

## **Appendix 14.5**

### **Arklow WwