 | < 0.50 | 0.73 | |
| Benzo[k]fluoranthene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Benzo[a]pyrene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | 0.62 | |
| Indeno(1,2,3-c,d)Pyrene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Dibenz(a,h)Anthracene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Benzo[g,h,i]perylene | U | 2790 | mg/kg | 0.50 | < 0.50 | < 0.50 | < 0.50 | |
| Naphthalene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Acenaphthene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Fluorene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Phenanthrene | N | 2800 | mg/kg | 0.010 | 0.26 | 0.12 | 0.76 | 0.16 |
| Anthracene | N | 2800 | mg/kg | 0.010 | 0.040 | 0.030 | 0.070 | 0.030 |
| Fluoranthene | N | 2800 | mg/kg | 0.010 | 0.33 | 0.17 | 0.90 | 0.15 |
| Pyrene | N | 2800 | mg/kg | 0.010 | 0.28 | 0.16 | 0.64 | 0.10 |
| Benzo[a]anthracene | N | 2800 | mg/kg | 0.010 | 0.12 | 0.070 | 0.15 | 0.020 |
| Chrysene | N | 2800 | mg/kg | 0.010 | 0.13 | 0.080 | 0.16 | 0.030 |
| Benzo[b]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.14 | 0.040 | < 0.010 | < 0.010 |

Chemtest
The right chemistry to deliver results

# Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-05585 | 18-05585 | 18-05585 | 18-05585 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 584684 | 584685 | 584690 | 584691 |
| Order No.: | | | Client Sample Ref.: | | BH8 | BH8 | BH9 | BH9 |
| | | | Client Sample ID.: | | ES3 | ES4 | ES3 | ES4 |
| | | | Sample Type: | | SOIL | SOIL | SOIL | SOIL |
| | | | Top Depth (m): | | 2.00 | 3.00 | 3.00 | 4.00 |
| | | | Date Sampled: | | 22-Feb-2018 | 22-Feb-2018 | 21-Feb-2018 | 21-Feb-2018 |
| | | | Asbestos Lab: | | COVENTRY | COVENTRY | COVENTRY | COVENTRY |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Benzo[k]fluoranthene | N | 2800 | mg/kg | 0.010 | 0.040 | 0.020 | < 0.010 | < 0.010 |
| Benzo[a]pyrene | N | 2800 | mg/kg | 0.010 | 0.090 | 0.060 | 0.15 | < 0.010 |
| Indeno(1,2,3-c,d)Pyrene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Dibenz(a,h)Anthracene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Benzo[g,h,i]perylene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Coronene | N | 2800 | mg/kg | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Total Of 17 PAH's | N | 2800 | mg/kg | 0.20 | 1.4 | 0.75 | 2.8 | 0.49 |
| PCB 28 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 52 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 90+101 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 118 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 153 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 138 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| PCB 180 | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| Total PCBs (7 congeners) | N | 2815 | mg/kg | 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 | < 0.0010 |
| 2,4,6-Trinitrotoluene (TNT) | S | | mg/kg | 5.00 | | | < 5.0 | |
| 2,4-dinitrotoluene | S | | mg/kg | 5.00 | | | < 5.0 | |
| 2,6-dinitrotoluene | S | | mg/kg | 5.00 | | | < 5.0 | |
| Ethylene Glycol Dinitrate (EGDN) | S | | mg/kg | 5.00 | | | < 5.0 | |
| Cyclotetramethylenetetranitramine(HMX) | S | | mg/kg | 5.00 | | | < 5.0 | |
| Hexanitrostilbene (HNS) | S | | mg/kg | 5.00 | | | < 5.0 | |
| Nitrocellulose (NC) | S | | mg/kg | 5000.00 | | | < 5000 | |
| Nitroglycerine (NG) | S | | mg/kg | 5.00 | | | < 5.0 | |
| Pentaerythritol tetranitrate (PETN) | SN | | mg/kg | 5.00 | | | < 5.0 | |
| Picrite | S | | mg/kg | 5.00 | | | < 5.0 | |
| Cyclotrimethylenetrinitramine (RDX) | S | | mg/kg | 5.00 | | | < 5.0 | |
| 2,4,6-trinitrophenol | S | | mg/kg | 5.00 | | | < 5.0 | |
| N-methyl-N,2,4,6-tetranitroaniline | S | | mg/kg | 5.00 | | | < 5.0 | |

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05585 | | | | | | |
| **Chemtest Sample ID:** | 584684 | | | | | | |
| **Sample Ref:** | BH8 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 2.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 22-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.0 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 1.9 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0060 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.013 | 0.13 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.028 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | 0.0010 | 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | 0.0023 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.074 | 0.74 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0027 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | 0.0025 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.086 | 0.86 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.30 | 3.0 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.10 | 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 65 | 650 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 120 | 1200 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 3.4 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 12 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05585 | | | | | | |
| **Chemtest Sample ID:** | 584685 | | | | | | |
| **Sample Ref:** | BH8 | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 3.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 22-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 0.26 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 0.78 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 8.4 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | 0.0050 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.0041 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.011 | 0.11 | 2 | 50 | 100 |
| Mercury | 1450 | U | 0.0027 | 0.027 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0049 | 0.049 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | < 0.0010 | < 0.010 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.013 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.095 | < 1.0 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 5.1 | 51 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 26 | 260 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 4.1 | < 50 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 16 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05585 | | | | | | |
| **Chemtest Sample ID:** | 584690 | | | | | | |
| **Sample Ref:** | BH9 | | | | | | |
| **Sample ID:** | ES3 | | | | | | |
| **Top Depth(m):** | 3.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 21-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 3.4 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 2.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | 39 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | 2.8 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.0013 | < 0.050 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.056 | 0.56 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | < 0.0010 | < 0.050 | 2 | 50 | 100 |
| Mercury | 1450 | U | < 0.00050 | < 0.0050 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0038 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.0011 | 0.011 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.012 | 0.12 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | < 0.0010 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | 5.4 | 54 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 1.3 | 13 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 12 | 120 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 55 | 550 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 7.8 | 78 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 15 |

**Waste Acceptance Criteria**

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

# Results - Single Stage WAC

**Project: 17-1455 - Arklow WWTW Land GI**

| | | | | | Landfill Waste Acceptance Criteria Limits | | |
|---|---|---|---|---|---|---|---|
| **Chemtest Job No:** | 18-05585 | | | | | | |
| **Chemtest Sample ID:** | 584691 | | | | | | |
| **Sample Ref:** | BH9 | | | | | | |
| **Sample ID:** | ES4 | | | | | | |
| **Top Depth(m):** | 4.00 | | | | | | |
| **Bottom Depth(m):** | | | | | | | |
| **Sampling Date:** | 21-Feb-2018 | | | | | | |
| **Determinand** | **SOP** | **Accred.** | **Units** | | **Inert Waste Landfill** | **Stable, Non-reactive hazardous waste in non-hazardous Landfill** | **Hazardous Waste Landfill** |
| Total Organic Carbon | 2625 | U | % | 1.3 | 3 | 5 | 6 |
| Loss On Ignition | 2610 | U | % | 3.4 | -- | -- | 10 |
| Total BTEX | 2760 | U | mg/kg | < 0.010 | 6 | -- | -- |
| Total PCBs (7 Congeners) | 2815 | U | mg/kg | < 0.10 | 1 | -- | -- |
| TPH Total WAC (Mineral Oil) | 2670 | U | mg/kg | < 10 | 500 | -- | -- |
| Total (Of 17) PAH's | 2800 | N | mg/kg | < 2.0 | 100 | -- | -- |
| pH | 2010 | U | | 7.7 | -- | >6 | -- |
| Acid Neutralisation Capacity | 2015 | N | mol/kg | < 0.0020 | -- | To evaluate | To evaluate |
| **Eluate Analysis** | | | **10:1 Eluate mg/l** | **10:1 Eluate mg/kg** | **Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg** | | |
| Arsenic | 1450 | U | 0.018 | 0.18 | 0.5 | 2 | 25 |
| Barium | 1450 | U | 0.011 | < 0.50 | 20 | 100 | 300 |
| Cadmium | 1450 | U | < 0.00010 | < 0.010 | 0.04 | 1 | 5 |
| Chromium | 1450 | U | < 0.0010 | < 0.050 | 0.5 | 10 | 70 |
| Copper | 1450 | U | 0.0076 | 0.076 | 2 | 50 | 100 |
| Mercury | 1450 | U | 0.0015 | 0.015 | 0.01 | 0.2 | 2 |
| Molybdenum | 1450 | U | 0.0011 | < 0.050 | 0.5 | 10 | 30 |
| Nickel | 1450 | U | < 0.0010 | < 0.050 | 0.4 | 10 | 40 |
| Lead | 1450 | U | 0.024 | 0.24 | 0.5 | 10 | 50 |
| Antimony | 1450 | U | 0.0019 | 0.019 | 0.06 | 0.7 | 5 |
| Selenium | 1450 | U | < 0.0010 | < 0.010 | 0.1 | 0.5 | 7 |
| Zinc | 1450 | U | 0.0095 | < 0.50 | 4 | 50 | 200 |
| Chloride | 1220 | U | < 1.0 | < 10 | 800 | 15000 | 25000 |
| Fluoride | 1220 | U | 0.18 | 1.8 | 10 | 150 | 500 |
| Sulphate | 1220 | U | 3.7 | 37 | 1000 | 20000 | 50000 |
| Total Dissolved Solids | 1020 | N | 18 | 180 | 4000 | 60000 | 100000 |
| Phenol Index | 1920 | U | < 0.030 | < 0.30 | 1 | - | - |
| Dissolved Organic Carbon | 1610 | U | 5.7 | 57 | 500 | 800 | 1000 |

| **Solid Information** | |
|---|---|
| Dry mass of test portion/kg | 0.090 |
| Moisture (%) | 17 |

**Waste Acceptance Criteria**

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

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1610 | Total/Dissolved Organic Carbon in Waters | Organic Carbon | TOC Analyser using Catalytic Oxidation |
| 1920 | Phenols in Waters by HPLC | Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded. | Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection. |
| 2010 | pH Value of Soils | pH | pH Meter |
| 2015 | Acid Neutralisation Capacity | Acid Reserve | Titration |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium | Boron; Sulphate; Magnesium; Chromium | Aqueous extraction / ICP-OES |
| 2192 | Asbestos | Asbestos | Polarised light microscopy / Gravimetry |
| 2300 | Cyanides & Thiocyanate in Soils | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser. |
| 2325 | Sulphide in Soils | Sulphide | Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine. |
| 2450 | Acid Soluble Metals in Soils | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc | Acid digestion followed by determination of metals in extract by ICP-MS. |
| 2490 | Hexavalent Chromium in Soils | Chromium [VI] | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2610 | Loss on Ignition | loss on ignition (LOI) | Determination of the proportion by mass that is lost from a soil by ignition at 550°C. |
| 2625 | Total Organic Carbon in Soils | Total organic Carbon (TOC) | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser. |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40 | Dichloromethane extraction / GC-FID |
| 2680 | TPH A/A Split | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Dichloromethane extraction / GCxGC FID detection |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds. |
| 2790 | Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS | Semi-volatile organic compounds(cf. USEPA Method 8270) | Acetone/Hexane extraction / GC-MS |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 2800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS | Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene* | Dichloromethane extraction / GC-MS |
| 2815 | Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS | ICES7 PCB congeners | Acetone/Hexane extraction / GC-MS |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-09812-2 | | |
| **Initial Date of Issue:** | 17-May-2018 | **Date of Re-Issue:** | 21-May-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 Arklow WWTW Land GI | | |
| **Quotation No.:** | Q17-11626 | **Date Received:** | 11-Apr-2018 |
| **Order No.:** | | **Date Instructed:** | 13-Apr-2018 |
| **No. of Samples:** | 29 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 19-Apr-2018 |
| **Date Approved:** | 17-May-2018 | **Subcon Results Due:** | 03-May-2018 |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 604828 | 604829 | 604830 | 604831 | 604832 | 604833 | 604834 | 604835 | 604836 |
| Order No.: | | | | | Client Sample Ref.: | BH08 | BH06A | BH10B | SW03 | SW01 | SW01 | SW02 | SW02 | SW03 |
| | | | | | Client Sample ID.: | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | | HW | LW | HW | LW | HW | LW |
| | | | | | Date Sampled: | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | | |
| pH | U | 1010 | | N/A | | 7.8 | 7.4 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | | 1300 | 10000 | 50000 | 50000 | 49000 | 49000 | 49000 | 49000 | 50000 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | | 690 | 530 | 490 | 220 | 250 | 240 | 170 | 150 | 140 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | | 760 | 6000 | 30000 | 30000 | 30000 | 30000 | 29000 | 30000 | 30000 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | | [B] < 4.0 | [B] < 4.0 | [B] 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | | 34 | 40 | 36 | 280 | 300 | 290 | 310 | 230 | 280 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | | 5.4 | 5.6 | 4.7 | 6.5 | 6.7 | 6.6 | 6.3 | 6.9 | 6.7 |
| Redox Potential | N | 1170 | mV | N/A | | 270 | 300 | 220 | 210 | 210 | 210 | 210 | 210 | 210 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | | 170 | 230 | 350 | 59 | 54 | 81 | 58 | 51 | 59 |
| Chloride | U | 1220 | mg/l | 1.0 | | 55 | 2700 | 130 | 19000 | 19000 | 19000 | 19000 | 20000 | 19000 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | | 0.14 | 1.5 | 1.4 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 | 0.86 |
| Nitrate | U | 1220 | mg/l | 0.50 | | 17 | 1.7 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phosphate | U | 1220 | mg/l | 0.200 | | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| Sulphate | U | 1220 | mg/l | 1.0 | | 460 | 1100 | 600 | 2600 | 2600 | 2500 | 2500 | 2600 | 2500 |
| Cyanide (Free) | U | 1300 | mg/l | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Cyanide (Complex) | U | 1300 | mg/l | 0.050 | | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Calcium | U | 1415 | mg/l | 5.0 | | 230 | 390 | 350 | 560 | 570 | 570 | 530 | 620 | 540 |
| Magnesium | U | 1415 | mg/l | 0.50 | | 15 | 220 | 22 | 1700 | 1700 | 1800 | 1700 | 2100 | 1800 |
| Sodium | U | 1415 | mg/l | 0.50 | | 33 | 1500 | 59 | 6200 | 6200 | 6300 | 6600 | 5200 | 6100 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | | < 1.0 | 7.7 | 20 | 72 | 80 | 87 | 120 | 92 | 96 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | | 45 | 29 | 33 | 5.8 | < 5.0 | 5.0 | 7.1 | 5.6 | 9.8 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | | 2.4 | 19 | 2.1 | < 0.080 | < 0.080 | < 0.080 | < 0.080 | < 0.080 | 0.10 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | | 48 | 120 | 14 | 780 | 310 | 400 | 470 | 340 | 300 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | | 520 | 500 | 620 | 1400 | 1000 | 1200 | 1600 | 1200 | 1600 |
| Mercury (Dissolved) | U | 1450 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | 2.2 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | | 390 | 1200 | 740 | 5.1 | 3.7 | 4.4 | 5.9 | 5.3 | 13 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | | < 1.0 | 1.1 | 4.4 | 8.9 | 9.1 | 9.5 | 12 | 9.9 | 11 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | | 6.0 | 23 | 9.9 | 3.9 | 9.7 | 9.1 | 9.9 | 7.6 | 8.0 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | | 15 | 2.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | | < 1.0 | < 1.0 | 3.7 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | | 7.6 | 26 | 4.3 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | | < 1.0 | 6.0 | 3.9 | 48 | 75 | 78 | 98 | 79 | 82 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | | 360 | 28000 | 1300 | 74 | 61 | 73 | 89 | 75 | 94 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | | < 20 | 21 | < 20 | 150 | 240 | 250 | 310 | 250 | 260 |
| Chromium (Hexavalent) | U | 1490 | µg/l | 20 | | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 604828 | 604829 | 604830 | 604831 | 604832 | 604833 | 604834 | 604835 | 604836 |
| Order No.: | | | | | Client Sample Ref.: | BH08 | BH06A | BH10B | SW03 | SW01 | SW01 | SW02 | SW02 | SW03 |
| | | | | | Client Sample ID.: | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | | HW | LW | HW | LW | HW | LW |
| | | | | | Date Sampled: | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | | |
| Chloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 604828 | 604829 | 604830 | 604831 | 604832 | 604833 | 604834 | 604835 | 604836 |
| Order No.: | | | | | Client Sample Ref.: | BH08 | BH06A | BH10B | SW03 | SW01 | SW01 | SW02 | SW02 | SW03 |
| | | | | | Client Sample ID.: | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | | HW | LW | HW | LW | HW | LW |
| | | | | | Date Sampled: | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | | |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 604828 | 604829 | 604830 | 604831 | 604832 | 604833 | 604834 | 604835 | 604836 |
| Order No.: | | | | | Client Sample Ref.: | BH08 | BH06A | BH10B | SW03 | SW01 | SW01 | SW02 | SW02 | SW03 |
| | | | | | Client Sample ID.: | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | | HW | LW | HW | LW | HW | LW |
| | | | | | Date Sampled: | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | | |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | | See Attached | | See Attached | See Attached | | | |
| Gross Alpha/Beta (Subcon) | S | | | N/A | | | | See Attached | | See Attached | See Attached | | | |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604828 | 604829 | 604830 | 604831 | 604832 | 604833 | 604834 | 604835 | 604836 |
| Order No.: | | | Client Sample Ref.: | | BH08 | BH06A | BH10B | SW03 | SW01 | SW01 | SW02 | SW02 | SW03 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | HW | LW | HW | LW | HW | LW |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604837 | 604838 | 604839 | 604840 | 604841 | 604842 | 604843 | 604844 | 604845 |
| Order No.: | | | Client Sample Ref.: | | BH14 | BH15D | BH20 | SW04 | SW04 | BH11 | BH01 | BH02C | BH05 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | LW | HW | | | | |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| pH | U | 1010 | | N/A | 8.3 | 8.2 | 7.1 | 7.9 | 7.7 | 7.9 | 12.4 | 12.5 | 8.5 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 37000 | 2800 | 4800 | 510 | 990 | 7400 | 17000 | 21000 | 6400 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 270 | 2200 | 670 | 26 | 13 | 540 | 160 | 140 | 370 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 23000 | 1700 | 2900 | 310 | 600 | 4400 | 10000 | 13000 | 3800 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] 5.0 | [B] 4.0 | [B] 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 5.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 21 | 29 | 42 | 36 | 37 | 46 | 180 | 200 | 55 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 5.1 | 5.3 | 4.7 | 6.5 | 6.6 | 5.0 | 5.9 | 6.5 | 5.0 |
| Redox Potential | N | 1170 | mV | N/A | 200 | 220 | 230 | 160 | 180 | 210 | 9.4 | 0.000 | 110 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 350 | 350 | 100 | 23 | 17 | 350 | 1300 | 2000 | 210 |
| Chloride | U | 1220 | mg/l | 1.0 | 1200 | 740 | 1100 | 150 | 150 | 1800 | 2700 | 3700 | 2500 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.10 | 0.10 | 0.93 | 0.11 | 0.086 | 3.0 | 0.28 | 0.54 | 0.33 |
| Nitrate | U | 1220 | mg/l | 0.50 | 0.66 | 0.86 | < 0.50 | 3.4 | 3.1 | < 0.50 | 0.57 | 0.74 | < 0.50 |
| Phosphate | U | 1220 | mg/l | 0.200 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| Sulphate | U | 1220 | mg/l | 1.0 | 210 | 110 | 1200 | 63 | 35 | 1300 | 210 | 54 | 1400 |
| Cyanide (Free) | U | 1300 | mg/l | 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Cyanide (Complex) | U | 1300 | mg/l | 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Calcium | U | 1415 | mg/l | 5.0 | 120 | 110 | 420 | 7.9 | 7.2 | 570 | 860 | 1200 | 740 |
| Magnesium | U | 1415 | mg/l | 0.50 | 98 | 77 | 91 | 11 | 12 | 150 | 1.8 | < 0.50 | 250 |
| Sodium | U | 1415 | mg/l | 0.50 | 620 | 450 | 580 | 66 | 73 | 1100 | 1600 | 2100 | 1900 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 5.9 | 4.1 | 6.3 | 2.2 | 2.0 | 23 | 15 | 28 | 22 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 28 | 32 | 29 | 5.3 | < 5.0 | 31 | 590 | 1600 | 40 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 0.12 | < 0.080 | 17 | 0.14 | 0.14 | 1.9 | < 0.080 | < 0.080 | 0.23 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 8.3 | 4.7 | 83 | 9.9 | 9.7 | 26 | 36 | 120 | 28 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 170 | 150 | 1100 | 180 | 180 | 1100 | 1600 | 2000 | 5700 |
| Mercury (Dissolved) | U | 1450 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 1000 | 740 | 2200 | 56 | 54 | 1700 | 2.4 | 1.2 | 2300 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 5.3 | 32 | 37 | 4.3 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 3.3 | 2.9 | 22 | 1.6 | 1.7 | 11 | 5.5 | 15 | 22 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | 1.3 | 1.2 | < 1.0 | 37 | 38 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 2.4 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | 8.2 | 8.7 | 13 | 1.8 | 1.7 | 26 | 41 | < 1.0 | 48 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 5.3 | 5.0 | 6.0 | 4.7 | 3.9 | 8.1 | 12 | 20 | 10 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 83 | 37 | 3600 | 71 | 61 | 500 | 18 | 15 | 330 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | < 20 | < 20 | 20 | < 20 | < 20 | 28 | 69 | 110 | 34 |
| Chromium (Hexavalent) | U | 1490 | µg/l | 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | 130 | < 20 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604837 | 604838 | 604839 | 604840 | 604841 | 604842 | 604843 | 604844 | 604845 |
| Order No.: | | | Client Sample Ref.: | | BH14 | BH15D | BH20 | SW04 | SW04 | BH11 | BH01 | BH02C | BH05 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | LW | HW | | | | |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604837 | 604838 | 604839 | 604840 | 604841 | 604842 | 604843 | 604844 | 604845 |
| Order No.: | | | Client Sample Ref.: | | BH14 | BH15D | BH20 | SW04 | SW04 | BH11 | BH01 | BH02C | BH05 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | LW | HW | | | | |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 604837 | 604838 | 604839 | 604840 | 604841 | 604842 | 604843 | 604844 | 604845 |
| Order No.: | | | | | Client Sample Ref.: | BH14 | BH15D | BH20 | SW04 | SW04 | BH11 | BH01 | BH02C | BH05 |
| | | | | | Client Sample ID.: | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | | LW | HW | | | | |
| | | | | | Date Sampled: | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | | |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | | | | | | | | |
| Gross Alpha/Beta (Subcon) | S | | | N/A | | | | | | | | | | |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604837 | 604838 | 604839 | 604840 | 604841 | 604842 | 604843 | 604844 | 604845 |
| Order No.: | | | Client Sample Ref.: | | BH14 | BH15D | BH20 | SW04 | SW04 | BH11 | BH01 | BH02C | BH05 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | LW | HW | | | | |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604846 | 604847 | 604848 | 604849 | 604850 | 604851 | 604852 | 604853 | 604854 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 | SW05 | SW06 | SW07 | SW08 | SW05 | SW06 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | LW | HW | LW | LW | HW | LW |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| pH | U | 1010 | | N/A | 8.3 | 8.4 | 9.2 | 8.7 | 8.4 | 8.5 | 8.3 | 8.1 | 8.2 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 6500 | 2500 | 5500 | 350 | 400 | 120 | 120 | 360 | 120 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 310 | 570 | 200 | 7.0 | 5.0 | < 5.0 | < 5.0 | 16 | < 5.0 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 3900 | 1500 | 3300 | 210 | 240 | 71 | 70 | 220 | 70 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 6.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 37 | 17 | 46 | < 10 | < 10 | < 10 | 11 | < 10 | < 10 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 4.8 | 6.8 | 6.3 | 8.4 | 6.5 | 8.4 | 8.3 | 7.1 | 8.5 |
| Redox Potential | N | 1170 | mV | N/A | 120 | 150 | 71 | 160 | 190 | 210 | 220 | 220 | 220 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 230 | 190 | 45 | 22 | 21 | 19 | 19 | 33 | 23 |
| Chloride | U | 1220 | mg/l | 1.0 | 1700 | 590 | 1200 | 15 | 92 | 17 | 15 | 120 | 18 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.78 | 0.21 | 1.7 | 0.075 | 0.064 | 0.065 | 0.077 | 0.12 | 0.18 |
| Nitrate | U | 1220 | mg/l | 0.50 | 2.1 | 5.3 | < 0.50 | 13 | 12 | 14 | 13 | 12 | 13 |
| Phosphate | U | 1220 | mg/l | 0.200 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 |
| Sulphate | U | 1220 | mg/l | 1.0 | 740 | 150 | 1300 | 15 | 25 | 14 | 14 | 26 | 14 |
| Cyanide (Free) | U | 1300 | mg/l | 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Cyanide (Complex) | U | 1300 | mg/l | 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Calcium | U | 1415 | mg/l | 5.0 | 290 | 60 | 630 | < 5.0 | 5.3 | < 5.0 | < 5.0 | 10 | 34 |
| Magnesium | U | 1415 | mg/l | 0.50 | 140 | 46 | 19 | 3.6 | 9.2 | 3.5 | 3.4 | 24 | 7.2 |
| Sodium | U | 1415 | mg/l | 0.50 | 1000 | 440 | 740 | 8.7 | 54 | 7.7 | 7.2 | 190 | 28 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 7.7 | 5.0 | 9.2 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 22 | 27 | 42 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 7.6 | < 5.0 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 2.4 | 0.34 | < 0.080 | 0.17 | 0.13 | 0.15 | 0.20 | 0.15 | 0.16 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 17 | 22 | 11 | 9.2 | 7.5 | 8.6 | 12 | 9.1 | 9.2 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 710 | 86 | 1200 | 140 | 120 | 130 | 180 | 140 | 140 |
| Mercury (Dissolved) | U | 1450 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 590 | 32 | 7.9 | 40 | 38 | 38 | 51 | 44 | 42 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | 2.4 | 3.2 | 3.1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 7.3 | 2.4 | 5.3 | 1.2 | 1.0 | < 1.0 | 1.7 | 1.4 | 1.2 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | 1.6 | 1.5 | 1.2 | 1.4 | 1.9 | 1.5 | 1.5 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | 24 | 6.6 | 15 | < 1.0 | 1.0 | < 1.0 | < 1.0 | 1.2 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 5.5 | 2.6 | 7.4 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 820 | 130 | 34 | 54 | 48 | 51 | 70 | 54 | 55 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| Chromium (Hexavalent) | U | 1490 | µg/l | 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 604846 | 604847 | 604848 | 604849 | 604850 | 604851 | 604852 | 604853 | 604854 |
| Order No.: | | | | | Client Sample Ref.: | BH17 | BH18 | BH19 | SW05 | SW06 | SW07 | SW08 | SW05 | SW06 |
| | | | | | Client Sample ID.: | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | | LW | HW | LW | LW | HW | LW |
| | | | | | Date Sampled: | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | | |
| Chloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604846 | 604847 | 604848 | 604849 | 604850 | 604851 | 604852 | 604853 | 604854 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 | SW05 | SW06 | SW07 | SW08 | SW05 | SW06 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | LW | HW | LW | LW | HW | LW |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | | | **Chemtest Sample ID.:** | 604846 | 604847 | 604848 | 604849 | 604850 | 604851 | 604852 | 604853 | 604854 |
| Order No.: | | | | | Client Sample Ref.: | BH17 | BH18 | BH19 | SW05 | SW06 | SW07 | SW08 | SW05 | SW06 |
| | | | | | Client Sample ID.: | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | | LW | HW | LW | LW | HW | LW |
| | | | | | Date Sampled: | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | | |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | See Attached | See Attached | | | | | | |
| Gross Alpha/Beta (Subcon) | S | | | N/A | | | See Attached | See Attached | | | | | | |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604846 | 604847 | 604848 | 604849 | 604850 | 604851 | 604852 | 604853 | 604854 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 | SW05 | SW06 | SW07 | SW08 | SW05 | SW06 |
| | | | Client Sample ID.: | | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | | LW | HW | LW | LW | HW | LW |
| | | | Date Sampled: | | 09-Apr-2018 | 09-Apr-2018 | 09-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604855 | 604856 |
| Order No.: | | | Client Sample Ref.: | | SW07 | SW08 |
| | | | Client Sample ID.: | | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | HW | HW |
| | | | Date Sampled: | | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| pH | U | 1010 | | N/A | 7.9 | 7.9 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 420 | 440 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | < 5.0 | < 5.0 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 250 | 260 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] 4.0 | [B] 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | < 10 | 11 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 7.7 | 8.0 |
| Redox Potential | N | 1170 | mV | N/A | 230 | 240 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 21 | 19 |
| Chloride | U | 1220 | mg/l | 1.0 | 100 | 110 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.16 | 0.13 |
| Nitrate | U | 1220 | mg/l | 0.50 | 12 | 12 |
| Phosphate | U | 1220 | mg/l | 0.200 | < 0.20 | < 0.20 |
| Sulphate | U | 1220 | mg/l | 1.0 | 26 | 27 |
| Cyanide (Free) | U | 1300 | mg/l | 0.050 | < 0.050 | < 0.050 |
| Cyanide (Complex) | U | 1300 | mg/l | 0.050 | < 0.050 | < 0.050 |
| Calcium | U | 1415 | mg/l | 5.0 | < 5.0 | 5.0 |
| Magnesium | U | 1415 | mg/l | 0.50 | 9.6 | 9.8 |
| Sodium | U | 1415 | mg/l | 0.50 | 55 | 56 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 0.17 | 0.17 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 8.4 | 9.1 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 140 | 150 |
| Mercury (Dissolved) | U | 1450 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 45 | 45 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | 1.3 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | 1.3 | 1.4 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | 1.2 | 1.2 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 62 | 56 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | < 20 | < 20 |
| Chromium (Hexavalent) | U | 1490 | µg/l | 20 | < 20 | < 20 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604855 | 604856 |
| Order No.: | | | Client Sample Ref.: | | SW07 | SW08 |
| | | | Client Sample ID.: | | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | HW | HW |
| | | | Date Sampled: | | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604855 | 604856 |
| Order No.: | | | Client Sample Ref.: | | SW07 | SW08 |
| | | | Client Sample ID.: | | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | HW | HW |
| | | | Date Sampled: | | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604855 | 604856 |
| Order No.: | | | Client Sample Ref.: | | SW07 | SW08 |
| | | | Client Sample ID.: | | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | HW | HW |
| | | | Date Sampled: | | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | |
| Gross Alpha/Beta (Subcon) | S | | | N/A | | |

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-09812 | 18-09812 |
|---|---|---|---|---|---|---|
| Quotation No.: Q17-11626 | | | **Chemtest Sample ID.:** | | 604855 | 604856 |
| Order No.: | | | Client Sample Ref.: | | SW07 | SW08 |
| | | | Client Sample ID.: | | WS1 | WS1 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | HW | HW |
| | | | Date Sampled: | | 10-Apr-2018 | 10-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 604828 | BH08 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604828 | BH08 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604828 | BH08 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604829 | BH06A | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604829 | BH06A | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604829 | BH06A | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604830 | BH10B | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604830 | BH10B | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604830 | BH10B | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604831 | SW03 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604831 | SW03 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604831 | SW03 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604832 | SW01 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604832 | SW01 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604832 | SW01 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604833 | SW01 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604833 | SW01 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604833 | SW01 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604834 | SW02 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604834 | SW02 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604834 | SW02 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604835 | SW02 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604835 | SW02 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604835 | SW02 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604836 | SW03 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604836 | SW03 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604836 | SW03 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604837 | BH14 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604837 | BH14 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604837 | BH14 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604838 | BH15D | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604838 | BH15D | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604838 | BH15D | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604839 | BH20 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 604839 | BH20 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604839 | BH20 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604840 | SW04 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604840 | SW04 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604840 | SW04 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604841 | SW04 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604841 | SW04 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604841 | SW04 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604842 | BH11 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604842 | BH11 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604842 | BH11 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604843 | BH01 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604843 | BH01 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604843 | BH01 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604844 | BH02C | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604844 | BH02C | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604844 | BH02C | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604845 | BH05 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604845 | BH05 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604845 | BH05 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604846 | BH17 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604846 | BH17 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604846 | BH17 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604847 | BH18 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604847 | BH18 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604847 | BH18 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604848 | BH19 | WS1 | 09-Apr-2018 | B | Coloured Winchester 1000ml |
| 604848 | BH19 | WS1 | 09-Apr-2018 | B | EPA Vial 40ml |
| 604848 | BH19 | WS1 | 09-Apr-2018 | B | Plastic Bottle 1000ml |
| 604849 | SW05 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604849 | SW05 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604849 | SW05 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |
| 604850 | SW06 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604850 | SW06 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604850 | SW06 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 604851 | SW07 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604851 | SW07 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604851 | SW07 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |
| 604852 | SW08 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604852 | SW08 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604852 | SW08 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |
| 604853 | SW05 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604853 | SW05 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604853 | SW05 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |
| 604854 | SW06 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604854 | SW06 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604854 | SW06 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |
| 604855 | SW07 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604855 | SW07 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604855 | SW07 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |
| 604856 | SW08 | WS1 | 10-Apr-2018 | B | Coloured Winchester 1000ml |
| 604856 | SW08 | WS1 | 10-Apr-2018 | B | EPA Vial 40ml |
| 604856 | SW08 | WS1 | 10-Apr-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

SOCOTEC

# Analysis of Water Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12, Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0337 |
| Customer Reference: | 18-09812 / Arklow WwTW Land GI |
| Quote Number: | ENR-ANU-9202 |
| PO Number: | 16665 |
| Samples Received: | 16 April 2018 |
| Sample Condition: | Satisfactory; Ambient |
| Analysis Completed: | 10 May 2018 |
| Report Author: | |
| Author's Name: | Carla Thompson |
| Job Title: | Deputy Project Manager |
| Approved By: | |
| Approver's name: | Gary Shaw |
| Job Title: | Senior Analyst |
| Report Date: | 21 May 2018 |



UKAS TESTING
1015

SOCOTEC

## Introduction

This is a revised report as denoted by the suffix 'Rev1'. The report has been reissued with additional sample details at the request of the customer. All results remain unchanged. This report supersedes the previous issue.

## Sample Summary

The analysis schedule and sample details were confirmed on 25 April 2018.

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 604830 BH10B WS1 | RW2557 | Water | 09/04/2018 12:00 |
| 604832 SW01 WS1 LW | RW2558 | Water | 09/04/2018 12:00 |
| 604833 SW01 WS1 HW | RW2559 | Water | 09/04/2018 12:00 |
| 604847 BH18 WS1 | RW2560 | Water | 09/04/2018 12:00 |
| 604848 BH19 WS1 | RW2561 | Water | 09/04/2018 12:00 |

## Experimental

### Gross Alpha /Beta in Water

Samples were analysed following method "ANU/SOP/2002 Issue 8" – "An acidified water sample was concentrated by evaporation and sulphuric acid (specific gravity 1.84) added, the solution was then evaporated to dryness. The resulting solid material was ashed in a muffle furnace. An aliquot of the ground residue was used to prepare a uniform thickness source which was counted on a Berthold LB770 low-level proportional counter for an appropriate length of time."

### Gamma Spectrometry

Samples were analysed following method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Deviating Sample Disclaimer

The reported results are representative of the samples upon receipt. However,

E) Sample processing did not commence within the appropriate holding time (annotated with "†" in the tables below).

G) The samples were not received by the laboratory at the correct temperature. (Temperature on receipt was 16°C; between 2°C and 8°C is recommended).

M) Insufficient sample volume was received to complete all analysis simultaneously.

N) The Gross Alpha /Beta in Water method was not followed, due to insufficient sample.

Consequently the samples are considered deviating and the validity of the reported data may be compromised.



UKAS TESTING
1015

SOCOTEC

## Results

Results are presented in the following tables.

Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

## Results Summary – Gross Alpha/Beta

| Customer Reference | Laboratory Reference | Analysis Date | Gross Alpha as Pu-242 | Gross Beta as Cs-137 |
|---|---|---|---|---|
| **604830 BH10B WS1** | **RW2557 †** | 08/05/2018 | 7.15 ± 1.9 | 9.3 ± 2.3 |
| **604832 SW01 WS1 LW** | **RW2558 †** | 08/05/2018 | <2.8 | 11.7 ± 5.3 |
| **604833 SW01 WS1 HW** | **RW2559 †** | 08/05/2018 | <6 | 10.6 ± 4.4 |
| **604847 BH18 WS1** | **RW2560 †** | 08/05/2018 | 10.3 ± 3.4 | 13.7 ± 2.9 |
| **604848 BH19 WS1** | **RW2561 †** | 08/05/2018 | <0.92 | <2.3 |

**Notes**:
1. Results are presented as $Bq.L^{-1}$ of sample as received, relative to the analysis date.
2. Uncertainties are quoted at 2 s.d. and are based on a total uncertainty budget.
3. † Sample processing did not commence within the appropriate holding time.

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| 604830 BH10B WS1 | RW2557 † | <40 | <110 | <5.2 | <5.4 | <4.5 | <5.0 | <57 | <58 | <7.4 |
| 604832 SW01 WS1 LW | RW2558 † | <42 | <72 | <5.8 | <5.4 | <5.0 | <5.0 | <62 | <63 | <6.3 |
| 604833 SW01 WS1 HW | RW2559 † | <42 | <67 | <5.1 | <5.5 | <4.6 | <5.1 | <61 | <64 | <6.2 |
| 604847 BH18 WS1 | RW2560 † | <38 | <66 | <5.2 | <5.3 | <4.9 | <5.0 | <62 | <60 | <6.3 |
| 604848 BH19 WS1 | RW2561 † | <40 | <66 | <5.9 | <5.7 | <4.7 | <5.1 | <62 | <63 | <6.1 |

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| 604830 BH10B WS1 | RW2557 † | <12 | <11 | <70 | <81 | <21 | <510 | <63 | <5.1 | <5.7 |
| 604832 SW01 WS1 LW | RW2558 † | <10 | <9.4 | <60 | <94 | <17 | <740 | <78 | <5.9 | <5.2 |
| 604833 SW01 WS1 HW | RW2559 † | <11 | <9.8 | <60 | <93 | <19 | <700 | <79 | <5.8 | <5.3 |
| 604847 BH18 WS1 | RW2560 † | <11 | <9.7 | <61 | <90 | <19 | <700 | <79 | <5.6 | <5.5 |
| 604848 BH19 WS1 | RW2561 † | <11 | <9.7 | <62 | <93 | <19 | <670 | <77 | <5.8 | <5.4 |

**Notes:**

1. Analyses marked with an asterisk are not UKAS accredited.
2. Results are presented as $Bq.L^{-1}$ of sample as received and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
5. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.

UKAS TESTING
1015

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Final Report

**Report No.:** 18-11282-1

**Initial Date of Issue:** 11-Jun-2018

**Client** Causeway Geotech Ltd

**Client Address:** 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

**Contact(s):** Aisling O'Kane
Colm Hurley
Darren O'Mahony
Gabriella Horan
John Cameron
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Curtis
Stephen Franey
Stephen Watson

**Project** 17-1455 - Arklow WWTW Land GI

| | | | |
|---|---|---|---|
| **Quotation No.:** | Q18-13033 | **Date Received:** | 25-Apr-2018 |
| **Order No.:** | | **Date Instructed:** | 10-May-2018 |
| **No. of Samples:** | 11 | | |
| **Turnaround (Wkdays):** | 11 | **Results Due:** | 24-May-2018 |
| **Date Approved:** | 11-Jun-2018 | **Subcon Results Due:** | 12-Jun-2018 |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | 612641 | 612642 | 612643 | 612644 | 612645 | 612646 | 612647 | 612648 |
| Order No.: | | | Client Sample Ref.: | BH10B | BH11 | BH08 | BH06A | BH20 | BH02C | BH01 | BH05 |
| | | | Client Sample ID.: | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | |
| Explosives High Level Suite (Subcon) | SN | | mg/l | N/A | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | [B] 7.8 | [B] 7.8 | [B] 8.0 | [B] 8.0 | [B] 8.1 | [B] 12.8 | [B] 12.9 | [B] 8.4 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | [B] 7300 | [B] 7000 | [B] 2700 | [B] 4100 | [B] 17000 | [B] 21000 | [B] 22000 | [B] 18000 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | [B] 40000 | [B] 15000 | [B] 9200 | [B] 6900 | [B] 9500 | [B] 15000 | [B] 9500 | [B] 14000 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 4400 | 4200 | 1600 | 2400 | 10000 | 13000 | 13000 | 11000 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 6.4 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | [B] 21 | [B] 20 | [B] 16 | [B] 16 | [B] 44 | [B] 130 | [B] 140 | [B] 45 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.1 | 8.1 | 8.2 | 8.3 | 8.0 | 7.8 | 8.2 | 8.1 |
| Redox Potential | N | 1170 | mV | N/A | 300 | 300 | 300 | 300 | 300 | 60 | 160 | 210 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | [B] 460 | [B] 490 | [B] 230 | [B] 220 | [B] 210 | [B] 780 | [B] 240 | [B] 230 |
| Chloride | U | 1220 | mg/l | 1.0 | [B] 1000 | [B] 1100 | [B] 710 | [B] 440 | [B] 5700 | [B] 6800 | [B] 10000 | [B] 5800 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | [B] 0.40 | [B] 1.0 | [B] < 0.050 | [B] < 0.050 | [B] 1.6 | [B] 1.6 | [B] 1.3 | [B] 1.5 |
| Nitrate | U | 1220 | mg/l | 0.50 | [B] 4.0 | [B] < 0.50 | [B] 10 | [B] 11 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Sulphate | U | 1220 | mg/l | 1.0 | [B] 1300 | [B] 1300 | [B] 580 | [B] 510 | [B] 1200 | [B] 580 | [B] 1500 | [B] 1300 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | [B] 580 | [B] 590 | [B] 300 | [B] 270 | [B] 340 | [B] 260 | [B] 270 | [B] 360 |
| Potassium | U | 1415 | mg/l | 0.50 | [B] 39 | [B] 38 | [B] 19 | [B] 13 | [B] 81 | [B] 250 | [B] 170 | [B] 94 |
| Magnesium | U | 1415 | mg/l | 0.50 | [B] 71 | [B] 68 | [B] 58 | [B] 38 | [B] 270 | [B] 8.3 | [B] 480 | [B] 310 |
| Sodium | U | 1415 | mg/l | 0.50 | [B] 570 | [B] 530 | [B] 400 | [B] 220 | [B] 2200 | [B] 3700 | [B] 4200 | [B] 2500 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 16 | [B] 13 | [B] 2.7 | [B] 2.4 | [B] 16 | [B] 18 | [B] 30 | [B] 17 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | [B] 24 | [B] 28 | [B] 25 | [B] 31 | [B] 39 | [B] 230 | [B] 57 | [B] 40 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | [B] 0.69 | [B] 2.0 | [B] 1.3 | [B] 1.4 | [B] 2.4 | [B] 0.093 | [B] 2.2 | [B] 2.8 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 6.8 | [B] 9.3 | [B] 8.5 | [B] 15 | [B] 23 | [B] 130 | [B] 52 | [B] 38 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 740 | 900 | 310 | 420 | 510 | 870 | 540 | 550 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 2100 | [B] 3000 | [B] 240 | [B] 40 | [B] 370 | [B] 6.7 | [B] 330 | [B] 510 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 12 | [B] 8.4 | [B] 1.2 | [B] < 1.0 | [B] 2.1 | [B] 22 | [B] 8.2 | [B] 1.9 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 24 | [B] 35 | [B] 4.2 | [B] 3.0 | [B] 2.8 | [B] 6.8 | [B] 6.5 | [B] 3.2 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | [B] < 1.0 | [B] 1.6 | [B] < 1.0 | [B] 1.7 | [B] < 1.0 | [B] 2.4 | [B] < 1.0 | [B] < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 4.8 | [B] 4.6 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 12 | [B] 12 | [B] 8.7 | [B] 6.7 | [B] 39 | [B] 44 | [B] 19 | [B] 33 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 2.2 | [B] 4.8 | [B] 3.6 | [B] 3.6 | [B] 15 | [B] 22 | [B] 33 | [B] 24 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 110 | [B] 260 | [B] 76 | [B] 130 | [B] 72 | [B] 14 | [B] 77 | [B] 110 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | [B] < 20 | [B] < 20 | [B] < 20 | [B] < 20 | [B] 49 | [B] < 20 | [B] 110 | [B] 79 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] 190 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612641 | 612642 | 612643 | 612644 | 612645 | 612646 | 612647 | 612648 |
| Order No.: | | | Client Sample Ref.: | | BH10B | BH11 | BH08 | BH06A | BH20 | BH02C | BH01 | BH05 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] 23 | [B] 9.5 | [B] < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] 190 | [B] 160 | [B] < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [BC] < 5.0 | [B] < 5.0 | [B] 210 | [B] 170 | [B] < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] 41 | [B] 25 | [B] < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] 74 | [B] 36 | [B] < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] 57 | [B] 100 | [B] < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [BC] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [BC] < 5.0 | [B] < 5.0 | [B] 170 | [B] 160 | [B] < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 | [BC] < 10 | [B] < 10 | [B] 390 | [B] 340 | [B] < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 612641 | 612642 | 612643 | 612644 | 612645 | 612646 | 612647 | 612648 |
| Order No.: | | | | | Client Sample Ref.: | BH10B | BH11 | BH08 | BH06A | BH20 | BH02C | BH01 | BH05 |
| | | | | | Client Sample ID.: | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Date Sampled: | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 | [B] < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612641 | 612642 | 612643 | 612644 | 612645 | 612646 | 612647 | 612648 |
| Order No.: | | | Client Sample Ref.: | | BH10B | BH11 | BH08 | BH06A | BH20 | BH02C | BH01 | BH05 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612641 | 612642 | 612643 | 612644 | 612645 | 612646 | 612647 | 612648 |
| Order No.: | | | Client Sample Ref.: | | BH10B | BH11 | BH08 | BH06A | BH20 | BH02C | BH01 | BH05 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | See Attached | | | | | | | |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612649 | 612650 | 612651 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | |
| Explosives High Level Suite (Subcon) | SN | | mg/l | N/A | See Attached | See Attached | See Attached |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | [B] 8.1 | [B] 8.2 | [B] 12.8 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | [B] 18000 | [B] 34000 | [B] 27000 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | [B] 15000 | [B] 22000 | [B] 12000 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 11000 | 20000 | 16000 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | [B] 47 | [B] 140 | [B] 120 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.0 | 8.1 | 8.2 |
| Redox Potential | N | 1170 | mV | N/A | 230 | 230 | 240 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | [B] 240 | [B] 160 | [B] 200 |
| Chloride | U | 1220 | mg/l | 1.0 | [B] 5900 | [B] 12000 | [B] 11000 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | [B] 1.5 | [B] 1.2 | [B] 1.4 |
| Nitrate | U | 1220 | mg/l | 0.50 | [B] < 0.50 | [B] < 0.50 | [B] < 0.50 |
| Sulphate | U | 1220 | mg/l | 1.0 | [B] 1300 | [B] 1800 | [B] 1700 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | [B] 320 | [B] 290 | [B] 260 |
| Potassium | U | 1415 | mg/l | 0.50 | [B] 84 | [B] 190 | [B] 170 |
| Magnesium | U | 1415 | mg/l | 0.50 | [B] 280 | [B] 560 | [B] 530 |
| Sodium | U | 1415 | mg/l | 0.50 | [B] 2300 | [B] 4900 | [B] 4500 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 19 | [B] 37 | [B] 32 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | [B] 43 | [B] 50 | [B] 47 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | [B] 3.1 | [B] 120 | [B] 42 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 41 | [B] 65 | [B] 53 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 600 | 600 | 510 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 620 | [B] 110 | [B] 510 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 2.0 | [B] 10 | [B] 6.9 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 3.5 | [B] 5.8 | [B] 9.5 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 36 | [B] < 1.0 | [B] 5.3 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 26 | [B] 42 | [B] 41 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | [B] 110 | [B] 88 | [B] 260 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | [B] < 0.010 | [B] < 0.010 | [B] < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | [B] 86 | [B] 140 | [B] 140 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612649 | 612650 | 612651 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] 4.4 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] 47 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] 340 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] 390 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] 25 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] 46 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] 91 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | [B] < 0.10 | [B] < 0.10 | [B] < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] 160 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] 550 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612649 | 612650 | 612651 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | [B] < 10 | [B] < 10 | [B] < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | [B] < 5.0 | [B] < 5.0 | [B] < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | [B] < 50 | [B] < 50 | [B] < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | [B] < 50 | [B] < 50 | [B] < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | [B] < 2.0 | [B] < 2.0 | [B] < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | [B] < 1.0 | [B] < 1.0 | [B] < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612649 | 612650 | 612651 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11282 | 18-11282 | 18-11282 |
|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 612649 | 612650 | 612651 |
| Order No.: | | | Client Sample Ref.: | | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | See Attached | See Attached |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 612641 | BH10B | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612641 | BH10B | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612641 | BH10B | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612642 | BH11 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612642 | BH11 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612642 | BH11 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612643 | BH08 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612643 | BH08 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612643 | BH08 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612644 | BH06A | WS2 | 24-Apr-2018 | BC | EPA Vial 40ml |
| 612644 | BH06A | WS2 | 24-Apr-2018 | BC | Plastic Bottle 1000ml |
| 612645 | BH20 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612645 | BH20 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612645 | BH20 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612646 | BH02C | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612646 | BH02C | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612646 | BH02C | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612647 | BH01 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612647 | BH01 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612647 | BH01 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612648 | BH05 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612648 | BH05 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612648 | BH05 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612649 | BH17 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612649 | BH17 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612649 | BH17 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612650 | BH18 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612650 | BH18 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612650 | BH18 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 612651 | BH19 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 612651 | BH19 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 612651 | BH19 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1460 | Mercury low-level in Waters by AFS | Mercury | Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm. |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1495 | Low Level Hexavalent Chromium in Waters | Chromium [VI] | Colorimetric determination of hexavalent chromium expressed as Cr (VI) µg/l in water, using Ion Chromatography and UV-visible spectrophotometry. |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Pentane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

**Jason King**
Chemtest Ltd
11 Depot Road
Newmarket
Suffolk
CB8 0AL

**t:** 01638 60 60 70
**f:** 01638 60 60 71
**e:** Subcontracting@chemtest.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-86510

| | | | |
|---|---|---|---|
| **Project / Site name:** | Arklow WWTW Land GI | **Samples received on:** | 24/05/2018 |
| **Your job number:** | 18-11282 | **Samples instructed on:** | 24/05/2018 |
| **Your order number:** | 61725 | **Analysis completed by:** | 29/05/2018 |
| **Report Issue Number:** | 1 | **Report issued on:** | 04/06/2018 |
| **Samples Analysed:** | 11 water samples | | |

**Signed:**

Jordan Hill
Reporting Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.


This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

**Analytical Report Number: 18-86510**

**Project / Site name: Arklow WWTW Land GI**

**Your Order No: 61725**

| **Lab Sample Number** | | | | 966710 | 966711 | 966712 | 966713 | 966714 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 612641 (BH10B WS2) | 612642 (BH11 WS2) | 612643 (BH08 WS2) | 612644 (BH06A WS2) | 612645 (BH20 WS2) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | < 20 | 51 | 36 | 20 | 150 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-86510**

**Project / Site name: Arklow WWTW Land GI**

**Your Order No: 61725**

| **Lab Sample Number** | | | | 966715 | 966716 | 966717 | 966718 | 966719 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 612646 (BH02C WS2) | 612647 (BH01 WS2) | 612648 (BH05 WS2) | 612649 (BH17 WS2) | 612650 (BH18 WS2) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 230 | 88 | < 20 | 450 | 40 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-86510**

**Project / Site name: Arklow WWTW Land GI**

**Your Order No: 61725**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lab Sample Number** | | | | 966720 | | | | |
| **Sample Reference** | | | | 612651 (BH19 WS2) | | | | |
| **Sample Number** | | | | None Supplied | | | | |
| **Depth (m)** | | | | None Supplied | | | | |
| **Date Sampled** | | | | 24/04/2018 | | | | |
| **Time Taken** | | | | None Supplied | | | | |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 22 | | | | |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-86510**

**Project / Site name: Arklow WWTW Land GI**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Total Phosphate as P in water | Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by colorimetry.Accredited matrices: SW, PW, GW. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser. | L082-PL | W | ISO 17025 |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**


This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

| Sample ID | Other_ID | Sample Type | Job | Sample Number | Sample Deviation Code | test_name | test_ref | Test Deviation code |
|---|---|---|---|---|---|---|---|---|
| 612641 (BH10B WS2) | | W | 18-86510 | 966710 | c | Total Phosphate as P in water | L082-PL | c |
| 612641 (BH10B WS2) | | W | 18-86510 | 966710 | c | Total Phosphate in water | L082-PL | c |
| 612642 (BH11 WS2) | | W | 18-86510 | 966711 | c | Total Phosphate as P in water | L082-PL | c |
| 612642 (BH11 WS2) | | W | 18-86510 | 966711 | c | Total Phosphate in water | L082-PL | c |
| 612643 (BH08 WS2) | | W | 18-86510 | 966712 | c | Total Phosphate as P in water | L082-PL | c |
| 612643 (BH08 WS2) | | W | 18-86510 | 966712 | c | Total Phosphate in water | L082-PL | c |
| 612644 (BH06A WS2) | | W | 18-86510 | 966713 | c | Total Phosphate as P in water | L082-PL | c |
| 612644 (BH06A WS2) | | W | 18-86510 | 966713 | c | Total Phosphate in water | L082-PL | c |
| 612645 (BH20 WS2) | | W | 18-86510 | 966714 | c | Total Phosphate as P in water | L082-PL | c |
| 612645 (BH20 WS2) | | W | 18-86510 | 966714 | c | Total Phosphate in water | L082-PL | c |
| 612646 (BH02C WS2) | | W | 18-86510 | 966715 | c | Total Phosphate as P in water | L082-PL | c |
| 612646 (BH02C WS2) | | W | 18-86510 | 966715 | c | Total Phosphate in water | L082-PL | c |
| 612647 (BH01 WS2) | | W | 18-86510 | 966716 | c | Total Phosphate as P in water | L082-PL | c |
| 612647 (BH01 WS2) | | W | 18-86510 | 966716 | c | Total Phosphate in water | L082-PL | c |
| 612648 (BH05 WS2) | | W | 18-86510 | 966717 | c | Total Phosphate as P in water | L082-PL | c |
| 612648 (BH05 WS2) | | W | 18-86510 | 966717 | c | Total Phosphate in water | L082-PL | c |
| 612649 (BH17 WS2) | | W | 18-86510 | 966718 | c | Total Phosphate as P in water | L082-PL | c |
| 612649 (BH17 WS2) | | W | 18-86510 | 966718 | c | Total Phosphate in water | L082-PL | c |
| 612650 (BH18 WS2) | | W | 18-86510 | 966719 | c | Total Phosphate as P in water | L082-PL | c |
| 612650 (BH18 WS2) | | W | 18-86510 | 966719 | c | Total Phosphate in water | L082-PL | c |
| 612651 (BH19 WS2) | | W | 18-86510 | 966720 | c | Total Phosphate as P in water | L082-PL | c |
| 612651 (BH19 WS2) | | W | 18-86510 | 966720 | c | Total Phosphate in water | L082-PL | c |



Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

SOCOTEC

# Analysis of Water Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12<br>Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0419 |
| Customer Reference: | 18-11282 |
| Quote Number: | ENR-ANU-9266 |
| PO Number: | 16721 |
| Samples Received: | 24 May 2018 |
| Sample Condition: | Satisfactory, Ambient |
| Analysis Completed: | 31 May 2018 |
| Report Author: | Kiran |
| Author's Name: | Kiran Bala |
| Job Title: | Analyst |
| Approved By: | CHHunston |
| Approver's name: | Charlene Hunston |
| Job Title: | Senior Analyst |
| Report Date: | 31 May 2018 |

SOCOTEC

## Sample Summary

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 612641 (BH10B WS2) | RW3081 | Water | 24/04/2018 12:00 |
| 612650 (BH18 WS2) | RW3082 | Water | 24/04/2018 12:00 |
| 612651 (BH19 WS2) | RW3083 | Water | 24/04/2018 12:00 |

## Experimental

### Gamma Spectrometry

Filtered and acidified samples were analysed using method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Results

Results are presented in the following tables.

An asterisk "*" indicates that the analysis is not covered under the UKAS accreditation of the laboratory with UKAS 1015. Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

## Deviating Sample Disclaimer

The reported results are representative of the samples upon receipt. However,

E) Sample processing did not commence within the appropriate holding time.

G) The samples were not received by the laboratory at the correct temperature. (Temperature on receipt was 15.0°C; between 2°C and 8°C is recommended).

M) Insufficient sample volume was received for analysis.

Consequently the samples are considered deviating and the validity of the reported data may be compromised.

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| 612641 (BH10B WS2) | RW3081 | < 19 | < 32 | < 1.7 | < 1.9 | < 1.6 | < 1.9 | < 26 | < 22 | < 2.6 |
| 612650 (BH18 WS2) | RW3082 | < 19 | < 33 | < 1.7 | < 1.8 | < 1.7 | < 1.8 | < 27 | < 21 | < 2.7 |
| 612651 (BH19 WS2) | RW3083 | < 20 | < 28 | < 2.1 | < 1.9 | < 1.9 | < 1.6 | < 31 | < 23 | < 2.6 |

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| 612641 (BH10B WS2) | RW3081 | < 4 | < 3.8 | < 26 | < 30 | < 6.8 | < 180 | < 26 | < 1.9 | < 2.5 |
| 612650 (BH18 WS2) | RW3082 | < 3.9 | < 3.8 | < 26 | < 29 | < 7.1 | < 190 | < 26 | < 1.9 | < 2.5 |
| 612651 (BH19 WS2) | RW3083 | < 4.0 | < 3.9 | < 26 | < 40 | < 6.2 | < 270 | < 37 | < 2.5 | < 2.6 |

**Notes:**

1. Analysis marked with an asterisk is not UKAS accredited.
2. Results are presented as $Bq.L^{-1}$ of filtered and acidified samples and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Results above the LoD are reported with expanded (2σ) uncertainties based on a total uncertainty budget.
5. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
6. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.

UKAS TESTING
1015

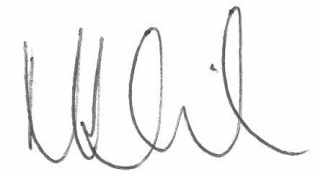
2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Certificate of Analysis

## Report No.: 18-71791-1

**Issue No.:** **1**
**Date of Issue** **21/05/2018**

| | |
|---|---|
| Customer Details: | Chemtest, Depot Road, Newmarket, Suffolk, CB8 0AL |
| Customer Contact: | Christina Botterill |
| Customer Order No.: | 16689 |
| Customer Reference: | 18-11282 |
| Quotation Reference: | 180501/03 |
| Description: | 11 water samples |
| Date Received: | 11/05/2018 |
| Date Started: | 16/05/2018 |
| Date Completed: | 21/05/2018 |
| Test Methods: | Details available on request (refer to SOP code against relevant result/s) |
| Notes: | None |



Approved By: **Matthew Hickson, Laboratory Manager**

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service.
Observations and interpretations are outside of the scope of UKAS accreditation.
Results reported herein relate only to the items supplied to the laboratory for testing.

RPS Mountainheath Limited, Registered in England No. 2772276, a wholly-owned subsidiary of RPS Consulting Services Ltd.
A member of the RPS Group plc. Terms and conditions apply - copy on request

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Results Summary

**Report No.: 18-71791-1**

Customer Reference: 18-11282

Customer Order No: 16689

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Customer Sample No** | **612641** | **612642** | **612643** | **612644** | **612645** | **612646** | **612647** | **612648** |
| | | | | | RPS Sample No | 363524 | 363525 | 363526 | 363527 | 363528 | 363529 | 363530 | 363531 |
| | | | | | **Sample Type** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** |
| | | | | | Sampling Date | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Determinand** | **CAS No** | **Codes** | **SOP** | **Units** | **RL** | | | | | | | | |
| 2,4,6-trinitrophenol (picric acid) surface water | 88-89-1 | N | in house | ug/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 2,4-dinitrotoluene surface water | 121-14-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| 2,6-dinitrotoluene surface water | 606-20-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| ethylene glycol dinitrate (EGDN) surface water | 628-96-9 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| cyclotetramethylenetetranitramine (HMX) surface wa | 2691-41-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| nitroglycerine (NG) surface water | 55-63-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| pentaerythritol tetranitrate (PETN) surface water | 78-11-5 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| picrite surface water | 556-88-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX) | 121-82-4 | N | in house | ug/l | 50 | < 200.0 | < 200.0 | < 200.0 | < 200.0 | < 200.0 | < 200.0 | < 200.0 | < 200.0 |
| 2,4,6-trinitrotoluene (TNT) surface water | 118-96-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| trinitro-2,4,6-phenylmethylnitramine (tetryl) | 479-45-8 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Results Summary

**Report No.: 18-71791-1**

Customer Reference: 18-11282

Customer Order No: 16689

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Customer Sample No** | **612649** | **612650** | **612651** |
| | | | | | RPS Sample No | 363532 | 363533 | 363534 |
| | | | | | **Sample Type** | **WATER** | **WATER** | **WATER** |
| | | | | | Sampling Date | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Determinand** | **CAS No** | **Codes** | **SOP** | **Units** | **RL** | | | |
| 2,4,6-trinitrophenol (picric acid) surface water | 88-89-1 | N | in house | ug/l | 50 | < 50 | < 50 | < 50 |
| 2,4-dinitrotoluene surface water | 121-14-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| 2,6-dinitrotoluene surface water | 606-20-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| ethylene glycol dinitrate (EGDN) surface water | 628-96-9 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| cyclotetramethylenetetranitramine (HMX) surface wa | 2691-41-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| nitroglycerine (NG) surface water | 55-63-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| pentaerythritol tetranitrate (PETN) surface water | 78-11-5 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| picrite surface water | 556-88-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX) | 121-82-4 | N | in house | ug/l | 50 | < 200.0 | < 200.0 | < 200.0 |
| 2,4,6-trinitrotoluene (TNT) surface water | 118-96-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |
| trinitro-2,4,6-phenylmethylnitramine (tetryl) | 479-45-8 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

**Report No.: 18-71791-1**
Customer Reference: 18-11282
Customer Order No: 16689

## Comments

| Job | Description | Job Comments |
|---|---|---|
| 18-71791 | 11 water samples | Due to matrix interference there was no spike recovery for the low spike for RDX. The reporting limit has been raised to 200ug/L, equivalent to the high spike which was detected. |

| RPS Sample Number | Customer Number | Sample Comments |
|---|---|---|
| 363529 | 612646 | Traces of DNT/TNT were detected. However, these were below the reporting limit. |
| 363530 | 612647 | Traces of DNT/TNT were detected. However, these were below the reporting limit. |
| 363531 | 612648 | Traces of DNT/TNT were detected. However, these were below the reporting limit. |
| 363532 | 612649 | Traces of DNT/TNT were detected. However, these were below the reporting limit. |
| 363533 | 612650 | Traces of DNT/TNT were detected. However, these were below the reporting limit. |
| 363534 | 612651 | Traces of DNT/TNT were detected. However, these were below the reporting limit. |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Deviating Samples

**Report No.: 18-71791-1**

Customer Reference: 18-11282

Customer Order No: 16689

Our policy on Deviating Samples and reference list of Holding Times applied can be supplied on request. These have been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).
RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling, and it is possible that samples submitted may be declared to be deviating.
Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be invalid. The reason for a sample being declared to be deviating is indicated below.
Where no sampling date was supplied, samples have been declared to be deviating. However, if a date of sampling can be supplied, the results may be reissued with the deviating sample status removed.
Where the sample container used was unsuitable, the appropriate Holding Time was exceeded, or the sample is flagged as deviating for some other reason, re-sampling/re-submisson may be required.

| RPS No. | Customer No. | Customer ID | Date Sampled | Containers Received | Deviating Sample | Reason for Sample Deviation |
|---|---|---|---|---|---|---|
| 363524 | 612641 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363525 | 612642 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363526 | 612643 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363527 | 612644 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363528 | 612645 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363529 | 612646 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363530 | 612647 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363531 | 612648 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363532 | 612649 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363533 | 612650 | | 24/04/2018 | 250ml plastic bottle | No | |
| 363534 | 612651 | | 24/04/2018 | 250ml plastic bottle | No | |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Report Information

## Key to Report Codes

| | |
|---|---|
| U | UKAS Accredited |
| F | UKAS Flexible Scope |
| M | MCERTS Accredited |
| N | Not accredited |
| O | Marine Management Organisation (MMO) Validated |
| S | Subcontracted to approved laboratory |
| US | Subcontracted to approved laboratory UKAS Accredited for the test |
| MS | Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test |
| SI | Subcontracted to internal RPS Group laboratory |
| USI | Subcontracted to internal RPS Group laboratory UKAS Accredited for the test |
| MSI | Subcontracted to internal RPS Group laboratory MCERTS/UKAS Accredited for the test |
| I/S (in results) | Insufficient Sample |
| U/S (in results) | Unsuitable Sample |
| S/C (in results) | See Comments |
| ND (in results) | Not Detected |
| DW (in units) | Results are expressed on a dry weight basis |

## Sample Retention and Disposal

Samples will generally* be retained for the following times prior to disposal:

| | |
|---|---|
| Perishables, e.g. foodstuffs | 1 month (if frozen) from the issue date of this report |
| Waters | 2 weeks from the issue date of this report |
| Other Liquids | 1 month from the issue date of this report |
| Solids (including Soils) | 1 month from the issue date of this report |

*Sample retention may be subject to agreement with the customer for particular projects

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Final Report

| | |
|---|---|
| **Report No.:** | 18-11516-1 |
| **Initial Date of Issue:** | 11-Jun-2018 |
| **Client** | Causeway Geotech Ltd |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson |
| **Project** | 17-1455 - Arklow WWTW Land GI |

| | | | |
|---|---|---|---|
| **Quotation No.:** | Q18-13033 | **Date Received:** | 26-Apr-2018 |
| **Order No.:** | | **Date Instructed:** | 27-Apr-2018 |
| **No. of Samples:** | 18 | | |
| **Turnaround (Wkdays):** | 19 | **Results Due:** | 24-May-2018 |
| **Date Approved:** | 11-Jun-2018 | **Subcon Results Due:** | 12-Jun-2018 |

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613772 | 613773 | 613774 | 613775 | 613776 | 613777 | 613778 | 613779 |
| Order No.: | | | Client Sample Ref.: | | BH14 | BH15D | SW01 | SW01 | SW02 | SW02 | SW03 | SW03 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | LW | HW | LW | HW | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Explosives High Level Suite (Subcon) | SN | | mg/l | N/A | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | 9.0 | 8.7 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 3600 | 3600 | 49000 | 50000 | 50000 | 50000 | 50000 | 49000 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 910 | 560 | 1400 | 1400 | 350 | 350 | 370 | 380 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 2100 | 2100 | 29000 | 30000 | 30000 | 30000 | 30000 | 30000 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] 4.6 | [B] 8.2 | [B] 11 | [B] 11 | [B] 13 | [B] 10 | [B] 10 | [B] 16 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 15 | 15 | 140 | 150 | 130 | 150 | 160 | 140 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.1 | 8.1 | 8.2 | 8.2 | 8.1 | 8.0 | 7.9 | 7.9 |
| Redox Potential | N | 1170 | mV | N/A | 230 | 250 | 260 | 250 | 250 | 250 | 250 | 250 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 230 | 240 | 67 | 66 | 71 | 69 | 70 | 70 |
| Chloride | U | 1220 | mg/l | 1.0 | 1100 | 960 | 19000 | 19000 | 19000 | 19000 | 19000 | 19000 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | < 0.050 | < 0.050 | 1.0 | 0.93 | 1.0 | 1.0 | 0.93 | 1.0 |
| Nitrate | U | 1220 | mg/l | 0.50 | 2.0 | 1.9 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphate | U | 1220 | mg/l | 1.0 | 190 | 180 | 2500 | 2500 | 2500 | 2500 | 2500 | 2500 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 100 | 94 | 310 | 310 | 280 | 330 | 310 | 290 |
| Potassium | U | 1415 | mg/l | 0.50 | 23 | 16 | 310 | 310 | 290 | 330 | 320 | 300 |
| Magnesium | U | 1415 | mg/l | 0.50 | 99 | 76 | 980 | 1000 | 930 | 1100 | 1000 | 980 |
| Sodium | U | 1415 | mg/l | 0.50 | 690 | 480 | 8400 | 8500 | 8000 | 9000 | 8800 | 8500 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 7.6 | 4.1 | 65 | 69 | 62 | 68 | 64 | 59 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 33 | 21 | 5.6 | 5.9 | 5.3 | 5.9 | 5.4 | < 5.0 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 2.2 | 0.12 | < 0.080 | < 0.080 | < 0.080 | < 0.080 | < 0.080 | < 0.080 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 13 | 6.9 | 110 | 140 | 130 | 140 | 140 | 130 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 160 | 79 | 740 | 820 | 770 | 770 | 770 | 690 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 27 | 1.7 | 2.5 | 2.6 | 9.5 | 3.4 | < 1.0 | < 1.0 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | 1.2 | < 1.0 | 9.7 | 11 | 8.9 | 9.5 | 9.5 | 8.7 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | 4.6 | 5.3 | 4.8 | 5.1 | 5.0 | 4.1 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | 9.9 | 5.6 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 25 | 13 | 68 | 83 | 77 | 82 | 81 | 74 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 27 | 9.0 | 48 | 50 | 43 | 46 | 45 | 40 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | 23 | 43 | 230 | 280 | 260 | 270 | 270 | 240 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | 59 | 0.15 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613772 | 613773 | 613774 | 613775 | 613776 | 613777 | 613778 | 613779 |
| Order No.: | | | Client Sample Ref.: | | BH14 | BH15D | SW01 | SW01 | SW02 | SW02 | SW03 | SW03 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | LW | HW | LW | HW | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 613772 | 613773 | 613774 | 613775 | 613776 | 613777 | 613778 | 613779 |
| Order No.: | | | | | Client Sample Ref.: | BH14 | BH15D | SW01 | SW01 | SW02 | SW02 | SW03 | SW03 |
| | | | | | Client Sample ID.: | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | LW | HW | LW | HW | LW | HW |
| | | | | | Date Sampled: | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Toluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 613772 | 613773 | 613774 | 613775 | 613776 | 613777 | 613778 | 613779 |
| Order No.: | | | | | Client Sample Ref.: | BH14 | BH15D | SW01 | SW01 | SW02 | SW02 | SW03 | SW03 |
| | | | | | Client Sample ID.: | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | | | LW | HW | LW | HW | LW | HW |
| | | | | | Date Sampled: | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613772 | 613773 | 613774 | 613775 | 613776 | 613777 | 613778 | 613779 |
| Order No.: | | | Client Sample Ref.: | | BH14 | BH15D | SW01 | SW01 | SW02 | SW02 | SW03 | SW03 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | | | LW | HW | LW | HW | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | See Attached | See Attached | | | | |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613780 | 613781 | 613782 | 613783 | 613784 | 613785 | 613786 | 613787 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW04 | SW05 | SW05 | SW06 | SW06 | SW07 | SW07 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | HW | LW | HW | LW | HW | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Explosives High Level Suite (Subcon) | SN | | mg/l | N/A | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | 8.5 | 9.0 | 8.0 | 7.7 | 7.7 | 7.5 | 7.3 | 7.3 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 410 | 420 | 290 | 280 | 290 | 290 | 390 | 390 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 50 | 35 | 45 | 53 | 49 | 41 | 27 | 38 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 240 | 250 | 170 | 170 | 170 | 170 | 230 | 230 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] 4.6 | [B] 5.5 | [B] < 4.0 | [B] 4.6 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 12 | 12 | 12 | 11 | < 10 | < 10 | < 10 | < 10 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.1 | 8.1 | 7.4 | 7.9 | 8.1 | 7.4 | 7.6 | 8.1 |
| Redox Potential | N | 1170 | mV | N/A | 210 | 220 | 250 | 260 | 270 | 300 | 280 | 290 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 40 | 48 | 56 | 57 | 60 | 61 | 54 | 59 |
| Chloride | U | 1220 | mg/l | 1.0 | 150 | 63 | 57 | 54 | 55 | 54 | 58 | 84 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | < 0.050 |
| Nitrate | U | 1220 | mg/l | 0.50 | 7.0 | 6.5 | 4.9 | 3.8 | 3.4 | 4.7 | 5.0 | 9.0 |
| Sulphate | U | 1220 | mg/l | 1.0 | 39 | 21 | 20 | 20 | 20 | 20 | 20 | 23 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 9.7 | 8.9 | 10 | 11 | 11 | 11 | 8.7 | 9.4 |
| Potassium | U | 1415 | mg/l | 0.50 | 2.7 | 1.7 | 1.8 | 1.9 | 1.8 | 1.9 | 1.6 | 2.2 |
| Magnesium | U | 1415 | mg/l | 0.50 | 9.5 | 6.1 | 5.8 | 5.8 | 5.7 | 5.9 | 5.7 | 7.3 |
| Sodium | U | 1415 | mg/l | 0.50 | 62 | 33 | 29 | 29 | 29 | 29 | 30 | 44 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 4.1 | 3.6 | 3.7 | 3.3 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 0.16 | 0.13 | 0.11 | 0.089 | 0.11 | 0.099 | 0.11 | 0.13 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 12 | 9.1 | 8.1 | 7.4 | 7.2 | 6.7 | 6.9 | 7.5 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 140 | 130 | 150 | 130 | 120 | 110 | 100 | 100 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 20 | 21 | 13 | 11 | 9.4 | 8.7 | 8.4 | 16 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 1.2 | < 1.0 | < 1.0 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 8.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | 1.2 | 1.1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | 2.8 | 3.0 | 2.6 | 2.4 | 2.2 | 2.2 | 1.9 | 2.8 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 26 | 22 | 21 | 18 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 56 | 54 | 44 | 40 | 45 | 42 | 41 | 51 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | 83 | 70 | 68 | 58 | < 20 | < 20 | < 20 | < 20 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | 0.32 | 0.22 | 0.21 | < 0.10 | 25 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 613780 | 613781 | 613782 | 613783 | 613784 | 613785 | 613786 | 613787 |
| Order No.: | | | | | Client Sample Ref.: | SW04 | SW04 | SW05 | SW05 | SW06 | SW06 | SW07 | SW07 |
| | | | | | Client Sample ID.: | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | LW | HW | LW | HW | LW | HW | LW | HW |
| | | | | | Date Sampled: | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 613780 | 613781 | 613782 | 613783 | 613784 | 613785 | 613786 | 613787 |
| Order No.: | | | | | Client Sample Ref.: | SW04 | SW04 | SW05 | SW05 | SW06 | SW06 | SW07 | SW07 |
| | | | | | Client Sample ID.: | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | LW | HW | LW | HW | LW | HW | LW | HW |
| | | | | | Date Sampled: | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Toluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 613780 | 613781 | 613782 | 613783 | 613784 | 613785 | 613786 | 613787 |
| Order No.: | | | | | Client Sample Ref.: | SW04 | SW04 | SW05 | SW05 | SW06 | SW06 | SW07 | SW07 |
| | | | | | Client Sample ID.: | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | LW | HW | LW | HW | LW | HW | LW | HW |
| | | | | | Date Sampled: | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613780 | 613781 | 613782 | 613783 | 613784 | 613785 | 613786 | 613787 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW04 | SW05 | SW05 | SW06 | SW06 | SW07 | SW07 |
| | | | Client Sample ID.: | | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | HW | LW | HW | LW | HW | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | | | | | | |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613788 | 613789 |
| Order No.: | | | Client Sample Ref.: | | SW08 | SW08 |
| | | | Client Sample ID.: | | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Explosives High Level Suite (Subcon) | SN | | mg/l | N/A | See Attached | See Attached |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached |
| pH | U | 1010 | | N/A | 7.4 | 7.5 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 280 | 690 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 30 | 46 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 170 | 410 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 11 | < 10 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 7.5 | 8.1 |
| Redox Potential | N | 1170 | mV | N/A | 300 | 300 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 57 | < 10 |
| Chloride | U | 1220 | mg/l | 1.0 | 57 | 83 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | < 0.050 | < 0.050 |
| Nitrate | U | 1220 | mg/l | 0.50 | 4.0 | 4.9 |
| Sulphate | U | 1220 | mg/l | 1.0 | 19 | 23 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 8.6 | 9.5 |
| Potassium | U | 1415 | mg/l | 0.50 | 1.6 | 2.2 |
| Magnesium | U | 1415 | mg/l | 0.50 | 5.6 | 7.3 |
| Sodium | U | 1415 | mg/l | 0.50 | 30 | 45 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 0.14 | 0.16 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 7.7 | 7.9 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 110 | 95 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 20 | 19 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | 1.7 | 1.6 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 51 | 56 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | < 0.010 | < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | < 20 | < 20 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613788 | 613789 |
| Order No.: | | | Client Sample Ref.: | | SW08 | SW08 |
| | | | Client Sample ID.: | | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613788 | 613789 |
| Order No.: | | | Client Sample Ref.: | | SW08 | SW08 |
| | | | Client Sample ID.: | | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613788 | 613789 |
| Order No.: | | | Client Sample Ref.: | | SW08 | SW08 |
| | | | Client Sample ID.: | | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 - Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-11516 | 18-11516 |
|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 613788 | 613789 |
| Order No.: | | | Client Sample Ref.: | | SW08 | SW08 |
| | | | Client Sample ID.: | | WS2 | WS2 |
| | | | Sample Type: | | WATER | WATER |
| | | | Top Depth (m): | | LW | HW |
| | | | Date Sampled: | | 24-Apr-2018 | 24-Apr-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 613772 | BH14 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613772 | BH14 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613772 | BH14 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613773 | BH15D | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613773 | BH15D | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613773 | BH15D | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613774 | SW01 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613774 | SW01 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613774 | SW01 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613775 | SW01 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613775 | SW01 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613775 | SW01 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613776 | SW02 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613776 | SW02 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613776 | SW02 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613777 | SW02 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613777 | SW02 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613777 | SW02 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613778 | SW03 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613778 | SW03 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613778 | SW03 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613779 | SW03 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613779 | SW03 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613779 | SW03 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613780 | SW04 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613780 | SW04 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613780 | SW04 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613781 | SW04 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613781 | SW04 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613781 | SW04 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613782 | SW05 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613782 | SW05 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613782 | SW05 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613783 | SW05 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 613783 | SW05 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613783 | SW05 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613784 | SW06 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613784 | SW06 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613784 | SW06 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613785 | SW06 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613785 | SW06 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613785 | SW06 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613786 | SW07 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613786 | SW07 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613786 | SW07 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613787 | SW07 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613787 | SW07 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613787 | SW07 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613788 | SW08 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613788 | SW08 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613788 | SW08 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |
| 613789 | SW08 | WS2 | 24-Apr-2018 | B | Coloured Winchester 1000ml |
| 613789 | SW08 | WS2 | 24-Apr-2018 | B | EPA Vial 40ml |
| 613789 | SW08 | WS2 | 24-Apr-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1460 | Mercury low-level in Waters by AFS | Mercury | Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm. |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1495 | Low Level Hexavalent Chromium in Waters | Chromium [VI] | Colorimetric determination of hexavalent chromium expressed as Cr (VI) µg/l in water, using Ion Chromatography and UV-visible spectrophotometry. |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Pentane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

**Jason King**
Chemtest Ltd
11 Depot Road
Newmarket
Suffolk
CB8 0AL

**t:** 01638 60 60 70
**f:** 01638 60 60 71
**e:** Subcontracting@chemtest.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-86508

| | | | |
|---|---|---|---|
| **Project / Site name:** | Arklow WWTW Land GI | **Samples received on:** | 24/05/2018 |
| **Your job number:** | 18-11516 | **Samples instructed on:** | 24/05/2018 |
| **Your order number:** | 16726 | **Analysis completed by:** | 29/05/2018 |
| **Report Issue Number:** | 1 | **Report issued on:** | 04/06/2018 |
| **Samples Analysed:** | 18 water samples | | |

**Signed:**

Jordan Hill
Reporting Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.


This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-86508**

**Project / Site name: Arklow WWTW Land GI**

**Your Order No: 16726**

| **Lab Sample Number** | | | | 966688 | 966689 | 966690 | 966691 | 966692 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 613772 (BH14 WS2) | 613773 (BH15D WS2) | 613774 (SW01 WS2 LW) | 613775 (SW01 WS2 HW) | 613776 (SW02 WS2 LW) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 150 | < 20 | < 20 | 32 | 35 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-86508**

**Project / Site name: Arklow WWTW Land GI**

**Your Order No: 16726**

| Lab Sample Number | | | | 966693 | 966694 | 966695 | 966696 | 966697 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 613777 (SW02 WS2 HW) | 613778 (SW03 WS2 LW) | 613779 (SW03 WS2 HW) | 613780 (SW04 WS2 LW) | 613781 (SW04 WS2 HW) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 38 | 32 | 28 | < 20 | < 20 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-86508**

**Project / Site name: Arklow WWTW Land GI**

**Your Order No: 16726**

| Lab Sample Number | | | | 966698 | 966699 | 966700 | 966701 | 966702 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 613782 (SW05 WS2 LW) | 613783 (SW05 WS2 HW) | 613784 (SW06 WS2 LW) | 613785 (SW06 WS2 HW) | 613786 (SW07 WS2 LW) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 24 | < 20 | 33 | 26 | 38 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-86508**

**Project / Site name: Arklow WWTW Land GI**

**Your Order No: 16726**

| **Lab Sample Number** | | | | 966703 | 966704 | 966705 | | |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 613787 (SW07 WS2 HW) | 613788 (SW08 WS2 LW) | 613789 (SW08 WS2 HW) | | |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | | |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | | |
| **Date Sampled** | | | | 24/04/2018 | 24/04/2018 | 24/04/2018 | | |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | | |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | < 20 | < 20 | 28 | | |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-86508**

**Project / Site name: Arklow WWTW Land GI**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Total Phosphate as P in water | Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by colorimetry.Accredited matrices: SW, PW, GW. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser. | L082-PL | W | ISO 17025 |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**


This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

| Sample ID | Other_ID | Sample Type | Job | Sample Number | Sample Deviation Code | test_name | test_ref | Test Deviation code |
|---|---|---|---|---|---|---|---|---|
| 613772 (BH14 WS2) | | W | 18-86508 | 966688 | c | Total Phosphate as P in water | L082-PL | c |
| 613772 (BH14 WS2) | | W | 18-86508 | 966688 | c | Total Phosphate in water | L082-PL | c |
| 613773 (BH15D WS2) | | W | 18-86508 | 966689 | c | Total Phosphate as P in water | L082-PL | c |
| 613773 (BH15D WS2) | | W | 18-86508 | 966689 | c | Total Phosphate in water | L082-PL | c |
| 613774 (SW01 WS2 LW) | | W | 18-86508 | 966690 | c | Total Phosphate as P in water | L082-PL | c |
| 613774 (SW01 WS2 LW) | | W | 18-86508 | 966690 | c | Total Phosphate in water | L082-PL | c |
| 613775 (SW01 WS2 HW) | | W | 18-86508 | 966691 | c | Total Phosphate as P in water | L082-PL | c |
| 613775 (SW01 WS2 HW) | | W | 18-86508 | 966691 | c | Total Phosphate in water | L082-PL | c |
| 613776 (SW02 WS2 LW) | | W | 18-86508 | 966692 | c | Total Phosphate as P in water | L082-PL | c |
| 613776 (SW02 WS2 LW) | | W | 18-86508 | 966692 | c | Total Phosphate in water | L082-PL | c |
| 613777 (SW02 WS2 HW) | | W | 18-86508 | 966693 | c | Total Phosphate as P in water | L082-PL | c |
| 613777 (SW02 WS2 HW) | | W | 18-86508 | 966693 | c | Total Phosphate in water | L082-PL | c |
| 613778 (SW03 WS2 LW) | | W | 18-86508 | 966694 | c | Total Phosphate as P in water | L082-PL | c |
| 613778 (SW03 WS2 LW) | | W | 18-86508 | 966694 | c | Total Phosphate in water | L082-PL | c |
| 613779 (SW03 WS2 HW) | | W | 18-86508 | 966695 | c | Total Phosphate as P in water | L082-PL | c |
| 613779 (SW03 WS2 HW) | | W | 18-86508 | 966695 | c | Total Phosphate in water | L082-PL | c |
| 613780 (SW04 WS2 LW) | | W | 18-86508 | 966696 | c | Total Phosphate as P in water | L082-PL | c |
| 613780 (SW04 WS2 LW) | | W | 18-86508 | 966696 | c | Total Phosphate in water | L082-PL | c |
| 613781 (SW04 WS2 HW) | | W | 18-86508 | 966697 | c | Total Phosphate as P in water | L082-PL | c |
| 613781 (SW04 WS2 HW) | | W | 18-86508 | 966697 | c | Total Phosphate in water | L082-PL | c |
| 613782 (SW05 WS2 LW) | | W | 18-86508 | 966698 | c | Total Phosphate as P in water | L082-PL | c |
| 613782 (SW05 WS2 LW) | | W | 18-86508 | 966698 | c | Total Phosphate in water | L082-PL | c |
| 613783 (SW05 WS2 HW) | | W | 18-86508 | 966699 | c | Total Phosphate as P in water | L082-PL | c |
| 613783 (SW05 WS2 HW) | | W | 18-86508 | 966699 | c | Total Phosphate in water | L082-PL | c |
| 613784 (SW06 WS2 LW) | | W | 18-86508 | 966700 | c | Total Phosphate as P in water | L082-PL | c |
| 613784 (SW06 WS2 LW) | | W | 18-86508 | 966700 | c | Total Phosphate in water | L082-PL | c |
| 613785 (SW06 WS2 HW) | | W | 18-86508 | 966701 | c | Total Phosphate as P in water | L082-PL | c |
| 613785 (SW06 WS2 HW) | | W | 18-86508 | 966701 | c | Total Phosphate in water | L082-PL | c |
| 613786 (SW07 WS2 LW) | | W | 18-86508 | 966702 | c | Total Phosphate as P in water | L082-PL | c |
| 613786 (SW07 WS2 LW) | | W | 18-86508 | 966702 | c | Total Phosphate in water | L082-PL | c |
| 613787 (SW07 WS2 HW) | | W | 18-86508 | 966703 | c | Total Phosphate as P in water | L082-PL | c |
| 613787 (SW07 WS2 HW) | | W | 18-86508 | 966703 | c | Total Phosphate in water | L082-PL | c |
| 613788 (SW08 WS2 LW) | | W | 18-86508 | 966704 | c | Total Phosphate as P in water | L082-PL | c |
| 613788 (SW08 WS2 LW) | | W | 18-86508 | 966704 | c | Total Phosphate in water | L082-PL | c |
| 613789 (SW08 WS2 HW) | | W | 18-86508 | 966705 | c | Total Phosphate as P in water | L082-PL | c |
| 613789 (SW08 WS2 HW) | | W | 18-86508 | 966705 | c | Total Phosphate in water | L082-PL | c |



Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

# Analysis of Water Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12<br>Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0418 |
| Customer Reference: | 18-11516 |
| Quote Number: | ENR-ANU-9266 |
| PO Number: | 16722 |
| Samples Received: | 24 May 2018 |
| Sample Condition: | Satisfactory, Ambient |
| Analysis Completed: | 31 May 2018 |
| Report Author: | KKiran |
| Author's Name: | Kiran Bala |
| Job Title: | Analyst |
| Approved By: | CHunston |
| Approver's name: | Charlene Hunston |
| Job Title: | Senior Analyst |
| Report Date: | 31 May 2018 |



1015

SOCOTEC

## Sample Summary

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 613774 (SW1 WS2 LW) | RW3084 | Water (18-11516) | 24/04/2018 12:00 |
| 613775 (SW1 WS2 HW) | RW3085 | Water | 24/04/2018 12:00 |

## Experimental

### Gamma Spectrometry

Filtered and acidified samples were analysed using method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Results

Results are presented in the following tables.

An asterisk "*" indicates that the analysis is not covered under the UKAS accreditation of the laboratory with UKAS 1015. Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

## Deviating Sample Disclaimer

The reported results are representative of the samples upon receipt. However,

E) Sample processing did not commence within the appropriate holding time.

G) The samples were not received by the laboratory at the correct temperature. (Temperature on receipt was 16.0°C; between 2°C and 8°C is recommended).

M) Insufficient sample volume was received for analysis.

Consequently the samples are considered deviating and the validity of the reported data may be compromised.

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| 613774 (SW1 WS2 LW) | RW3084 | < 19 | < 35 | < 1.7 | < 1.8 | < 1.7 | < 1.8 | < 26 | < 21 | < 2.7 |
| 613775 (SW1 WS2 HW) | RW3085 | < 19 | < 33 | < 1.8 | < 1.9 | < 1.6 | < 1.8 | < 27 | < 21 | < 2.7 |

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| 613774 (SW1 WS2 LW) | RW3084 | < 4.0 | < 3.6 | < 27 | < 30 | < 7.2 | < 180 | < 26 | < 1.9 | < 2.5 |
| 613775 (SW1 WS2 HW) | RW3085 | < 4.0 | < 3.7 | < 27 | < 29 | < 6.6 | < 200 | < 26 | < 1.8 | < 2.5 |

**Notes:**

1. Analysis marked with an asterisk is not UKAS accredited.
2. Results are presented as $Bq.L^{-1}$ of filtered and acidified samples and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Results above the LoD are reported with expanded (2σ) uncertainties based on a total uncertainty budget.
5. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
6. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.

UKAS TESTING
1015

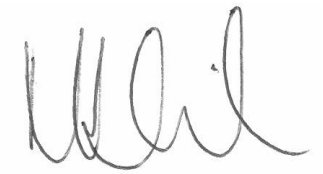
2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Certificate of Analysis

## Report No.: 18-71455-1

**Issue No.:** **1**
**Date of Issue** **21/05/2018**

| | |
|---|---|
| Customer Details: | Chemtest, Depot Road, Newmarket, Suffolk, CB8 0AL |
| Customer Contact: | Christina Botterill |
| Customer Order No.: | 16677 |
| Customer Reference: | Not Supplied |
| Quotation Reference: | 180501/03 |
| Description: | 18 water samples |
| Date Received: | 30/04/2018 |
| Date Started: | 04/05/2018 |
| Date Completed: | 21/05/2018 |
| Test Methods: | Details available on request (refer to SOP code against relevant result/s) |
| Notes: | None |



Approved By: **Matthew Hickson, Laboratory Manager**

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service.
Observations and interpretations are outside of the scope of UKAS accreditation.
Results reported herein relate only to the items supplied to the laboratory for testing.

RPS Mountainheath Limited, Registered in England No. 2772276, a wholly-owned subsidiary of RPS Consulting Services Ltd.
A member of the RPS Group plc. Terms and conditions apply - copy on request

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Results Summary

**Report No.: 18-71455-1**

Customer Reference: Not Supplied

Customer Order No: 16677

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Customer Sample No** | **613772** | **613773** | **613774** | **613775** | **613776** | **613777** | **613778** | **613779** | **613780** | **613781** | **613782** | **613783** | **613784** | **613785** |
| | | | | | | RPS Sample No | 362344 | 362345 | 362346 | 362347 | 362348 | 362349 | 362350 | 362351 | 362352 | 362353 | 362354 | 362355 | 362356 | 362357 |
| | | | | | | **Sample Type** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** | **WATER** |
| | | | | | | Sampling Date | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Determinand** | **CAS No** | **Codes** | **SOP** | **Units** | **RL** | | | | | | | | | | | | | | | |
| 2,4,6-trinitrophenol (picric acid) surface water | 88-89-1 | N | in house | ug/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 2,4-dinitrotoluene surface water | 121-14-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| 2,6-dinitrotoluene surface water | 606-20-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| ethylene glycol dinitrate (EGDN) surface water | 628-96-9 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| cyclotetramethylenetetranitramine (HMX) surface wa | 2691-41-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| nitroglycerine (NG) surface water | 55-63-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| pentaerythritol tetranitrate (PETN) surface water | 78-11-5 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| picrite surface water | 556-88-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX) | 121-82-4 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| 2,4,6-trinitrotoluene (TNT) surface water | 118-96-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| trinitro-2,4,6-phenylmethylnitramine (tetryl) | 479-45-8 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Results Summary

**Report No.: 18-71455-1**

Customer Reference: Not Supplied

Customer Order No: 16677

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Customer Sample No** | **613786** | **613787** | **613788** | **613789** |
| | | | | | RPS Sample No | 362358 | 362359 | 362360 | 362361 |
| | | | | | **Sample Type** | **WATER** | **WATER** | **WATER** | **WATER** |
| | | | | | Sampling Date | 24/04/2018 | 24/04/2018 | 24/04/2018 | 24/04/2018 |
| **Determinand** | **CAS No** | **Codes** | **SOP** | **Units** | **RL** | | | | |
| 2,4,6-trinitrophenol (picric acid) surface water | 88-89-1 | N | in house | ug/l | 50 | < 50 | < 50 | < 50 | < 50 |
| 2,4-dinitrotoluene surface water | 121-14-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| 2,6-dinitrotoluene surface water | 606-20-2 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| ethylene glycol dinitrate (EGDN) surface water | 628-96-9 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| cyclotetramethylenetetranitramine (HMX) surface wa | 2691-41-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| nitroglycerine (NG) surface water | 55-63-0 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| pentaerythritol tetranitrate (PETN) surface water | 78-11-5 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| picrite surface water | 556-88-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX) | 121-82-4 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| 2,4,6-trinitrotoluene (TNT) surface water | 118-96-7 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |
| trinitro-2,4,6-phenylmethylnitramine (tetryl) | 479-45-8 | N | in house | ug/l | 50 | < 50.0 | < 50.0 | < 50.0 | < 50.0 |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

**Report No.: 18-71455-1**
Customer Reference: Not Supplied
Customer Order No: 16677

## Comments

| RPS Sample Number | Customer Number | Sample Comments |
|---|---|---|
| 362346 | 613774 | Traces of NG were detected. However, these were below the reporting limit. |
| 362347 | 613775 | Traces of NG were detected. However, these were below the reporting limit. |
| 362349 | 613777 | Traces of NG were detected. However, these were below the reporting limit. |
| 362350 | 613778 | Traces of NG were detected. However, these were below the reporting limit. |
| 362351 | 613779 | Traces of NG were detected. However, these were below the reporting limit. |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Deviating Samples

**Report No.: 18-71455-1**

Customer Reference: Not Supplied

Customer Order No: 16677

Our policy on Deviating Samples and reference list of Holding Times applied can be supplied on request. These have been implemented in accordance with UKAS Policy on Deviating Samples (TPS63).
RPS is not responsible for the integrity of samples as received, unless RPS personnel performed the sampling, and it is possible that samples submitted may be declared to be deviating.
Where applicable the analysis method remains UKAS accredited, however results reported for a deviating sample may be invalid. The reason for a sample being declared to be deviating is indicated below.
Where no sampling date was supplied, samples have been declared to be deviating. However, if a date of sampling can be supplied, the results may be reissued with the deviating sample status removed.
Where the sample container used was unsuitable, the appropriate Holding Time was exceeded, or the sample is flagged as deviating for some other reason, re-sampling/re-submisson may be required.

| RPS No. | Customer No. | Customer ID | Date Sampled | Containers Received | Deviating Sample | Reason for Sample Deviation |
|---|---|---|---|---|---|---|
| 362344 | 613772 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362345 | 613773 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362346 | 613774 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362347 | 613775 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362348 | 613776 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362349 | 613777 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362350 | 613778 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362351 | 613779 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362352 | 613780 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362353 | 613781 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362354 | 613782 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362355 | 613783 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362356 | 613784 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362357 | 613785 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362358 | 613786 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362359 | 613787 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362360 | 613788 | | 24/04/2018 | 250ml plastic bottle | No | |
| 362361 | 613789 | | 24/04/2018 | 250ml plastic bottle | No | |

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth Garden City, Hertfordshire, SG6 1HE
**T** +44 (0)1462 480 400, **F** +44 (0)1462 480 403, **E** rpsmh@rpsgroup.com, **W** rpsgroup.com

# Report Information

## Key to Report Codes

| | |
|---|---|
| U | UKAS Accredited |
| F | UKAS Flexible Scope |
| M | MCERTS Accredited |
| N | Not accredited |
| O | Marine Management Organisation (MMO) Validated |
| S | Subcontracted to approved laboratory |
| US | Subcontracted to approved laboratory UKAS Accredited for the test |
| MS | Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test |
| SI | Subcontracted to internal RPS Group laboratory |
| USI | Subcontracted to internal RPS Group laboratory UKAS Accredited for the test |
| MSI | Subcontracted to internal RPS Group laboratory MCERTS/UKAS Accredited for the test |
| I/S (in results) | Insufficient Sample |
| U/S (in results) | Unsuitable Sample |
| S/C (in results) | See Comments |
| ND (in results) | Not Detected |
| DW (in units) | Results are expressed on a dry weight basis |

## Sample Retention and Disposal

Samples will generally* be retained for the following times prior to disposal:

| | |
|---|---|
| Perishables, e.g. foodstuffs | 1 month (if frozen) from the issue date of this report |
| Waters | 2 weeks from the issue date of this report |
| Other Liquids | 1 month from the issue date of this report |
| Solids (including Soils) | 1 month from the issue date of this report |

*Sample retention may be subject to agreement with the customer for particular projects

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-12798-2 | | |
| **Initial Date of Issue:** | 24-May-2018 | **Date of Re-Issue:** | 25-May-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 Arklow WWTW Land GI | | |
| **Quotation No.:** | Q18-13033 | **Date Received:** | 09-May-2018 |
| **Order No.:** | | **Date Instructed:** | 11-May-2018 |
| **No. of Samples:** | 5 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 17-May-2018 |
| **Date Approved:** | 23-May-2018 | **Subcon Results Due:** | 04-Jun-2018 |

**Approved By:**



**Details:** Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12798 | 18-12798 | 18-12798 | 18-12798 | 18-12798 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619357 | 619358 | 619359 | 619360 | 619361 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | HW | HW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | 7.7 | 7.3 | 7.5 | 7.1 | 7.1 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 1300 | 2900 | 1000 | 460 | 120 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 48 | 64 | 9.0 | < 5.0 | < 5.0 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 760 | 1700 | 600 | 280 | 71 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 19 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 10 | 20 | 24 | 11 | < 10 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.5 | 8.6 | 8.4 | 8.7 | 8.3 |
| Redox Potential | N | 1170 | mV | N/A | 220 | 250 | 240 | 250 | 240 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 37 | 56 | 160 | 28 | < 10 |
| Chloride | U | 1220 | mg/l | 1.0 | 380 | 880 | 240 | 120 | 19 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.25 | 5.2 | 10 | 1.4 | 0.23 |
| Nitrate | U | 1220 | mg/l | 0.50 | 4.3 | 3.7 | < 0.50 | 4.0 | 5.5 |
| Sulphate | U | 1220 | mg/l | 1.0 | 64 | 130 | 49 | 31 | 16 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 17 | 29 | 32 | 10 | 6.2 |
| Potassium | U | 1415 | mg/l | 0.50 | 8.7 | 29 | 10 | 3.6 | 1.0 |
| Magnesium | U | 1415 | mg/l | 0.50 | 26 | 57 | 21 | 9.8 | 3.6 |
| Sodium | U | 1415 | mg/l | 0.50 | 210 | 500 | 130 | 62 | 7.7 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 2.8 | 5.6 | 3.6 | 1.7 | < 1.0 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 8.0 | 7.8 | 14 | 5.7 | 5.5 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 0.32 | 0.29 | 0.10 | 0.14 | 0.23 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 15 | 16 | 8.5 | 10 | 14 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 330 | 250 | 200 | 190 | 250 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 65 | 82 | 87 | 32 | 53 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | 2.1 | < 1.0 | 35 | 2.9 | 1.9 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 1.5 | 1.4 | 1.1 | 1.1 | 1.1 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | 2.1 | 2.9 | < 1.0 | 1.3 | 2.3 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | 3.7 | 8.3 | 2.2 | 1.7 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 4.6 | 11 | 9.7 | 5.5 | 3.3 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 99 | 87 | 29 | 81 | 100 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | 0.10 | 0.66 | 0.080 | 0.12 | 0.090 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | < 20 | 34 | 29 | < 20 | < 20 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12798 | 18-12798 | 18-12798 | 18-12798 | 18-12798 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619357 | 619358 | 619359 | 619360 | 619361 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | HW | HW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12798 | 18-12798 | 18-12798 | 18-12798 | 18-12798 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619357 | 619358 | 619359 | 619360 | 619361 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | HW | HW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12798 | 18-12798 | 18-12798 | 18-12798 | 18-12798 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619357 | 619358 | 619359 | 619360 | 619361 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | HW | HW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12798 | 18-12798 | 18-12798 | 18-12798 | 18-12798 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619357 | 619358 | 619359 | 619360 | 619361 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | HW | HW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected |

# Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 619357 | SW04 | | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619357 | SW04 | | 07-May-2018 | B | EPA Vial 40ml |
| 619357 | SW04 | | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619358 | SW05 | | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619358 | SW05 | | 07-May-2018 | B | EPA Vial 40ml |
| 619358 | SW05 | | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619359 | SW06 | | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619359 | SW06 | | 07-May-2018 | B | EPA Vial 40ml |
| 619359 | SW06 | | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619360 | SW07 | | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619360 | SW07 | | 07-May-2018 | B | EPA Vial 40ml |
| 619360 | SW07 | | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619361 | SW08 | | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619361 | SW08 | | 07-May-2018 | B | EPA Vial 40ml |
| 619361 | SW08 | | 07-May-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1460 | Mercury low-level in Waters by AFS | Mercury | Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm. |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1495 | Low Level Hexavalent Chromium in Waters | Chromium [VI] | Colorimetric determination of hexavalent chromium expressed as Cr (VI) µg/l in water, using Ion Chromatography and UV-visible spectrophotometry. |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Pentane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

**Customer Service**
Chemtest Ltd
11 Depot Road
Newmarket
Suffolk
CB8 0AL

**t:** 01638 60 60 70
**f:** 01638 60 60 71
**e:** Subcontracting@chemtest.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-85155

Replaces Analytical Report Number : 18-85155, issue no. 1

| | | | |
|---|---|---|---|
| **Project / Site name:** | 18-12798 | **Samples received on:** | 14/05/2018 |
| **Your job number:** | 18-12798 | **Samples instructed on:** | 14/05/2018 |
| **Your order number:** | 16699 | **Analysis completed by:** | 24/05/2018 |
| **Report Issue Number:** | 2 | **Report issued on:** | 24/05/2018 |
| **Samples Analysed:** | 5 water samples | | |

**Signed:**

Jordan Hill
Reporting Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-85155**

**Project / Site name: 18-12798**

**Your Order No: 16699**

| **Lab Sample Number** | | | | 959400 | 959401 | 959402 | 959403 | 959404 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 619357 (SW04 HW WS3) | 619358 (SW05 HW WS3) | 619359 (SW06 HW WS3) | 619360 (SW07 HW WS3) | 619361 (SW08 HW WS3) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 07/05/2018 | 07/05/2018 | 07/05/2018 | 07/05/2018 | 07/05/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 34 | 630 | 940 | 66 | < 20 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-85155**

**Project / Site name: 18-12798**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Total Phosphate as P in water | Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by colorimetry.Accredited matrices: SW, PW, GW. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser. | L082-PL | W | ISO 17025 |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Final Report

| | |
|---|---|
| **Report No.:** | 18-12800-1 |
| **Initial Date of Issue:** | 31-May-2018 |
| **Client** | Causeway Geotech Ltd |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson |
| **Project** | 17-1455 Arklow WWTW Land GI |

| | | | |
|---|---|---|---|
| **Quotation No.:** | Q18-13033 | **Date Received:** | 09-May-2018 |
| **Order No.:** | | **Date Instructed:** | 11-May-2018 |
| **No. of Samples:** | 4 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 17-May-2018 |
| **Date Approved:** | 31-May-2018 | **Subcon Results Due:** | 04-Jun-2018 |

**Approved By:**



**Details:** Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12800 | 18-12800 | 18-12800 | 18-12800 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619392 | 619393 | 619394 | 619395 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH14 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | 7.8 | 7.9 | 7.9 | 7.7 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 49000 | 49000 | 49000 | 44000 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 260 | 310 | 260 | 1800 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 29000 | 29000 | 30000 | 27000 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 130 | 150 | 140 | 11 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.1 | 7.9 | 8.6 | 8.6 |
| Redox Potential | N | 1170 | mV | N/A | 250 | 240 | 230 | 220 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 47 | 50 | 51 | 300 |
| Chloride | U | 1220 | mg/l | 1.0 | 24000 | 21000 | 21000 | 1600 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.70 | 0.71 | 0.72 | 0.075 |
| Nitrate | U | 1220 | mg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | 0.75 |
| Sulphate | U | 1220 | mg/l | 1.0 | 2700 | 2800 | 2800 | 310 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 320 | 400 | 390 | 190 |
| Potassium | U | 1415 | mg/l | 0.50 | 350 | 390 | 400 | 34 |
| Magnesium | U | 1415 | mg/l | 0.50 | 1000 | 1300 | 1200 | 150 |
| Sodium | U | 1415 | mg/l | 0.50 | 9300 | 11000 | 11000 | 780 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 140 | 150 | 140 | 16 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 12 | 12 | 12 | 62 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | < 0.080 | 0.084 | 0.092 | 0.70 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 120 | 460 | 410 | 36 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 800 | 900 | 960 | 290 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 7.6 | 7.8 | 7.3 | 1100 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | 13 | 19 | 36 | 12 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 9.0 | 8.9 | 9.9 | 4.4 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | 1.5 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 190 | 220 | 200 | 88 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 83 | 84 | 84 | 55 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | 0.070 | 0.080 | 0.16 | 0.10 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | 570 | 670 | 610 | 260 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12800 | 18-12800 | 18-12800 | 18-12800 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619392 | 619393 | 619394 | 619395 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH14 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12800 | 18-12800 | 18-12800 | 18-12800 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619392 | 619393 | 619394 | 619395 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH14 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12800 | 18-12800 | 18-12800 | 18-12800 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619392 | 619393 | 619394 | 619395 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH14 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12800 | 18-12800 | 18-12800 | 18-12800 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619392 | 619393 | 619394 | 619395 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH14 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | See Attached | | | |
| Gross Alpha/Beta (Subcon) | S | | | N/A | See Attached | | | |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected |

# Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 619392 | SW01 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619392 | SW01 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619392 | SW01 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619393 | SW02 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619393 | SW02 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619393 | SW02 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619394 | SW03 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619394 | SW03 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619394 | SW03 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619395 | BH14 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619395 | BH14 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619395 | BH14 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1460 | Mercury low-level in Waters by AFS | Mercury | Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm. |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1495 | Low Level Hexavalent Chromium in Waters | Chromium [VI] | Colorimetric determination of hexavalent chromium expressed as Cr (VI) µg/l in water, using Ion Chromatography and UV-visible spectrophotometry. |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Pentane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

**Customer Service**
Chemtest Ltd
11 Depot Road
Newmarket
Suffolk
CB8 0AL

**t:** 01638 60 60 70
**f:** 01638 60 60 71
**e:** Subcontracting@chemtest.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-85154

Replaces Analytical Report Number : 18-85154, issue no. 1

| | | | |
|---|---|---|---|
| **Project / Site name:** | 18-12800 | **Samples received on:** | 14/05/2018 |
| **Your job number:** | 18-12800 | **Samples instructed on:** | 14/05/2018 |
| **Your order number:** | 16700 | **Analysis completed by:** | 24/05/2018 |
| **Report Issue Number:** | 2 | **Report issued on:** | 24/05/2018 |
| **Samples Analysed:** | 4 water samples | | |

**Signed:**

Jordan Hill
Reporting Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-85154**

**Project / Site name: 18-12800**

**Your Order No: 16700**

| **Lab Sample Number** | | | | 959396 | 959397 | 959398 | 959399 | |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 619392 (SW01 LW WS3) | 619393 (SW02 LW WS3) | 619394 (SW03 LW WS3) | 619395 (BH14 WS3) | |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | |
| **Date Sampled** | | | | 07/05/2018 | 07/05/2018 | 07/05/2018 | 07/05/2018 | |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | < 20 | < 20 | < 20 | < 20 | |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-85154**

**Project / Site name: 18-12800**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Total Phosphate as P in water | Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by colorimetry.Accredited matrices: SW, PW, GW. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser. | L082-PL | W | ISO 17025 |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

# Analysis of Water Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12, Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0386 |
| Customer Reference: | 18-12800 |
| Quote Number: | ENR-ANU-9266 |
| PO Number: | 16701 |
| Sample Received: | 14 May 2018 |
| Sample Condition: | Satisfactory; Ambient |
| Analysis Completed: | 29 May 2018 |
| Report Author: |  |
| Author's Name: | Trevor Harding |
| Job Title: | Senior Analyst |
| Approved By: |  |
| Approver's name: | Charlene Hunston |
| Job Title: | Senior Analyst |
| Report Date: | 31 May 2018 |



1015

SOCOTEC

## Introduction

This is a revised report as denoted by the suffix 'Rev1'. Additional information has been added to the Customer Reference and a Project Reference included at the client's request; the report has been reissued to reflect this. All results remain unchanged. This report supersedes the previous issue.

## Sample Summary: Project Arklow WwTW Land GI

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 619392 (SW01 WS3 LW) | RW2882 | Water | 07/05/2018 12:00 |

## Experimental

### Gross Alpha /Beta in Water

Samples were analysed following method "ANU/SOP/2002 Issue 8" – "An acidified water sample was concentrated by evaporation and sulphuric acid (specific gravity 1.84) added, the solution was then evaporated to dryness. The resulting solid material was ashed in a muffle furnace. An aliquot of the ground residue was used to prepare a uniform thickness source which was counted on a Berthold LB770 low-level proportional counter for an appropriate length of time."

### Gamma Spectrometry

Samples were analysed following method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Deviating Sample Disclaimer

The reported results are representative of the samples upon receipt. However,

G) The samples were not received by the laboratory at the correct temperature. (Temperature on receipt was 15.9°C; between 2°C and 8°C is recommended).

Consequently the samples are considered deviating and the validity of the reported data may be compromised.



UKAS TESTING
1015

SOCOTEC

## Results

Results are presented in the following tables.

Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

## Results Summary – Gross Alpha/Beta

| Customer Reference | Laboratory Reference | Analysis Date | Gross Alpha as Pu-242 | Gross Beta as Cs-137 |
|---|---|---|---|---|
| **619392 (SW01 WS3 LW)** | RW2882 | 24/05/2018 | <3.5 | 14.1 ± 6.1 |

**Notes**:
1. Results are presented as $Bq.L^{-1}$ of filtered and acidified sample, relative to the analysis date.
2. Uncertainties are quoted at 2 s.d. and are based on a total uncertainty budget.



UKAS TESTING
1015

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| 619392 (SW01 WS3 LW) | RW2882 | <14 | <48 | <2.2 | <2.0 | <1.9 | <2.0 | <29 | <25 | <2.4 |

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| 619392 (SW01 WS3 LW) | RW2882 | <4.2 | <3.6 | <24 | <27 | <7.6 | <210 | <27 | <1.7 | <2.4 |

**Notes:**

1. Analyses marked with an asterisk are not UKAS accredited.
2. Results are presented as $Bq.L^{-1}$ of filtered and acidified sample and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
5. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.



UKAS TESTING
1015

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Final Report

| | |
|---|---|
| **Report No.:** | 18-12809-1 |
| **Initial Date of Issue:** | 21-May-2018 |
| **Client** | Causeway Geotech Ltd |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson |
| **Project** | 17-1455 Aklow WWTW Land GI |

| | | | |
|---|---|---|---|
| **Quotation No.:** | Q18-13033 | **Date Received:** | 09-May-2018 |
| **Order No.:** | | **Date Instructed:** | 11-May-2018 |
| **No. of Samples:** | 4 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 17-May-2018 |
| **Date Approved:** | 21-May-2018 | **Subcon Results Due:** | 04-Jun-2018 |

**Approved By:**



**Details:** Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12809 | 18-12809 | 18-12809 | 18-12809 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619409 | 619410 | 619411 | 619412 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH15D |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | 7.9 | 8.1 | 8.2 | 8.0 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 4700 | 4800 | 4800 | 2000 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 350 | 300 | 320 | 3600 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 2900 | 2900 | 2900 | 1200 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 6.0 | [B] 5.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 140 | 140 | 140 | 20 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.5 | 8.5 | 8.4 | 8.6 |
| Redox Potential | N | 1170 | mV | N/A | 270 | 250 | 230 | 220 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 56 | 48 | < 10 | 300 |
| Chloride | U | 1220 | mg/l | 1.0 | 22000 | 21000 | 21000 | 1100 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.72 | 0.69 | 0.75 | < 0.050 |
| Nitrate | U | 1220 | mg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | 2.5 |
| Sulphate | U | 1220 | mg/l | 1.0 | 2700 | 2700 | 2600 | 130 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 380 | 380 | 360 | 80 |
| Potassium | U | 1415 | mg/l | 0.50 | 380 | 360 | 370 | 8.7 |
| Magnesium | U | 1415 | mg/l | 0.50 | 1200 | 1300 | 1200 | 58 |
| Sodium | U | 1415 | mg/l | 0.50 | 11000 | 11000 | 10000 | 300 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 130 | 120 | 120 | 10 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 10 | 8.3 | 9.6 | 42 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 0.092 | < 0.080 | < 0.080 | 0.15 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 260 | 310 | 320 | 22 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 870 | 890 | 890 | 190 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 12 | 7.6 | 8.2 | 720 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | 13 | 12 | 13 | 1.6 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 9.8 | 9.7 | 10 | 3.0 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 160 | 160 | 160 | 69 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 84 | 82 | 82 | 15 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | 0.90 | 0.10 | 0.12 | < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | 500 | 490 | 490 | 160 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | 49 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12809 | 18-12809 | 18-12809 | 18-12809 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619409 | 619410 | 619411 | 619412 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH15D |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12809 | 18-12809 | 18-12809 | 18-12809 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619409 | 619410 | 619411 | 619412 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH15D |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12809 | 18-12809 | 18-12809 | 18-12809 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619409 | 619410 | 619411 | 619412 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH15D |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12809 | 18-12809 | 18-12809 | 18-12809 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619409 | 619410 | 619411 | 619412 |
| Order No.: | | | Client Sample Ref.: | | SW01 | SW02 | SW03 | BH15D |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | HW | HW | HW | |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | See Attached | | | |
| Gross Alpha/Beta (Subcon) | S | | | N/A | See Attached | | | |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 619409 | SW01 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619409 | SW01 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619409 | SW01 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619410 | SW02 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619410 | SW02 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619410 | SW02 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619411 | SW03 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619411 | SW03 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619411 | SW03 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619412 | BH15D | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619412 | BH15D | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619412 | BH15D | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1460 | Mercury low-level in Waters by AFS | Mercury | Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm. |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1495 | Low Level Hexavalent Chromium in Waters | Chromium [VI] | Colorimetric determination of hexavalent chromium expressed as Cr (VI) µg/l in water, using Ion Chromatography and UV-visible spectrophotometry. |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Pentane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

**Customer Service**
Chemtest Ltd
11 Depot Road
Newmarket
Suffolk
CB8 0AL

**t:** 01638 60 60 70
**f:** 01638 60 60 71
**e:** Subcontracting@chemtest.co.uk

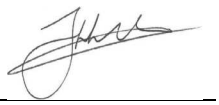
i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-85137

Replaces Analytical Report Number : 18-85137, issue no. 1

| | | | |
|---|---|---|---|
| **Project / Site name:** | 18-12809 | **Samples received on:** | 14/05/2018 |
| **Your job number:** | 18-12809 | **Samples instructed on:** | 14/05/2018 |
| **Your order number:** | 16695 | **Analysis completed by:** | 22/05/2018 |
| **Report Issue Number:** | 2 | **Report issued on:** | 22/05/2018 |
| **Samples Analysed:** | 4 water samples | | |

**Signed:** 

Jordan Hill
Reporting Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-85137**

**Project / Site name: 18-12809**

**Your Order No: 16695**

| **Lab Sample Number** | | | | 959301 | 959302 | 959303 | 959304 | |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 619409 (SW01 WS3 HW) | 619410 (SW02 WS3 HW) | 619411 (SW03 WS3 HW) | 619412 (BH15D WS3) | |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | |
| **Date Sampled** | | | | 07/05/2018 | 07/05/2018 | 07/05/2018 | 07/05/2018 | |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 26 | 34 | 26 | 23 | |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-85137**

**Project / Site name: 18-12809**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Total Phosphate as P in water | Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by colorimetry.Accredited matrices: SW, PW, GW. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser. | L082-PL | W | ISO 17025 |

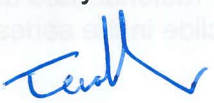
**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

SOCOTEC

# Analysis of Water Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12, Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0385 |
| Customer Reference: | 18-12809 |
| Quote Number: | ENR-ANU-9266 |
| PO Number: | 16694 |
| Sample Received: | 14 May 2018 |
| Sample Condition: | Satisfactory; Ambient |
| Analysis Completed: | 29 May 2018 |
| Report Author: |  |
| Author's Name: | Trevor Harding |
| Job Title: | Senior Analyst |
| Approved By: |  |
| Approver's name: | Charlene Hunston |
| Job Title: | Senior Analyst |
| Report Date: | 20 June 2018 |

SOCOTEC

## Introduction

This is a revised report as denoted by the suffix 'Rev1'. Additional information has been added to the Customer Reference and a Project Reference included at the client's request; the report has been reissued to reflect this. All results remain unchanged. This report supersedes the previous issue.

## Sample Summary: Project Arklow WwTW Land GI

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 619409 (SW01 WS3 HW) | RW2881 | Water | 07/05/2018 12:00 |

## Experimental

### Gross Alpha /Beta in Water

Samples were analysed following method "ANU/SOP/2002 Issue 8" – "An acidified water sample was concentrated by evaporation and sulphuric acid (specific gravity 1.84) added, the solution was then evaporated to dryness. The resulting solid material was ashed in a muffle furnace. An aliquot of the ground residue was used to prepare a uniform thickness source which was counted on a Berthold LB770 low-level proportional counter for an appropriate length of time."

### Gamma Spectrometry

Samples were analysed following method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Deviating Sample Disclaimer

The reported results are representative of the samples upon receipt. However,

G) The samples were not received by the laboratory at the correct temperature. (Temperature on receipt was 15.9°C; between 2°C and 8°C is recommended).

Consequently the samples are considered deviating and the validity of the reported data may be compromised.

SOCOTEC

## Results

Results are presented in the following tables.

Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

## Results Summary – Gross Alpha/Beta

| Customer Reference | Laboratory Reference | Analysis Date | Gross Alpha as Pu-242 | Gross Beta as Cs-137 |
|---|---|---|---|---|
| **619409 (SW01 WS3 HW)** | RW2881 | 24/05/2018 | <5.6 | <12 |

**Notes:**
1. Results are presented as $Bq.L^{-1}$ of filtered and acidified sample, relative to the analysis date.
2. Uncertainties are quoted at 2 s.d. and are based on a total uncertainty budget.



UKAS TESTING
1015

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| **619409 (SW01 WS3 HW)** | RW2881 | <13 | <48 | <2.1 | <2.0 | <1.7 | <1.9 | <29 | <25 | <2.4 |

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| **619409 (SW01 WS3 HW)** | RW2881 | <4.2 | <3.6 | <24 | <28 | <7.9 | <220 | <26 | <1.8 | <2.4 |

**Notes:**

1. Analyses marked with an asterisk are not UKAS accredited.
2. Results are presented as $Bq.L^{-1}$ of filtered and acidified sample and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
5. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Amended Report

| | | | |
|---|---|---|---|
| **Report No.:** | 18-12845-2 | | |
| **Initial Date of Issue:** | 24-May-2018 | **Date of Re-Issue:** | 25-May-2018 |
| **Client** | Causeway Geotech Ltd | | |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL | | |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson | | |
| **Project** | 17-1455 Arklow WWTW Land GI - Mill Rd, Ferrybank, Arklow | | |
| **Quotation No.:** | Q18-13033 | **Date Received:** | 09-May-2018 |
| **Order No.:** | | **Date Instructed:** | 11-May-2018 |
| **No. of Samples:** | 5 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 17-May-2018 |
| **Date Approved:** | 23-May-2018 | **Subcon Results Due:** | 04-Jun-2018 |

**Approved By:**



**Details:** Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI - Mill Rd, Ferrybank, Arklow**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12845 | 18-12845 | 18-12845 | 18-12845 | 18-12845 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619518 | 619519 | 619520 | 619521 | 619522 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | LW | LW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | 8.0 | 7.7 | 7.5 | 7.5 | 7.8 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 1100 | 990 | 1300 | 910 | 150 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 5.0 | < 5.0 | < 5.0 | 5.0 | < 5.0 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 680 | 600 | 770 | 550 | 93 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] 5.0 | [B] 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.4 | 8.5 | 8.4 | 8.4 | 8.6 |
| Redox Potential | N | 1170 | mV | N/A | 220 | 240 | 260 | 270 | 260 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 17 | 11 | < 10 | 25 | < 10 |
| Chloride | U | 1220 | mg/l | 1.0 | 400 | 340 | 400 | 290 | 37 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.10 | 0.20 | 0.14 | 0.12 | 0.19 |
| Nitrate | U | 1220 | mg/l | 0.50 | 5.7 | 5.7 | 5.9 | 5.7 | 5.8 |
| Sulphate | U | 1220 | mg/l | 1.0 | 68 | 59 | 67 | 51 | 19 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 14 | 13 | 14 | 12 | 6.9 |
| Potassium | U | 1415 | mg/l | 0.50 | 7.9 | 7.1 | 8.9 | 6.4 | 1.2 |
| Magnesium | U | 1415 | mg/l | 0.50 | 25 | 22 | 27 | 20 | 4.4 |
| Sodium | U | 1415 | mg/l | 0.50 | 180 | 160 | 200 | 140 | 13 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 8.1 | 8.3 | 2.2 | 1.7 | < 1.0 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 6.3 | 7.1 | 7.1 | 7.4 | 5.4 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 0.24 | 0.23 | 0.28 | 0.30 | 0.17 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 17 | 17 | 15 | 15 | 11 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 250 | 260 | 300 | 290 | 210 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 51 | 48 | 66 | 71 | 27 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 1.5 | 1.5 | 1.2 | 1.1 | 1.0 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | 1.8 | 2.1 | 2.1 | 2.1 | 1.5 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | < 1.0 | 5.0 | 2.7 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 53 | 52 | 4.7 | 2.1 | < 1.0 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 100 | 100 | 98 | 98 | 80 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | < 0.010 | < 0.010 | < 0.010 | 0.010 | < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | 160 | 160 | < 20 | < 20 | < 20 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI - Mill Rd, Ferrybank, Arklow**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-12845 | 18-12845 | 18-12845 | 18-12845 | 18-12845 |
|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 619518 | 619519 | 619520 | 619521 | 619522 |
| Order No.: | | | | | Client Sample Ref.: | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | | | Client Sample ID.: | WS3 | WS3 | WS3 | WS3 | WS3 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER |
| | | | | | Top Depth (m): | LW | LW | LW | LW | LW |
| | | | | | Date Sampled: | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI - Mill Rd, Ferrybank, Arklow**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12845 | 18-12845 | 18-12845 | 18-12845 | 18-12845 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619518 | 619519 | 619520 | 619521 | 619522 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | LW | LW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI - Mill Rd, Ferrybank, Arklow**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12845 | 18-12845 | 18-12845 | 18-12845 | 18-12845 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619518 | 619519 | 619520 | 619521 | 619522 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | LW | LW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Arklow WWTW Land GI - Mill Rd, Ferrybank, Arklow**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-12845 | 18-12845 | 18-12845 | 18-12845 | 18-12845 |
|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 619518 | 619519 | 619520 | 619521 | 619522 |
| Order No.: | | | Client Sample Ref.: | | SW04 | SW05 | SW06 | SW07 | SW08 |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER |
| | | | Top Depth (m): | | LW | LW | LW | LW | LW |
| | | | Date Sampled: | | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 | 07-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | 0.67 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | 0.82 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | 0.65 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | 0.82 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | 0.66 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | 1.2 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | 1.8 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | 0.60 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 619518 | SW04 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619518 | SW04 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619518 | SW04 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619519 | SW05 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619519 | SW05 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619519 | SW05 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619520 | SW06 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619520 | SW06 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619520 | SW06 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619521 | SW07 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619521 | SW07 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619521 | SW07 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |
| 619522 | SW08 | WS3 | 07-May-2018 | B | Coloured Winchester 1000ml |
| 619522 | SW08 | WS3 | 07-May-2018 | B | EPA Vial 40ml |
| 619522 | SW08 | WS3 | 07-May-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1460 | Mercury low-level in Waters by AFS | Mercury | Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm. |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1495 | Low Level Hexavalent Chromium in Waters | Chromium [VI] | Colorimetric determination of hexavalent chromium expressed as Cr (VI) µg/l in water, using Ion Chromatography and UV-visible spectrophotometry. |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Pentane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

**Customer Service**
Chemtest Ltd
11 Depot Road
Newmarket
Suffolk
CB8 0AL

**t:** 01638 60 60 70
**f:** 01638 60 60 71
**e:** Subcontracting@chemtest.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-85153

Replaces Analytical Report Number : 18-85153, issue no. 1

| | | | |
|---|---|---|---|
| **Project / Site name:** | 18-12845 | **Samples received on:** | 14/05/2018 |
| **Your job number:** | 18-12845 | **Samples instructed on:** | 14/05/2018 |
| **Your order number:** | 16693 | **Analysis completed by:** | 24/05/2018 |
| **Report Issue Number:** | 2 | **Report issued on:** | 24/05/2018 |
| **Samples Analysed:** | 5 water samples | | |

**Signed:**

Jordan Hill
Reporting Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-85153**

**Project / Site name: 18-12845**

**Your Order No: 16693**

| **Lab Sample Number** | | | | 959391 | 959392 | 959393 | 959394 | 959395 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 619518 (SW04 LW WS3) | 619519 (SW05 LW WS3) | 619520 (SW06 LW WS3) | 619521 (SW07 LW WS3) | 619522 (SW08 LW WS3) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 07/05/2018 | 07/05/2018 | 07/05/2018 | 07/05/2018 | 07/05/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | < 20 | 25 | 30 | 33 | 28 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-85153**

**Project / Site name: 18-12845**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Total Phosphate as P in water | Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by colorimetry.Accredited matrices: SW, PW, GW. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser. | L082-PL | W | ISO 17025 |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

# Final Report

| | |
|---|---|
| **Report No.:** | 18-13031-1 |
| **Initial Date of Issue:** | 31-May-2018 |
| **Client** | Causeway Geotech Ltd |
| **Client Address:** | 8 Drumahiskey Road<br>Balnamore<br>Ballymoney<br>County Antrim<br>BT53 7QL |
| **Contact(s):** | Aisling O'Kane<br>Colm Hurley<br>Darren O'Mahony<br>Gabriella Horan<br>John Cameron<br>Matthew Gilbert<br>Neil Haggan<br>Paul Dunlop<br>Paul McNamara<br>Stephen Curtis<br>Stephen Franey<br>Stephen Watson |
| **Project** | 17-1455 Aklow WWTW Land GI |

| | | | |
|---|---|---|---|
| **Quotation No.:** | Q18-13033 | **Date Received:** | 10-May-2018 |
| **Order No.:** | | **Date Instructed:** | 11-May-2018 |
| **No. of Samples:** | 15 | | |
| **Turnaround (Wkdays):** | 5 | **Results Due:** | 17-May-2018 |
| **Date Approved:** | 31-May-2018 | **Subcon Results Due:** | 04-Jun-2018 |

**Approved By:**



**Details:** Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 620282 | 620283 | 620284 | 620285 | 620286 | 620290 | 620291 | 620292 |
| Order No.: | | | | | Client Sample Ref.: | BH06A | BH08 | BH10D | BH11 | BH20 | BH04 | BH05 | BH07B |
| | | | | | Client Sample ID.: | WS3 | WS3 | WS3 | WS3 | WS3 | WS1 | WS3 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Date Sampled: | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Phosphate | SN | | mg/l | 0.0100 | | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | | 7.1 | 7.4 | 7.3 | 7.3 | 7.1 | 7.2 | 6.9 | 7.4 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | | 1500 | 10000 | 7800 | 10000 | 17000 | 19000 | 25000 | 28000 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | | 720 | 3800 | 20000 | 940 | 2500 | 800 | 890 | 2200 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | | 9100 | 6100 | 4700 | 6000 | 10000 | 12000 | 15000 | 17000 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | | 38 | 25 | 20 | 26 | 44 | 31 | 70 | 100 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | | 8.5 | 8.5 | 8.6 | 8.5 | 8.6 | 8.3 | 8.3 | 7.9 |
| Redox Potential | N | 1170 | mV | N/A | | 320 | 330 | 300 | 240 | 280 | 270 | 280 | 220 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | | 240 | 220 | 330 | 340 | 210 | 210 | 340 | 190 |
| Chloride | U | 1220 | mg/l | 1.0 | | 5400 | 3100 | 2300 | 2800 | 6700 | 6600 | 9000 | 11000 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | | 1.1 | 0.38 | 2.6 | 2.2 | 1.6 | 1.3 | 1.5 | 1.5 |
| Nitrate | U | 1220 | mg/l | 0.50 | | < 0.50 | 4.1 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Sulphate | U | 1220 | mg/l | 1.0 | | 1600 | 890 | 1600 | 1400 | 1500 | 2100 | 2400 | 1900 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | | 550 | 330 | 730 | 620 | 460 | 740 | 1200 | 420 |
| Potassium | U | 1415 | mg/l | 0.50 | | 120 | 73 | 71 | 100 | 120 | 140 | 230 | 240 |
| Magnesium | U | 1415 | mg/l | 0.50 | | 430 | 230 | 170 | 270 | 410 | 430 | 770 | 760 |
| Sodium | U | 1415 | mg/l | 0.50 | | 3200 | 1800 | 1400 | 2100 | 3300 | 3700 | 6600 | 5500 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | | 27 | 15 | 22 | 27 | 41 | 49 | 71 | 72 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | | 75 | 49 | 54 | 53 | 66 | 25 | 69 | 87 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | | 29 | 2.8 | 0.29 | 1.1 | 7.2 | 2.4 | 3.0 | 3.0 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | | 90 | 25 | 13 | 24 | 68 | 55 | 60 | 81 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | | 930 | 560 | 1300 | 1000 | 930 | 1300 | 1700 | 770 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | | 3900 | 760 | 3100 | 1700 | 3300 | 1800 | 2500 | 1200 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | | 4.1 | 17 | 13 | 40 | 6.2 | 16 | 7.2 | 20 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | | 41 | 6.7 | 40 | 8.5 | 11 | 11 | 12 | 19 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | | < 1.0 | < 1.0 | 4.8 | < 1.0 | < 1.0 | < 1.0 | 1.7 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | | 58 | 40 | 26 | 31 | 37 | 21 | < 1.0 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | | 21 | 12 | 16 | 20 | 33 | 39 | 55 | 74 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | | 32000 | 290 | 150 | 170 | 570 | 290 | 440 | 530 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | | < 0.010 | 0.12 | < 0.010 | 0.020 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | | 63 | 38 | 43 | 57 | 96 | 62 | 170 | 210 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | | < 0.10 | < 0.10 | < 0.10 | 0.13 | < 0.10 | 53 | < 0.10 | < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| Client: Causeway Geotech Ltd | | | | | Chemtest Job No.: | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | Chemtest Sample ID.: | 620282 | 620283 | 620284 | 620285 | 620286 | 620290 | 620291 | 620292 |
| Order No.: | | | | | Client Sample Ref.: | BH06A | BH08 | BH10D | BH11 | BH20 | BH04 | BH05 | BH07B |
| | | | | | Client Sample ID.: | WS3 | WS3 | WS3 | WS3 | WS3 | WS1 | WS3 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Date Sampled: | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | | < 5.0 | [C] < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | | < 0.10 | [C] < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | | < 5.0 | [C] < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | | < 10 | [C] < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 620282 | 620283 | 620284 | 620285 | 620286 | 620290 | 620291 | 620292 |
| Order No.: | | | | | Client Sample Ref.: | BH06A | BH08 | BH10D | BH11 | BH20 | BH04 | BH05 | BH07B |
| | | | | | Client Sample ID.: | WS3 | WS3 | WS3 | WS3 | WS3 | WS1 | WS3 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Date Sampled: | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | | | **Chemtest Job No.:** | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | | | **Chemtest Sample ID.:** | 620282 | 620283 | 620284 | 620285 | 620286 | 620290 | 620291 | 620292 |
| Order No.: | | | | | Client Sample Ref.: | BH06A | BH08 | BH10D | BH11 | BH20 | BH04 | BH05 | BH07B |
| | | | | | Client Sample ID.: | WS3 | WS3 | WS3 | WS3 | WS3 | WS1 | WS3 | WS1 |
| | | | | | Sample Type: | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | | | Date Sampled: | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | | |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 620282 | 620283 | 620284 | 620285 | 620286 | 620290 | 620291 | 620292 |
| Order No.: | | | Client Sample Ref.: | | BH06A | BH08 | BH10D | BH11 | BH20 | BH04 | BH05 | BH07B |
| | | | Client Sample ID.: | | WS3 | WS3 | WS3 | WS3 | WS3 | WS1 | WS3 | WS1 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | | | | | |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | | | See Attached | | | | | |
| Gross Alpha/Beta (Subcon) | S | | | N/A | | | See Attached | | | | | |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected | None Detected |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 620293 | 620294 | 620295 | 620296 |
| Order No.: | | | Client Sample Ref.: | | BH09 | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS1 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Phosphate | SN | | mg/l | 0.0100 | See Attached | See Attached | See Attached | See Attached |
| pH | U | 1010 | | N/A | 7.4 | 7.9 | 7.5 | 7.9 |
| Electrical Conductivity | U | 1020 | µS/cm | 1.0 | 27000 | 4300 | 11000 | 8600 |
| Suspended Solids At 105C | U | 1030 | mg/l | 5.0 | 16000 | 940 | 3400 | 4100 |
| Total Dissolved Solids | N | 1020 | mg/l | 1.0 | 16000 | 2600 | 6400 | 5200 |
| Biochemical Oxygen Demand | N | 1090 | mg O2/l | 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 | [B] < 4.0 |
| Chemical Oxygen Demand | U | 1100 | mg O2/l | 10 | 93 | 13 | 30 | 21 |
| Dissolved Oxygen | N | 1150 | mg O2/l | 0.50 | 8.1 | 8.6 | 8.6 | 8.7 |
| Redox Potential | N | 1170 | mV | N/A | 40 | 160 | 190 | 180 |
| Alkalinity (Total) | U | 1220 | mg/l | 10 | 270 | 220 | 320 | 150 |
| Chloride | U | 1220 | mg/l | 1.0 | 10000 | 1500 | 3300 | 2500 |
| Ammoniacal Nitrogen | U | 1220 | mg/l | 0.050 | 0.93 | 0.18 | 0.93 | 1.5 |
| Nitrate | U | 1220 | mg/l | 0.50 | < 0.50 | 1.5 | < 0.50 | < 0.50 |
| Sulphate | U | 1220 | mg/l | 1.0 | 1900 | 500 | 910 | 1300 |
| Cyanide (Free) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | I/S | < 0.0050 | < 0.0050 |
| Cyanide (Complex) Low-Level | N | 1300 | mg/l | 0.0050 | < 0.0050 | I/S | < 0.0050 | < 0.0050 |
| Calcium | U | 1415 | mg/l | 5.0 | 540 | 240 | 500 | 570 |
| Potassium | U | 1415 | mg/l | 0.50 | 280 | 33 | 120 | 64 |
| Magnesium | U | 1415 | mg/l | 0.50 | 840 | 94 | 330 | 88 |
| Sodium | U | 1415 | mg/l | 0.50 | 5400 | 720 | 2700 | 1400 |
| Arsenic (Dissolved) | U | 1450 | µg/l | 1.0 | 73 | 11 | 26 | 17 |
| Barium (Dissolved) | U | 1450 | µg/l | 5.0 | 76 | 42 | 140 | 41 |
| Cadmium (Dissolved) | U | 1450 | µg/l | 0.080 | 1.4 | 0.74 | 7.5 | 1.7 |
| Copper (Dissolved) | U | 1450 | µg/l | 1.0 | 77 | 17 | 47 | 23 |
| Iron (Dissolved) | N | 1450 | µg/l | 20 | 830 | 460 | 710 | 1000 |
| Manganese (Dissolved) | U | 1450 | µg/l | 1.0 | 2200 | 150 | 330 | 92 |
| Molybdenum (Dissolved) | U | 1450 | µg/l | 1.0 | 29 | 5.7 | 7.2 | 3.1 |
| Nickel (Dissolved) | U | 1450 | µg/l | 1.0 | 40 | 3.9 | 8.9 | 5.4 |
| Lead (Dissolved) | U | 1450 | µg/l | 1.0 | 3.1 | 3.9 | < 1.0 | < 1.0 |
| Antimony (Dissolved) | U | 1450 | µg/l | 1.0 | 5.2 | < 1.0 | 1.1 | 1.2 |
| Selenium (Dissolved) | U | 1450 | µg/l | 1.0 | < 1.0 | 9.6 | 39 | 19 |
| Vanadium (Dissolved) | U | 1450 | µg/l | 1.0 | 70 | 19 | 33 | 16 |
| Zinc (Dissolved) | U | 1450 | µg/l | 1.0 | 160 | 240 | 1100 | 110 |
| Mercury Low Level | U | 1460 | µg/l | 0.010 | < 0.010 | < 0.010 | < 0.010 | < 0.010 |
| Chromium (Trivalent) | N | 1490 | µg/l | 20 | 210 | 54 | 93 | 44 |
| Low-Level Chromium (Hexavalent) | U | 1495 | µg/l | 0.10 | < 0.10 | < 0.10 | < 0.10 | < 0.10 |
| Aliphatic TPH >C5-C6 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 620293 | 620294 | 620295 | 620296 |
| Order No.: | | | Client Sample Ref.: | | BH09 | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS1 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Aliphatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | [C] I/S | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1675 | µg/l | 0.10 | < 0.10 | [C] I/S | < 0.10 | < 0.10 |
| Total Aromatic Hydrocarbons | N | 1675 | µg/l | 5.0 | < 5.0 | [C] I/S | < 5.0 | < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | µg/l | 10 | < 10 | [C] I/S | < 10 | < 10 |
| Dichlorodifluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl Chloride | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichlorofluoromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| cis 1,2-Dichloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromochloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Trichloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1-Trichloroethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloromethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloropropene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Benzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Trichloroethene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichloropropane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Dibromomethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Bromodichloromethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| cis-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| Toluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Trans-1,3-Dichloropropene | N | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| 1,1,2-Trichloroethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 620293 | 620294 | 620295 | 620296 |
| Order No.: | | | Client Sample Ref.: | | BH09 | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS1 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Tetrachloroethene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichloropropane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Dibromochloromethane | U | 1760 | µg/l | 10 | < 10 | < 10 | < 10 | < 10 |
| 1,2-Dibromoethane | U | 1760 | µg/l | 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Chlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,1,2-Tetrachloroethane | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Ethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| o-Xylene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Styrene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tribromomethane | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichloropropane | N | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 |
| N-Propylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3,5-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tert-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Sec-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,3-Dichlorobenzene | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Isopropyltoluene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,4-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Butylbenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | U | 1760 | µg/l | 50 | < 50 | < 50 | < 50 | < 50 |
| 1,2,4-Trichlorobenzene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Hexachlorobutadiene | U | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,3-Trichlorobenzene | U | 1760 | µg/l | 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Methyl Tert-Butyl Ether | N | 1760 | µg/l | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| N-Nitrosodimethylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis-(2-Chloroethyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,3-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,4-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylphenol (o-Cresol) | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroisopropyl)Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 620293 | 620294 | 620295 | 620296 |
| Order No.: | | | Client Sample Ref.: | | BH09 | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS1 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Hexachloroethane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| N-Nitrosodi-n-propylamine | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Nitrobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Isophorone | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dimethylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Chloroethoxy)Methane | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 1,2,4-Trichlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Naphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobutadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chloro-3-Methylphenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methylnaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorocyclopentadiene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,6-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4,5-Trichlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Chloronaphthalene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dimethylphthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,6-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Acenaphthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 3-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenzofuran | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Chlorophenylphenylether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2,4-Dinitrotoluene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Fluorene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Diethyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitroaniline | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 2-Methyl-4,6-Dinitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Azobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Bromophenylphenyl Ether | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Hexachlorobenzene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pentachlorophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Phenanthrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Carbazole | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Butyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |

Chemtest
The right chemistry to deliver results

# Results - Water

**Project: 17-1455 Aklow WWTW Land GI**

| **Client: Causeway Geotech Ltd** | | | **Chemtest Job No.:** | | 18-13031 | 18-13031 | 18-13031 | 18-13031 |
|---|---|---|---|---|---|---|---|---|
| Quotation No.: Q18-13033 | | | **Chemtest Sample ID.:** | | 620293 | 620294 | 620295 | 620296 |
| Order No.: | | | Client Sample Ref.: | | BH09 | BH17 | BH18 | BH19 |
| | | | Client Sample ID.: | | WS1 | WS3 | WS3 | WS3 |
| | | | Sample Type: | | WATER | WATER | WATER | WATER |
| | | | Date Sampled: | | 08-May-2018 | 08-May-2018 | 08-May-2018 | 08-May-2018 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | | |
| Fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Butylbenzyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Chrysene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Bis(2-Ethylhexyl)Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Di-N-Octyl Phthalate | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[b]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[k]fluoranthene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[a]pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Indeno(1,2,3-c,d)Pyrene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Dibenz(a,h)Anthracene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Benzo[g,h,i]perylene | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| 4-Nitrophenol | N | 1790 | µg/l | 0.50 | < 0.50 | < 0.50 | < 0.50 | < 0.50 |
| Gamma Spectrometry (Subcon) | S | | | N/A | See Attached | | See Attached | See Attached |
| Gross Alpha/Beta (Subcon) | S | | | N/A | See Attached | | See Attached | See Attached |
| SVOC TIC | N | 1790 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected |
| VOC TIC | N | 1760 | µg/l | N/A | None Detected | None Detected | None Detected | None Detected |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample ID: | Sample Ref: | Sample ID: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---|---|---|---|---|---|
| 620282 | BH06A | WS3 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620282 | BH06A | WS3 | 08-May-2018 | B | EPA Vial 40ml |
| 620282 | BH06A | WS3 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620283 | BH08 | WS3 | 08-May-2018 | BC | EPA Vial 40ml |
| 620283 | BH08 | WS3 | 08-May-2018 | BC | Plastic Bottle 1000ml |
| 620284 | BH10D | WS3 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620284 | BH10D | WS3 | 08-May-2018 | B | EPA Vial 40ml |
| 620284 | BH10D | WS3 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620285 | BH11 | WS3 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620285 | BH11 | WS3 | 08-May-2018 | B | EPA Vial 40ml |
| 620285 | BH11 | WS3 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620286 | BH20 | WS3 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620286 | BH20 | WS3 | 08-May-2018 | B | EPA Vial 40ml |
| 620286 | BH20 | WS3 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620290 | BH04 | WS1 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620290 | BH04 | WS1 | 08-May-2018 | B | EPA Vial 40ml |
| 620290 | BH04 | WS1 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620291 | BH05 | WS3 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620291 | BH05 | WS3 | 08-May-2018 | B | EPA Vial 40ml |
| 620291 | BH05 | WS3 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620292 | BH07B | WS1 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620292 | BH07B | WS1 | 08-May-2018 | B | EPA Vial 40ml |
| 620292 | BH07B | WS1 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620293 | BH09 | WS1 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620293 | BH09 | WS1 | 08-May-2018 | B | EPA Vial 40ml |
| 620293 | BH09 | WS1 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620294 | BH17 | WS3 | 08-May-2018 | BC | EPA Vial 40ml |
| 620294 | BH17 | WS3 | 08-May-2018 | BC | Plastic Bottle 1000ml |
| 620295 | BH18 | WS3 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620295 | BH18 | WS3 | 08-May-2018 | B | EPA Vial 40ml |
| 620295 | BH18 | WS3 | 08-May-2018 | B | Plastic Bottle 1000ml |
| 620296 | BH19 | WS3 | 08-May-2018 | B | Coloured Winchester 1000ml |
| 620296 | BH19 | WS3 | 08-May-2018 | B | EPA Vial 40ml |
| 620296 | BH19 | WS3 | 08-May-2018 | B | Plastic Bottle 1000ml |

# Test Methods

| SOP | Title | Parameters included | Method summary |
|---|---|---|---|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1020 | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Electrical Conductivity and Total Dissolved Solids (TDS) in Waters | Conductivity Meter |
| 1030 | Total Suspended Solids | Total suspended solids | Filtration of a mixed sample through a standard glass fibre filter and determination of the mass of residue retained dried at 105°C. |
| 1090 | Biochemical Oxygen Demand | Biochemical Oxygen demand (BOD) | Electrometric determination of dissolved oxygen in seeded sample initially and after 5 days incubation at 20°C. |
| 1100 | Chemical Oxygen Demand | Chemical Oxygen demand (COD) | Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI]. |
| 1150 | Dissolved Oxygen | Dissolved Oxygen (DO) | Electrometric determination (on site preferred), using oxygen sensitive membrane electrode. |
| 1170 | Redox Potential | Redox Potential | Meter |
| 1220 | Anions, Alkalinity & Ammonium in Waters | Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium | Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser. |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1415 | Cations in Waters by ICP-MS | Sodium; Potassium; Calcium; Magnesium | Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS). |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1460 | Mercury low-level in Waters by AFS | Mercury | Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm. |
| 1490 | Hexavalent Chromium in Waters | Chromium [VI] | Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 1495 | Low Level Hexavalent Chromium in Waters | Chromium [VI] | Colorimetric determination of hexavalent chromium expressed as Cr (VI) µg/l in water, using Ion Chromatography and UV-visible spectrophotometry. |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44 | Pentane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1790 | Semi-Volatile Organic Compounds (SVOCs) in Waters by GC-MS | Semi-volatile organic compounds | Solvent extraction / GCMS detection |

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable Sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

**Customer Service**
Chemtest Ltd
11 Depot Road
Newmarket
Suffolk
CB8 0AL

**t:** 01638 60 60 70
**f:** 01638 60 60 71
**e:** Subcontracting@chemtest.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

**t:** 01923 225404
**f:** 01923 237404
**e:** reception@i2analytical.com

# Analytical Report Number : 18-85140

Replaces Analytical Report Number : 18-85140, issue no. 1

| | | | |
|---|---|---|---|
| **Project / Site name:** | 18-13031 | **Samples received on:** | 14/05/2018 |
| **Your job number:** | 18-13031 | **Samples instructed on:** | 14/05/2018 |
| **Your order number:** | 16696 | **Analysis completed by:** | 24/05/2018 |
| **Report Issue Number:** | 2 | **Report issued on:** | 24/05/2018 |
| **Samples Analysed:** | 12 water samples | | |

**Signed:**

Jordan Hill
Reporting Manager
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

| | |
|---|---|
| soils | - 4 weeks from reporting |
| leachates | - 2 weeks from reporting |
| waters | - 2 weeks from reporting |
| asbestos | - 6 months from reporting |

Excel copies of reports are only valid when accompanied by this PDF certificate.



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-85140**

**Project / Site name: 18-13031**

**Your Order No: 16696**

| **Lab Sample Number** | | | | 959315 | 959316 | 959591 | 959592 | 959593 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 620282 (BH06A WS3) | 620283 (BH08 WS3) | 620284 (BH10D WS3) | 620285 (BH11 WS3) | 620286 (BH20 WS3) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 08/05/2018 | 08/05/2018 | 08/05/2018 | 08/05/2018 | 08/05/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | < 20 | < 20 | < 20 | < 20 | < 20 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-85140**

**Project / Site name: 18-13031**

**Your Order No: 16696**

| **Lab Sample Number** | | | | 959594 | 959595 | 959596 | 959597 | 959598 |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 620290(BH04 WS1) | 620291(BH05 WS3) | 620292(BH07B WS1) | 620293(BH09 WS1) | 620294(BH17 WS3) |
| **Sample Number** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Depth (m)** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Date Sampled** | | | | 08/05/2018 | 08/05/2018 | 08/05/2018 | 08/05/2018 | 08/05/2018 |
| **Time Taken** | | | | None Supplied | None Supplied | None Supplied | None Supplied | None Supplied |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 47 | < 20 | 25 | < 20 | < 20 |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number: 18-85140**

**Project / Site name: 18-13031**

**Your Order No: 16696**

| **Lab Sample Number** | | | | 959599 | 959600 | | | |
|---|---|---|---|---|---|---|---|---|
| **Sample Reference** | | | | 620295(BH18 WS3) | 620296(BH19 WS3) | | | |
| **Sample Number** | | | | None Supplied | None Supplied | | | |
| **Depth (m)** | | | | None Supplied | None Supplied | | | |
| **Date Sampled** | | | | 08/05/2018 | 08/05/2018 | | | |
| **Time Taken** | | | | None Supplied | None Supplied | | | |
| **Analytical Parameter (Water Analysis)** | **Units** | **Limit of detection** | **Accreditation Status** | | | | | |
| **General Inorganics** | | | | | | | | |
| Total Phosphate as P | µg/l | 20 | ISO 17025 | 57 | < 20 | | | |

U/S = Unsuitable Sample  I/S = Insufficient Sample



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

**Analytical Report Number : 18-85140**

**Project / Site name: 18-13031**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

| Analytical Test Name | Analytical Method Description | Analytical Method Reference | Method number | Wet / Dry Analysis | Accreditation Status |
|---|---|---|---|---|---|
| Total Phosphate as P in water | Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by colorimetry.Accredited matrices: SW, PW, GW. | In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser. | L082-PL | W | ISO 17025 |

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**
**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**
**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

SOCOTEC

# Analysis of Water Samples

| | |
|---|---|
| Client: | Chemtest Ltd<br>Depot Road<br>Newmarket<br>Suffolk<br>CB8 0AL |
| Testing Facility: | SOCOTEC UK<br>Unit 12, Moorbrook<br>Southmead Industrial Park<br>Didcot<br>Oxfordshire<br>OX11 7HP |
| Laboratory Reference: | 18-0384 |
| Customer Reference: | 18-13031 |
| Quote Number: | ENR-ANU-9266 |
| PO Number: | 16697 |
| Samples Received: | 14 May 2018 |
| Sample Condition: | Satisfactory; Ambient |
| Analysis Completed: | 29 May 2018 |
| Report Author: |  |
| Author's Name: | Trevor Harding |
| Job Title: | Senior Analyst |
| Approved By: |  |
| Approver's name: | Charlene Hunston |
| Job Title: | Senior Analyst |
| Report Date: | 31 May 2018 |



UKAS TESTING
1015

SOCOTEC

## Introduction

This is a revised report as denoted by the suffix 'Rev1'. Additional information has been added to the Customer Reference and a Project Reference included at the client's request; the report has been reissued to reflect this. All results remain unchanged. This report supersedes the previous issue.

## Sample Summary: Project Arklow WwTW Land GI

| Customer Reference | Laboratory Reference | Matrix | Sampling Date |
|---|---|---|---|
| 620284 (BH10D WS3) | RW2883 | Water | 08/05/2018 12:00 |
| 620293 (BH09 WS1) | RW2884 | Water | 08/05/2018 12:00 |
| 620295 (BH18 WS3) | RW2885 | Water | 08/05/2018 12:00 |
| 620296 (BH19 WS3) | RW2886 | Water | 08/05/2018 12:00 |

## Experimental

### Gross Alpha /Beta in Water

Samples were analysed following method "ANU/SOP/2002 Issue 8" – "An acidified water sample was concentrated by evaporation and sulphuric acid (specific gravity 1.84) added, the solution was then evaporated to dryness. The resulting solid material was ashed in a muffle furnace. An aliquot of the ground residue was used to prepare a uniform thickness source which was counted on a Berthold LB770 low-level proportional counter for an appropriate length of time."

### Gamma Spectrometry

Samples were analysed following method "ANU/SOP/2029 Issue 4" – "The measurement technique is based on the use of high purity germanium (HPGe) detectors coupled to an Ortec gamma ray spectroscopy system. The gamma ray spectra are stored on a computer and analysed using the software programme Fitzpeaks for photopeak identification and quantification. The detectors are calibrated for efficiency using a mixed radionuclide standard, which covers an energy range of approximately 60-2000 keV. The efficiency of gamma rays between 30 keV and 120 keV are determined on an individual basis.

Application of decay corrections for the naturally occurring daughter radionuclides of uranium and thorium assumes that the series daughter radionuclides are all in secular equilibrium and therefore decay with the half-life of the first radionuclide in the series." ($^{226}$Ra is not UKAS accredited)

## Deviating Sample Disclaimer

The reported results are representative of the samples upon receipt. However,

G) The samples were not received by the laboratory at the correct temperature. (Temperature on receipt was 15.9°C; between 2°C and 8°C is recommended).

Consequently the samples are considered deviating and the validity of the reported data may be compromised.

SOCOTEC

## Results

Results are presented in the following tables.

Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

The results in this test report relate only to the items tested, and test portions taken thereof. This test report must not be reproduced except in full, without written approval of the laboratory.

## Results Summary – Gross Alpha/Beta

| Customer Reference | Laboratory Reference | Analysis Date | Gross Alpha as Pu-242 | Gross Beta as Cs-137 |
|---|---|---|---|---|
| **620284 (BH10D WS3)** | RW2883 | 24/05/2018 | <0.33 | 2.12 ± 0.50 |
| **620293 (BH09 WS1)** | RW2884 | 24/05/2018 | <2.1 | 7.22 ± 1.8 |
| **620295 (BH18 WS3)** | RW2885 | 24/05/2018 | <0.50 | 2.94 ± 0.89 |
| **620296 (BH19 WS3)** | RW2886 | 24/05/2018 | <0.46 | 2.05 ± 0.77 |

**Notes**:
1. Results are presented as $Bq.L^{-1}$ of filtered and acidified sample, relative to the analysis date.
2. Uncertainties are quoted at 2 s.d. and are based on a total uncertainty budget.



UKAS TESTING
1015

SOCOTEC

# Results Summary – Gamma Spectrometry

| Customer Reference | Laboratory Reference | Be-7 | K-40 | Co-60 | Cs-134 | Cs-137 | Tl-208 | Pb-210 | Bi-212 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| 620284 (BH10D WS3) | RW2883 | <14 | <46 | <2.0 | <2.0 | <1.8 | <1.9 | <29 | <24 | <2.4 |
| 620293 (BH09 WS1) | RW2884 | <15 | <50 | <2.4 | <2.2 | <2.1 | <2.3 | <24 | <28 | <2.8 |
| 620295 (BH18 WS3) | RW2885 | <15 | <48 | <2.5 | <2.2 | <2.2 | <2.3 | <24 | <28 | <2.7 |
| 620296 (BH19 WS3) | RW2886 | <15 | <49 | <2.6 | <2.3 | <2.1 | <2.3 | <24 | <30 | <2.7 |

| Customer Reference | Laboratory Reference | Bi-214 | Pb-214 | Ra-224 | Ra-226* | Ac-228 | Pa-234m | Th-234 | U-235 | Am-241 |
|---|---|---|---|---|---|---|---|---|---|---|
| 620284 (BH10D WS3) | RW2883 | <4.1 | <3.6 | <24 | <27 | <8.1 | <220 | <27 | <1.7 | <2.4 |
| 620293 (BH09 WS1) | RW2884 | <5.0 | <3.9 | <30 | <30 | <11 | <290 | <27 | <1.9 | <2.2 |
| 620295 (BH18 WS3) | RW2885 | <5.0 | <3.9 | <25 | <30 | <9.3 | <280 | <27 | <1.9 | <2.2 |
| 620296 (BH19 WS3) | RW2886 | <4.5 | <4.0 | <26 | <30 | <11 | <240 | <28 | <1.9 | <2.2 |

**Notes:**

1. Analyses marked with an asterisk are not UKAS accredited.
2. Results are presented as $Bq.L^{-1}$ of filtered and acidified sample and are decay corrected to the sampling date.
3. For results below the Limit of Detection, the LoD is rounded up to 2 significant figures.
4. Detector calibrations are based upon homogeneous standard solutions. For quantification purposes the samples are assumed to be homogeneous.
5. $^{226}Ra$ has only one gamma ray at 186 keV and the major gamma ray from $^{235}U$ also occurs at 186 keV. $^{235}U$ can be measured by the lower abundance gamma ray at 144 keV and if a positive result for $^{235}U$ is reported, the $^{226}Ra$ result will be unreliable and overestimated. However even if $^{235}U$ is below the LoD there may still be a contribution to the $^{226}Ra$ from $^{235}U$ and the $^{226}Ra$ result may be unreliable and overestimated. If an accurate result for $^{226}Ra$ is required this is better obtained by radiochemical analysis.

UKAS TESTING
1015

CAUSEWAY GEOTECH

# APPENDIX L

# Radman Associates Radiological Survey Report



Radman Associates

Specialists in Radiological Protection Management

# Non-intrusive & Intrusive Radiological Survey Report

| | |
|---|---|
| Author: |  <br>Dr Mark Bescoby<br>Accredited Radiation Protection Adviser<br>Radioactive Waste Adviser |
| Document status: | 1st Issue |
| Document reference: | CGT/AWwTP/SR1 |
| Document approved: |  <br>Robert Collins<br>Accredited Radiation Protection Adviser |
| Date: | 15 January 2018 |
| Client: | **Causeway Geotech** |
| Address: | 8 Drumahiskey Road<br>Ballymoney<br>Co. Antrim<br>BT53 7QL |
| Client contact: | Neil Haggan<br>Senior Engineering Geologist |
| Address of premises surveyed: | Arklow Wastewater Treatment Plant<br>N Quay<br>Ferrybank<br>Arklow<br>Co. Wicklow<br>Ireland |
| Survey dates: | 08-09 January 2018 |

*This report has been prepared by Radman Associates with all reasonable skill, care and diligence, within the terms of the contract with the client. The report is confidential to the client and Radman Associates accepts no responsibility of whatever nature to third parties to whom this report may be made known. No part of this document may be reproduced without the prior written approval of Radman Associates.*

# Contents

1. Introduction ..... 2
2. Potential radioactive contaminants ..... 2
3. Survey instruments ..... 2
4. Survey methodology ..... 2
5. Survey results ..... 3
6. Sampling ..... 3
7. Conclusions and recommendations ..... 3
References ..... 4
Appendix 1 – Survey locations ..... 5
Appendix 2 – Trial pits ..... 6
Appendix 3 - Area B (300 cps) ..... 7

## 1. Introduction

This report relates to a non-intrusive and intrusive radiological survey of an area of the proposed Arklow Wastewater Treatment Plant, Arklow, Co. Wicklow. The site is suspected to have been used for making plaster boards with waste gypsum (potentially phosphogypsum) reported to have been stored on the site above and below ground.

The aim of the survey was to identify any radiologically significant contamination as a result of historic use of the site.

It should be noted that the non-intrusive survey reports on contamination in surface layers only, due to the shielding effect of soil overburden. The absence of contamination at deeper levels (>200 mm) and across the whole site cannot be guaranteed.

## 2. Potential radioactive contaminants

Due to the site's previous use, the potential exists for the presence of radioactive contaminants in the form of phosphogypsum which is a by-product of the production of fertilizer from phosphate rock. Phosphogypsum contains naturally occurring radioactive material (NORM) in the form of uranium and thorium and their associated daughter products.

## 3. Survey instruments

A hand-held solid state scintillation detector (Georadis RT-30, serial no. 1997) was used during the walkover survey in order to identify any contaminated material via the detection of gamma emitting radionuclides in the surface or immediate subsurface (to a depth of ~200 mm). The instrument was connected to a GPS logger to allow any areas of elevated count rate to be identified.

A dose rate monitor (RadEye B20, serial no. 30749) was used to determine the dose rate in areas of elevated count rate and hence, external exposure risk to workers on the site.

The instruments were calibrated in compliance with Article 21 of the Radiological Protection Act 1991 (Ionising Radiation) Order 2000[1] and in accordance with guidance published by the National Physical Laboratory[2]

## 4. Survey methodology

A non-intrusive walk-over survey of all accessible areas was performed (Appendix 1) using the scintillation detector. Originally the walkover survey was to a 1 metre transect in the areas with potential over-ground phosphogypsum and 5 m across the remainder of the site. However, due to dense vegetation in the area with potential over-ground phosphogypsum a 1 m survey was not possible. A tracked excavator was used to make two tracks through the area to allow measurements to be taken.

The majority of areas where elevated readings were discovered were subject to intrusive investigations in the form of trial pits. Contamination monitoring was performed by the RPA/RWA on each bucket load of spoil after emptying at the side of the excavation prior to the next bucket load being excavated and added to the stockpile. The excavations continued until natural material was reached which was at approximate depths of 1 m,

2.3 m and 1.4 m in TP24, TP25 and TP26 respectively. Contaminated material in TP27 was seen to only be present within the top 0.5 m.

## 5. Survey results

The majority of the readings were comparable to the local area background signal (80-120 cps), indicating the absence of any radiologically significant contamination in the surface and immediate sub-surface layer in the areas surveyed.

Elevated readings were recorded in three areas of the site:

1. The area where the presence of radiological contamination was suspected (Appendix 1).
2. The area of TP27 (Appendix 1).
3. An area at the end of the building with two open pipes (Area B, Appendix 3).

Areas 1 and 2 were subject to further intrusive investigations. Phosphogypsum was easily identifiable in TP24, TP25 and TP26 by the characteristic white chalky appearance (Appendix 2). Readings upto 550 cps were recorded in close proximity to the phosphogypsum from all three trial pits. The maximum associated dose rate was 0.3 μSv/h.

Material from TP27 gave elevated readings upto 400 cps (0.2 μSv/h) but no obvious phosphogypsum was observed. The elevated readings may be due to other material containing NORM e.g. bricks and rubble which was present in the area.

The area around the open pipes gave elevated readings upto 350 cps (0.2 μSv/h) and should be investigated further to determine the type and extent of radiological contamination.

## 6. Sampling

Causeway Geotech site operatives took samples of the contaminated material and the natural material beneath from TP24, TP25, TP26 and TP27. Representative samples should be sent for analysis by high-resolution gamma spectroscopy in order to determine the activity concentrations (Bq/g) of the contaminant nuclides.

## 7. Conclusions and recommendations

The walkover survey results indicate the absence of any radiologically significant contamination in the surface and immediate sub-surface layer in the majority of the areas surveyed.

As phosphogypsum was identified on site a watching brief should be maintained during further intrusive works to determine if any further deposits of phosphogypsum have been buried on site.

Due to the nature of the radiological contamination there is a need to consider both the external radiation and internal contamination hazard.

Being in close proximity to surface ground contamination raises the potential for exposure to external gamma radiation. Since this type of radiation follows the inverse square law, the exposure levels increase significantly with reduced distance from the emitting material.

The maximum dose rate recorded in area 1 was 0.3 μSv/h which is slightly above the background of 0.1 μSv/h. However, it would take over 3330 hours to reach the annual dose limit for a member of the public (1 mSv) within Article 10 of the Radiological Protection Act 1991 (Ionising Radiation) Order 2000.

Whilst the external radiation risk is deemed to be low, consideration should be given to the amount of time workers spend in the area to ensure compliance with ALARA.

Contamination of the person leading to internal exposure may occur via physical skin contact, or uptake via inhalation or ingestion of contaminant radionuclides. To protect against the internal contamination hazard, dust masks and disposable gloves should be worn when working in areas with phosphogypsum contamination. Further precautions should be taken to reduce the inhalation risk if dusty conditions prevail by damping down material.

It is understood that ARUP will interpret the sample analysis results and therefore determine the fate of the material in consultation with the Environmental Protection Agency and the Local Authority.

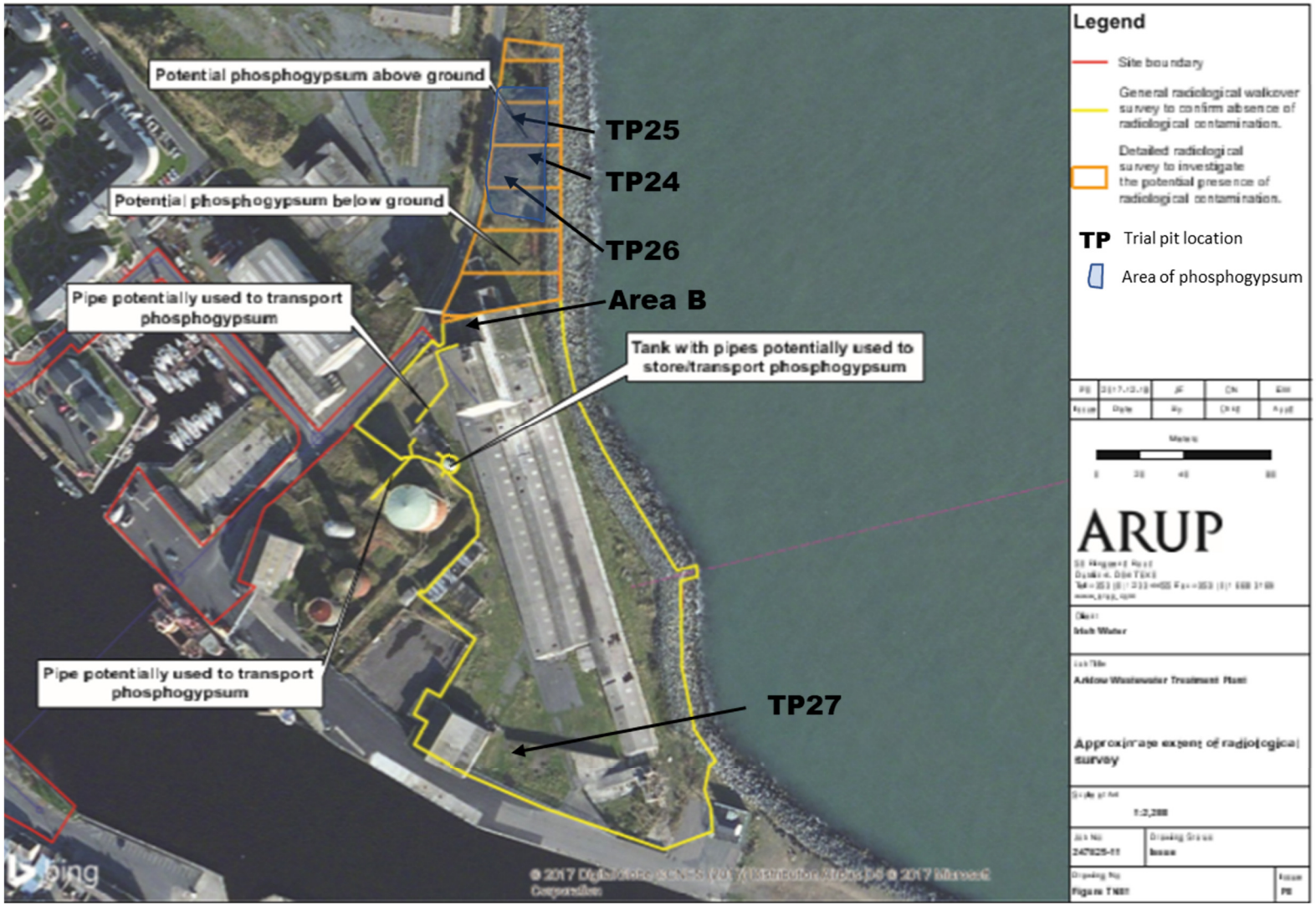
Dependant on the activity concentrations the material may be buried on site or may need to be removed for disposal as either exempt waste to uncontrolled landfill or radioactive waste to a licenced landfill site.

If material is to be potentially buried on site, an assessment should be performed (such as Public Health England's assessment tool for radioactively contaminated land [NRPB-W36][4]) in order to estimate the potential doses to future occupiers of the site.

## References

1. Radiological Protection Act 1991 (Ionising Radiation) Order 2000. S.I. No. 125 of 2000.
2. Measurement Good Practice Guide No 14: The Examination, Testing & Calibration of Portable Radiation Protection Instruments ISSN 1368-6550. Issue 2 (August 2014).
3. The Environmental Permitting (England and Wales) Regulations 2016 S.I. No. 1154.
4. WB Oatway & SF Mobbs. Methodology for Estimating the Doses to Members of the Public from Future Land Use of Land Previously Contaminated with Radioactivity. NRPB-W36. 2003.

## Appendix 1 – Survey locations



## Appendix 2 – Radiological trial pits

TP24



TP25



TP 26



TP27



## Appendix 3 - Area B (maximum reading 350 cps)



CAUSEWAY GEOTECH

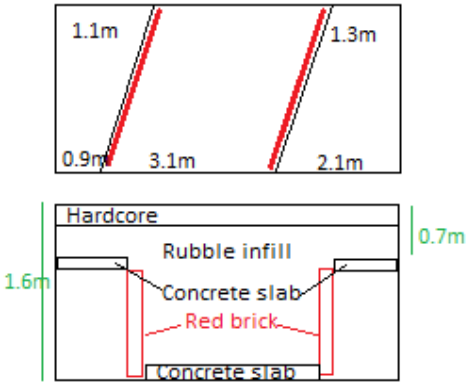
# APPENDIX M

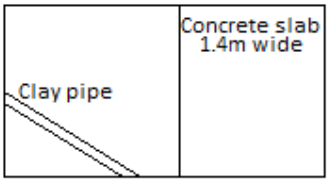
# IAC Archaeology Survey Report

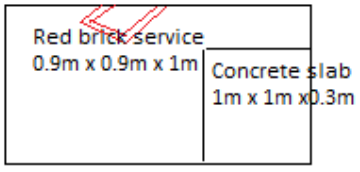


**Site**: Arklow SS Waste Water Treatment Site **Job Number:** J3096

**Monitored By:** Liza Kavanagh and Red Tobin **January 2018**

| Trial Pit | Date | Length (m) | Width (m) | Depth (m) | Stratigraphy |
|---|---|---|---|---|---|
| 1 | 9/01/18 | 6.1 | 1.1 | 1.6 | Orientated NW-SE<br><br>1.1: Hardcore<br>1.2: Rubble infill, composed of red brick, sand and concrete.<br>1.3: Concrete slabs (0.15m wide), 0.7m down from ground level extended from the NW and SE ends of the trench leaving a gap of 3.1m between them. These slabs sat atop two, three brick wide, red brick walls. See plan and profile below.<br>  |
| 2 | 15/01/18 | 3 | 1.2 | 2.3 | Orientated N-S<br><br>2.1 Tarmacadam<br>2.2 Sub-base material<br>2.3 Demolition waste<br>2.4 Distinct layer of black granular material with a particularly chemical smell. Corresponding to this layer and crossing the NE corner of TP2 is a well-defined wall face with traces of plaster render. This wall crosses from SE to NW. The wall is evident to natural.<br>2.5 The black layer seals a thick layer of demolition debris characteristic by the fact that it shows evidence of having been exposed to high temperatures. The rubble and associated soil is pink/purple in colour and friable.<br>2.6 The NW corner of TP2, at the base of the 2.5 deposit shows the possible remains of a brick built, domed or vaulted structure again heavily affected by heat.<br>2.7 Sand – clean |
| 3 | 15/01/18 | 4 | 1.3 | 0.2 | Orientated WSW-ENE<br><br>3.1 Concrete<br>3.2 Concrete floor, extended throughout trench so trench abandoned and Trench 3a dug to the south. |

| | | | | | |
|---|---|---|---|---|---|
| 3a | 15/01/18 | 3.5 | 1.2 | 1.5 | Orientated NNE-SSW<br><br>Dug through gap between two concrete floor slabs<br><br>3a.1 Concrete<br>3a.2 Edge of concrete floor slab<br>3a.3 Dump of material which contained considerable quantities of brick, slate and fragments of asbestos sheeting. |
| 4 | 10/01/18 | 3.4 | 1.6 | 2.3 | Orientated ENE-WSW<br><br>4.1: Topsoil (0.2m).<br>4.2: Concrete slab (0.2m).<br>4.3: Red and orange gravely sand fill around a clay pipe, 0.3m in diameter (0.5).<br>4.4: Cut by pipe trench, beige yellow sand (0.2m).<br>4.5: Cut by pipe trench, dark brown gravely sand with inclusions of white flecked mortar, red brick rubble etc (0.3m).<br>4.6: Beige yellow beach sand with lenses of red orange iron staining (1.6m +). |
| 5 | 10/01/18 | 4 | 1.3 | 2.8 | Orientated NW-SE<br><br>NW facing section:<br>5.1: Topsoil and hardcore (0.6m).<br>5.2: Fine silty yellow sand (0.1m).<br>5.3: Dark black stony silty sand with inclusions of red brick and rubbish, very compact (0.5m).<br>5.4: Orange yellow/iron stained sand and gravel (0.15m).<br>5.5: Pinky mauve sand and gravel with occasional stone (0.25m). Contains disused clay pipe.<br>5.6: Purply pink stone, small and angular –infill (0.2m).<br>5.7: Orange yellow/iron stained sand and gravel (0.2m).<br>5.8: Beach sand.<br><br>SE facing section:<br>5.1: Topsoil and hardcore (0.5m).<br>5.2: Fine silty yellow sand (0.1m).<br>5.3: Dark black stony silty sand with inclusions of red brick and rubbish, very compact (0.4m).<br>5.4: Creamy yellow orangey sand (0.3m).<br>5.5: Concrete slab (1m deep).<br>5.6: Beach sand.<br><br>  |

| | | | | | |
|---|---|---|---|---|---|
| 6 | 12/01/18 | 3 | 1.2 | 2.1 | Orientated NNW-SSE<br><br>6.1 Tarmacadam<br>6.2 Sub-base material<br>6.3 Demolition waste and rubble<br>6.4 Oxidised layer (ferrous?)<br>6.5 Demolition waste<br>6.6 Heavily oxidised layer (intense heat?)<br>6.7 Sands with slight evidence for leachate. |
| 7 | 12/01/18 | 4 | 1.2 | 1.5 | Orientated NNW-SSE<br><br>7.1 Tarmacadam<br>7.2 Sub-base material<br>7.3 Unstratified rubble (demolition waste)<br>7.4 Concrete floor (1.1m) with visible remains of a wall running from NE to SW and forming the SSE limit of the concrete floor.<br>7.5 Sands showing stratified leachate (ferrous, hydrocarbon, chemical) to 1.5m |
| 8 | 12/01/18 | 3 | 2 | 2.3 | Orientated NE-SW<br><br>8.1 Fine gravel<br>8.2 Sub-base<br>8.3 Unstratified demolition waste, mainly rubble.<br>8.4 Concrete floor or mounting<br>8.5 Major accumulation of hydrocarbon seepage at 1.5m<br>8.6 Sands showing stratified leachate (ferrous, hydrocarbon, chemical) to 2.3m |
| 9 | 11/01/18 | 4.3 | 2.1 | 2.5 | Orientated NW-SE<br><br>9.1: Topsoil (0.1m)<br>9.2: Green-grey sand and gravel infill (0.2m).<br>9.3: Mottled mix of dark purple brown silty clay and inclusions of building waste including red brick and concrete (0.4m).<br>9.4: Dark black and purple clayey silt and sand with inclusions of rubble red brick and concrete.<br>9.5: Brown gravely clay and sand with frequent inclusions of rubble, rubbish and building waste. Contains a service box of red brick to the east and concrete and a slab of concrete in the southern corner.<br>  <br> |
| 10 | 10/01/18 | 3.7 | 1.3 | 2 | Orientated NW-SE<br><br>10.1: Hardcore and topsoil (0.2m).<br>10.2: Beige brown sand with occasional stone inclusions (0.5m). |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 10.3: Concrete slab (0.25m).<br>10.4: Pinkish mauve sand (0.1m)<br>10.5: Mix of black and purple sandy gravel and clay (0.2m).<br>10.6: Creamy white beach sand with lenses of orange/iron staining. (1.2m+). |
| 11 | 11/01/18 | 3.5 | 1.3 | 1.9 | Orientated NE-SW<br><br>11.1: Tarmacadem (0.1m)<br>11.2: Green-grey sand and gravel infill (0.15m).<br>11.3: Mauve grey sand and stony gravel with occasional red brick and stone inclusions (0.6m). This layer was cut by a plastic pipe and a storm drain.<br>11.4: Orange yellow/iron stained sand and gravel (0.2m). This layer was cut by a plastic pipe and a storm drain.<br>11.5: Beige yellow gravel sandy gravel and stone (0.3m). This layer was cut by a plastic pipe and a storm drain.<br>11.6: Purple/red small angular stone layer. Base layer for storm drain (0.2m).<br>11.7: Blue grey gravel, compacted like concrete (0.2m+). |
| 12 | 11/01/18 | 3.7 | 1.4 | 2.3 | Orientated ENE-WSW<br><br>12.1: Tarmacadem (0.1m)<br>12.2: Green-grey sand and gravel infill (0.2m).<br>12.3: Mauve grey sand and stony gravel with occasional red brick and stone inclusions (0.3m).<br>12.4: Beige brown sand and gravel with occasional inclusions of large rubblestone (0.6m).<br>12.5: Dark blackish grey gravel silty clay (0.3m).<br>12.6: Beach sand and occasional stone (0.3m).<br>12.7: Grey brown gravel, red brick, broken pipe, rotting wood and other waste building materials (0.5m +). |
| 13 | 11/01/18 | 2.5 | 1.6 | 0.7 | Orientated NW-SE<br><br>13.1: Hardcore and topsoil (0.3m).<br>13.2: Very compacted dark grey stone and silt almost cemented together – had to broken out by machine (0.15m).<br>13.3: Hardcore dark grey stone infill (0.2m)<br>13.4: Iron pan (0.1m).<br>13.5: Beige white sand with occasional orange/iron stain lenses (0.3m).<br>13.6: Concrete slab top to large tank extending throughout the trench. Decision made to leave in place. A second Trial Pit 13 may be excavated on Monday 15/01/18. |
| 14 | 12/01/18 | 4.5 | 1.2 | 2.1 | Orientated WNW-ESE |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 14.1 Reinforced concrete floor (rebar)<br>14.2 Demolition waste<br>14.3 Structural remains in original matrix. The structural remains consist of the partial brick side walls of a culvert with slate slab lintels. This was noted, partially exposed in the southern baulk of TP14. Partially exposed in the northern baulk of TP14 is a well-built brick culvert with vaulted roof. The side walls of the culvert are formed using red brick (kiln fired) as is the vault. Although the vault seems to be formed using a double layer of red bricks (kiln fired). The culvert appears to have been deliberately terminated at this point as it is closed by a red brick wall inserted into the path of the culvert. The location of this Trial Pit corresponds to the location of a series of outflow channels from the Kynoch's factory carrying waste water etc into the estuary. It is likely that such channels would have been culverted under the floors of the main factory.<br>14.4 Sands with slightly evidence of leaching |
| 15 | 8/01/18 | 4.8 | 1.1 | 2.2 | Orientated NE-SW<br><br>15.1: Hardcore, blue grey sand and clay mixed with angular and sub-angular stone (0.3m).<br>15.2: Concrete slab (0.2m).<br>15.3: Orange and yellow mixed gravely sand with iron pan staining evident (0.5m).<br>15.4: Grey gravely sand and stone with red brick and rubble inclusions (0.5m).<br>15.5: White yellow sand with inclusions of orange/iron stain noted (0.7m+).<br><br>Note on the NE end of trench was the remains of a N-S asbestos pipe 0.9m down from ground level, which was contained within a box composed of yellow and red brick, 0.45m in diameter. |
| 16 | 9/01/18 | 2.6 | 1 | 2.8 | Orientated NE-SW<br><br>16.1: Hardcore (0.2m)<br>16.2: Purply pink and black gravely rubble with stone and concrete inclusions (0.45m).<br>16.3: Yellow and orange (iron stained) coarse sand, stone rubble and red brick (0.8m). This deposit contained a single find of a struck piece of flint.<br>16.4: Fine grained yellow beige beach sand (1.4m +).<br><br>Find 1 of 1 |
| 17 | 10/01/18 | 3.3 | 1.2 | 2.1 | Orientated NW-SE<br><br>SE facing section:<br>17.1: Concrete slab (0.15m)<br>17.2: Dark blackish brown silty clay and stone |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | (0.15m)<br>17.3: Disturbed beige yellow beach sand (0.4m)<br>17.4: Fine grained silt and sand orange/iron stained and yellow (0.1m).<br>17.5: Dark grey and black sandy clay and stone (0.1m).<br>17.6: Bright yellow / possibly sulphur, powdery silt and sand (0.4-1.1m).<br>17.7: Orange /iron stained sand and gravel (1.1m). |
| 18 | | 3 | 1.2 | 2 | Orientated NNW-SSE<br><br>18.1 Tarmacadam<br>18.2 Sub-base material<br>18.3 Demolition waste and rubble<br>18.4 Heavily oxidised layer – north east corner (intense heat?)<br>18.5 Sands with slight evidence for leachate. |
| 19 | 11/01/18 | 4.7 | 1.9 | 2 | Orientated NW-SE<br><br>19.1: Grey gravel infill (0.2m)<br>19.2: Dark brown silty clay (0.05m)<br>19.3: Purple grey stony gravel, very occasional red brick (0.5m).<br>19.4A: A slab of concrete (0.9m below ground) and a pipe (1.2m below ground) were noted in the fill below this layer in fine beige sand.-West end<br>19.4B: Teal coarse grained sand –fill around plastic pipe (0.25m). –East end.<br>19.5: Dark grey with slight purple hue with inclusions of roots, clay, gravel and sand (0.35m).<br>19.6: Yellow beige beach sand (0.4m)<br>19.7: Dark grey brown gravel and sandy clay with inclusions of red brick, broken pipe and plastic (0.2m +). |
| 20 | | | | | Burst pipe, trench full of water. |
| 21 | 11/01/18 | 4.1 | 2 | 2.2 | Orientated ENE-WSW<br><br>21.1: Topsoil (0.1m)<br>21.2: Dark green grey clayey sand with waste material including broken pipe and stone (0.5m)<br>21.3: Beige grey sand with occasional red/purple sand mix through and some purple/red stone. Phosphogypsum and rubble waste pipe noted also (1.6m). |
| 22 | 10/01/18 | 4.2 | 1.4 | 2.3 | Orientated ENE-WSW<br><br>WSW facing section:<br>22.1: Topsoil (0.3m).<br>22.2: Dark black and brown gravel and stone very compacted with inclusions of lumps of concrete (0.2m)<br>22.3: Rubble infill of red brick and concrete rubble and beige/cream sand and gravel (0.5m) |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 22.4: Thin layer of compacted orange sand and gravel, compacted (0.1m).<br>22.5: Fine silt and sand black dark brown layer with occasional red brick inclusions (0.2m).<br>22.6 Beige yellow beach sand.<br><br>ENE facing section:<br>22.1: Toposil (0.3m).<br>22.2: Dark black and brown gravel and stone very compacted with inclusions of lumps of concrete (0.2).<br>22.3: Rubble infill of red brick and concrete rubble and beige/cream sand and gravel (0.5m).<br>22.4: Stone and red brick mortar bonded floor surface 1m below groundlevel and 1.5m long (0.15m).<br>22.5: Fine silt and sand black dark brown layer with occasional red brick inclusions (0.15m).<br>22.6: Beige yellow beach sand.<br><br>Noted within the trench were two pipes, one NE-SW clay pipe, NW-SE metal pipe. |
| 23 | 10/01/18 | 3.6 | 1.5 | 2.6 | Orientated ENE-WSW<br><br>23.1: Topsoil (0.15m)<br>23.2: Concrete slab (0.15m)<br>23.3: Beige white and orange/iron stained sand with inclusions of stone (0.6).<br>23.4: Stone and mortar wall (1.5m tall, 0.5m wide), in a partially rubble condition. Mortar contained shell fragments. Possibly part of the 19th century remains of factory which stood here.<br>23.5: Beach sand, beige yellow sand (1.5m).<br>23.6: Orange gravely sand with iron staining (0.4m+). |
| 24 | 9/01/18 | 3.3 | 1 | 1.4 | Orientated NNW-SSE<br><br>24.1: Phosphogypsum (1.1m).<br>24.2: Compacted grey brown sand and rock (0.3m).<br>24.3: Beige yellow beach sand (0.2m+).<br><br>This trial pit was dug within an area used to dump waste phosphogypsum to the North of the factory. |
| 25 | 9/01/18 | 3.3 | 1.1 | 2.3 | Orientated NNW-SSE<br><br>25.1: Phosphogypsum (2.1m).<br>25.2: Compacted grey brown sand and rock (0.2m+).<br><br>This trial pit was dug within an area used to dump waste phosphogypsum to the North of the factory. |
| 26 | 9/01/18 | 2.6 | 1.1 | 1.6 | Orientated N-S |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 26.1: Phosphogypsum (1.4m).<br>26.2: Compacted grey brown sand and rock (0.2m+).<br><br>This trial pit was dug within an area used to dump waste phosphogypsum to the North of the factory. |
| 27 | 9/01/18 | 3 | 1.4 | 2.3 | Orientated WNW-ESE<br><br>27.1: Light beige grey sand with inclusions of brick and gypsum (0.4m).<br>27.2: Purply pink and black gravely rubble with stone and concrete inclusions (0.45m).<br>27.3: Yellow and orange (iron stained) coarse sand, stone rubble and red brick (0.45m). The remains of a partially rubbled stone wall, bonded with white mortar with inclusions of shells was recorded in the WNW end of the trench 1m deep and 1.4m long. Possibly the remains of a wall from the 19th century factory which stood on this site. |

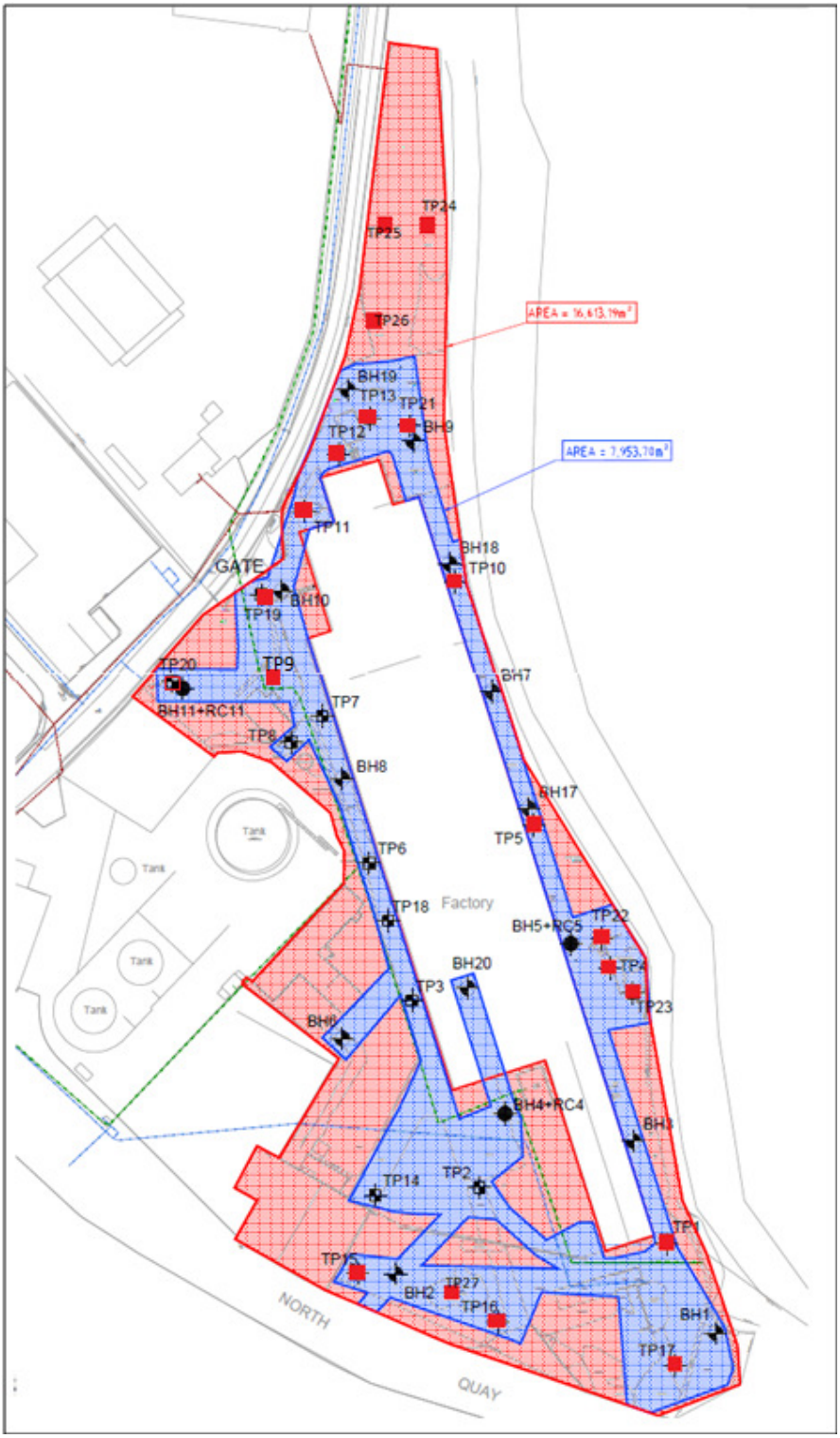


Figure 1: Plan of Trial Pits. Those highlighted red are completed.

| Photo Number | Description |
|---|---|
| 001 | Northeast facing view of TP15 |
| 002 | Southwest facing view of TP15 |
| 003 | Southeast view of TP15 |
| 004 | Northwest view of TP15 |
| 005 | South-southeast view of TP24 |
| 006 | North-northwest view of TP24 |
| 007 | East-northeast view of TP24 |
| 008 | West-northwest view of TP24 |
| 009 | South-southeast view of TP25 |
| 010 | North-northwest view of TP25 |
| 011 | East-northeast view of TP25 |
| 012 | West-southwest view of TP25 |
| 013 | South facing view of TP26 |
| 014 | West facing view of TP26 |
| 015 | North facing view of TP26 |
| 016 | East facing view of TP26 |
| 017 | East-southeast view of TP27 |
| 018 | West-northwest facing view of TP27 |
| 019 | South-southwest view of TP27 |
| 020 | North-northeast view of TP27 |
| 021 | Close-up, north-northeast view of rubble wall in TP27 |
| 022 | Southeast view of TP16 |
| 023 | Southwest view of TP16 |
| 024 | Northeast view of TP16 |
| 025 | Northwest view of TP16 |
| 026 | West facing view of red brick walls in TP 1 |
| 027 | Northwest view of TP1 |
| 028 | Southeast view of TP1 |
| 029 | Northeast view of TP1 |
| 030 | Northeast view of TP1 |
| 031 | Southwest view of TP1 |
| 032 | Southwest view of TP1 |
| 033 | Southeast view of TP17 |
| 034 | Northwest view of TP17 |
| 035 | Northeast view of TP17 |
| 036 | Southwest view of TP17 |
| 037 | West-southwest view of TP23 |
| 038 | East-northeast view of TP23 |
| 039 | South-southeast view of TP23 |
| 040 | North-northwest view of TP23 |
| 041 | West-southwest view of TP4 |
| 042 | East-northeast view of TP4 |
| 043 | South-southeast view of TP4 |
| 044 | North-northwest view of TP4 |
| 045 | West-southwest view of TP22 |
| 046 | East-northeast view of TP22 |
| 047 | North-northwest view of TP22 |
| 048 | Northeast view of TP22 |
| 049 | South-southeast view of TP22 |
| 050 | East-northeast view of TP5 |
| 051 | South-southeast view of TP5 |
| 052 | North-northeast view of TP5 |
| 053 | South-southeast view of TP10 |
| 054 | North-northwest view of TP10 |
| 055 | West-southwest view of TP10 |
| 056 | East-northeast view of TP10 |
| 057 | West-southwest view of TP21 |

| | |
|---|---|
| 058 | East-northeast view of TP10 |
| 059 | South-southeast view of TP21 |
| 060 | North-northwest view of TP21 |
| 061 | Northeast view of TP 13 |
| 062 | Northwest view of TP12 |
| 063 | Southwest view of TP12 |
| 064 | Northeast view of TP12 |
| 065 | North-northeast view of TP11 |
| 066 | East-northeast view of TP11 |
| 067 | South-southwest view of TP11 |
| 068 | West-southwest view of TP11 |
| 069 | Southeast view of TP19 |
| 070 | Northwest view of TP19 |
| 071 | Northeast view of TP19 |
| 072 | Southwest view of TP19 |
| 073 | North view of TP9 |
| 074 | South view of TP9 |
| 075 | West view of TP9 |
| 076 | East view of TP9 |
| 077 | Southwest view of TP21, burst pipe. |
| 078 | Southwest view of TP8 |
| 079 | North view of TP7 |
| 080 | Southwest view of TP7 |
| 081 | Southwest view of TP6 |
| 082 | Southwest view of TP18 |
| 083 | Southwest view of TP14 |
| 084 | Southwest view of TP14 |
| 085 | North view of TP3 |
| 086 | East view of TP2 |
| 086 | Southeast view of TP3a |
| 088 | Southwest view of TP2 |



Photo 1: Northeast facing view of TP15



Photo 2: Southwest facing view of TP15



Photo 3: Southeast view of TP15



Photo 4: Northwest view of TP15



Photo 5: South-southeast view of TP24



Photo 6: North-northwest view of TP24



Photo 7: East-northeast view of TP24



Photo 8: West-northwest view of TP24



Photo 9: South-southeast view of TP25



Photo 10: North-northwest view of TP25



Photo 11: East-northeast view of TP25



Photo 12: West-southwest view of TP25



Photo 13: South facing view of TP26



Photo 14: West facing view of TP26



Photo 15: North facing view of TP26



Photo 16: East facing view of TP26



Photo 17: East-southeast view of TP27



Photo 18: West-northwest facing view of TP27



Photo 19: South-southwest view of TP27



Photo 20: North-northeast view of TP27



Photo 21: Close-up, north-northeast view of rubble wall in TP27



Photo 22: Southeast view of TP16



Photo 23: Southwest view of TP16

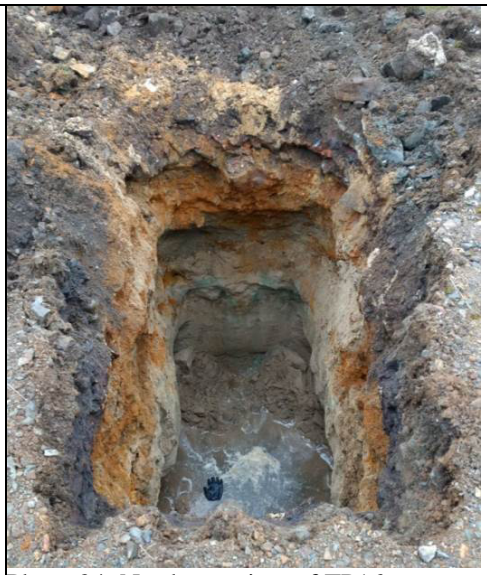


Photo 24: Northeast view of TP16



Photo 25: Northwest view of TP16



Photo 26: West facing view of red brick walls in TP 1



Photo 27: Northwest view of TP1



Photo 28: Southeast view of TP1



Photo 29: Northeast view of TP1



Photo 30:Northeast view of TP1



Photo 31: Southwest view of TP1



Photo 32: Southwest view of TP1

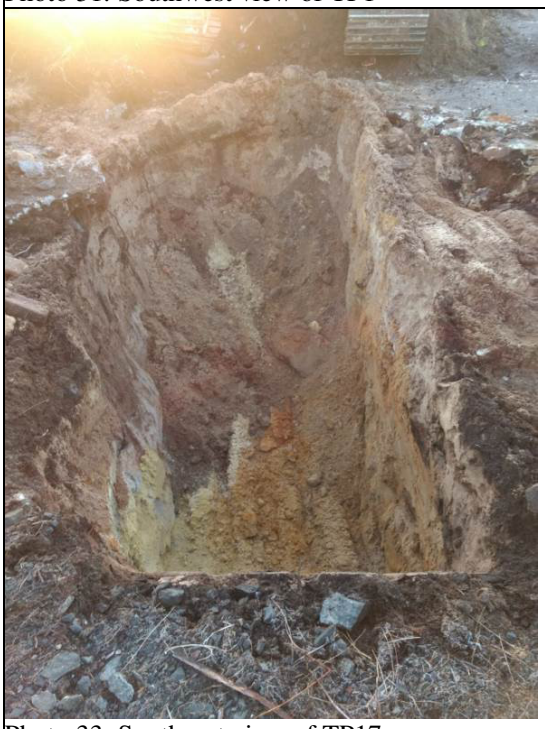


Photo 33: Southeast view of TP17



Photo 34: Northwest view of TP17



Photo 35:Northeast view of TP17



Photo 36: Southwest view of TP17



Photo 37: West-southwest view of TP23



Photo 38: East-northeast view of TP23



Photo 39:South-southeast view of TP23



Photo 40:North-northwest view of TP23



Photo 41: West-southwest view of TP4



Photo 42: East-northeast view of TP4



Photo 43: South-southeast view of TP4



Photo 44: North-northwest view of TP4



Photo 45:West-southwest view of TP22



Photo 46: East-northeast view of TP22



Photo 47: North-northwest view of TP22



Photo 48:Northeast view of TP22



Photo 49:South-southeast view of TP22



Photo 50: East-northeast view of TP5



Photo 51: South-southeast view of TP5



Photo 52: North-northeast view of TP5



Photo 53: South-southeast view of TP10



Photo 54: North-northwest view of TP10



Photo 55: West-southwest view of TP10



Photo 56: East-northeast view of TP10



Photo 57: West-southwest view of TP21



Photo 58: East-northeast view of TP10



Photo 59: South-southeast view of TP21



Photo 60: North-northwest view of TP21



Photo 61: Northeast view of TP 13



Photo 62: Northwest view of TP12



Photo 65: Southwest view of TP12



Photo 64: Northeast view of TP12



Photo 65: North-northeast view of TP11



Photo 66: East-northeast view of TP11



Photo 67: South-southwest view of TP11



Photo 68: West-southwest view of TP11



Photo 69: Southeast view of TP19



Photo 70: Northwest view of TP19



Photo 71: Northeast view of TP19



Photo 72: Southwest view of TP19



Photo 73: North view of TP9



Photo 74: South view of TP9



Photo 75: West view of TP9



Photo 76: East view of TP9



Photo 77: Southwest view of TP21, burst pipe.



Photo 78: Southwest view of TP8



Photo 79: North view of TP7



Photo 80: Southwest view of TP7



Photo 81: Southwest view of TP6



Photo 82: Southwest view of TP18



Photo 83: Southwest view fo TP14



Photo 84: Southwest view of TP14



Photo 85: North view of TP3



Photo 86: East view of TP2



Photo 87: Southeast view of TP3a



Photo 88: Southwest view of TP2

CAUSEWAY GEOTECH

# APPENDIX N

# SPT Hammer Energy Measurement Report



Southern Testing
Environmental & Geotechnical

# SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

**Southern Testing Laboratories**
**Keeble House**
**Stuart Way**
**East Grinstead**
**West Sussex**
**RH19 4QA**

| | |
|---|---|
| SPT Hammer Ref: | DR1 |
| Test Date: | 01/06/2017 |
| Report Date: | 01/06/2017 |
| File Name: | DR1.spt |
| Test Operator: | NPB |

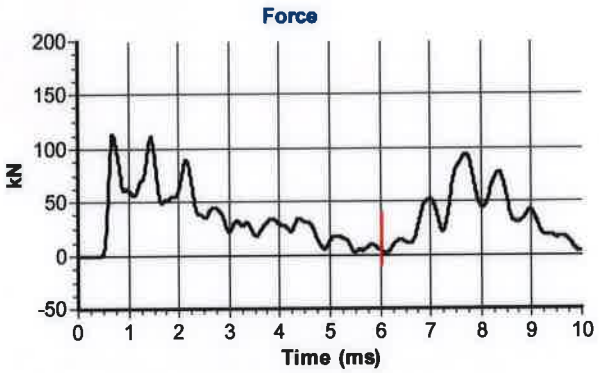
## Instrumented Rod Data

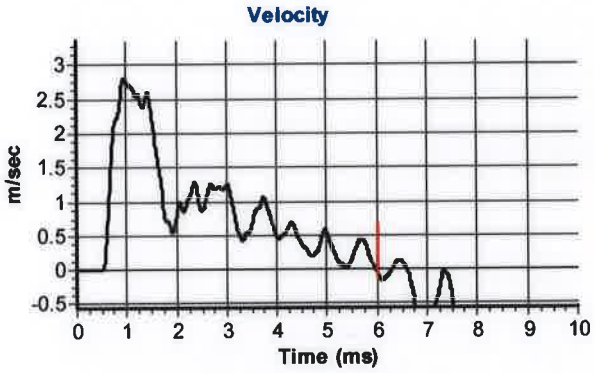
| | |
|---|---|
| Diameter $d_r$ (mm): | 54 |
| Wall Thickness $t_r$ (mm): | 6.0 |
| Assumed Modulus $E_a$ (GPa): | 200 |
| Accelerometer No.1: | 6458 |
| Accelerometer No.2: | 9607 |

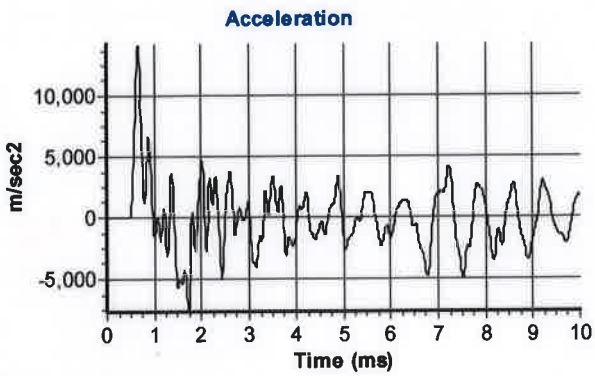
## SPT Hammer Information

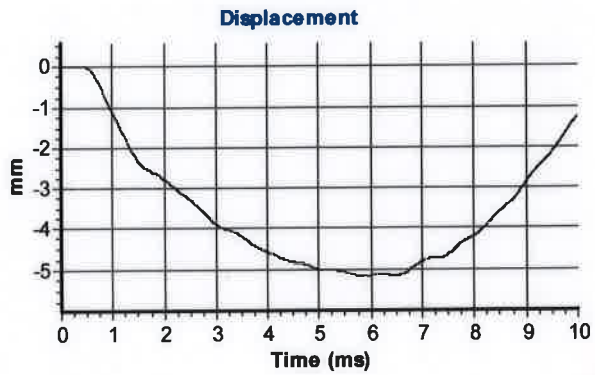
| | |
|---|---|
| Hammer Mass m (kg): | 63.5 |
| Falling Height h (mm): | 760 |
| SPT String Length L (m): | 14.5 |

**Comments / Location**
CHARLWOODS




## Calculations

| | |
|---|---|
| Area of Rod A (mm2): | 905 |
| Theoretical Energy $E_{theor}$ (J): | 473 |
| Measured Energy $E_{meas}$ (J): | 287 |

**Energy Ratio $E_r$ (%):** **61**

NPB Burrows

Signed: Neil Burrows
Title: Field Operations Manager

The recommended calibration interval is 12 months

*SPTMAN ver.1.92 All rights reserved, Testconsult ©2010*

Southern Testing
Environmental & Geotechnical

# SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

**Southern Testing Laboratories**
**Keeble House**
**Stuart Way**
**East Grinstead**
**West Sussex**
**RH19 4QA**

| | |
|---|---|
| SPT Hammer Ref: | D13 |
| Test Date: | 01/06/2017 |
| Report Date: | 01/06/2017 |
| File Name: | D13.spt |
| Test Operator: | NPB |

**Instrumented Rod Data**

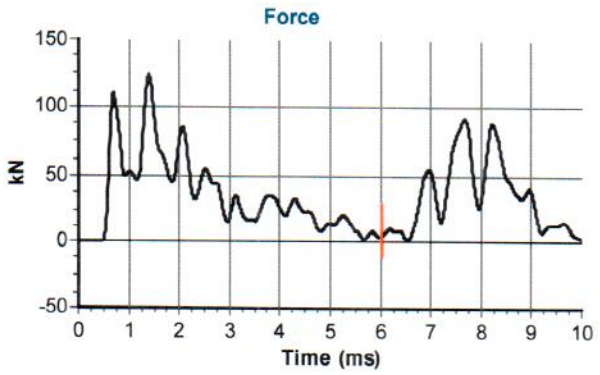
| | |
|---|---|
| Diameter $d_r$ (mm): | 54 |
| Wall Thickness $t_r$ (mm): | 6.0 |
| Assumed Modulus $E_a$ (GPa): | 200 |
| Accelerometer No.1: | 6458 |
| Accelerometer No.2: | 9607 |

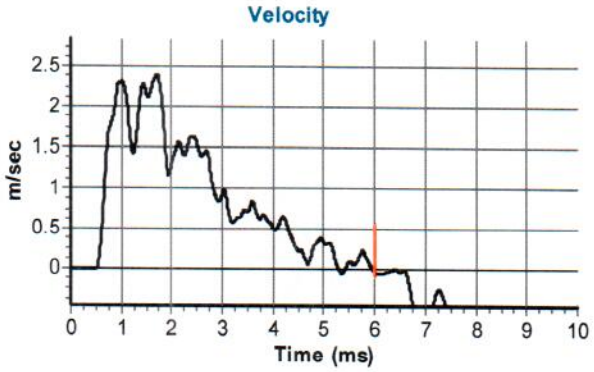
**SPT Hammer Information**

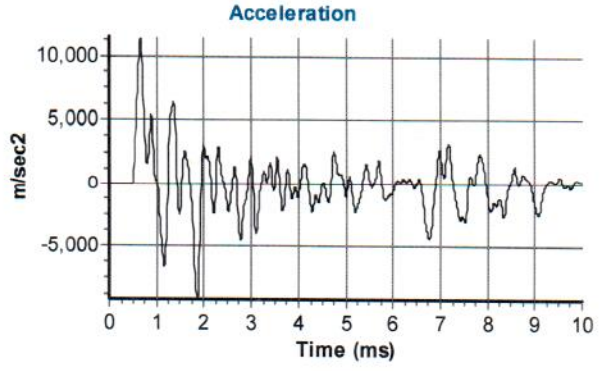
| | |
|---|---|
| Hammer Mass m (kg): | 63.5 |
| Falling Height h (mm): | 760 |
| SPT String Length L (m): | 14.5 |

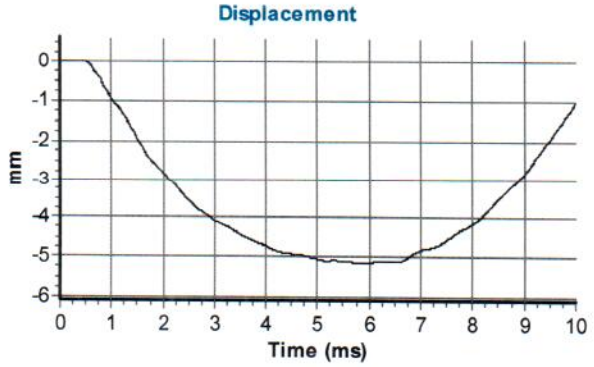
**Comments / Location**

CHARLWOODS




**Calculations**

| | |
|---|---|
| Area of Rod A (mm2): | 905 |
| Theoretical Energy $E_{theor}$ (J): | 473 |
| Measured Energy $E_{meas}$ (J): | 284 |

**Energy Ratio $E_r$ (%):** **60**

Signed: Neil Burrows

Title: Field Operations Manager

The recommended calibration interval is 12 months

*SPTMAN ver.1.92 All rights reserved, Testconsult ©2010*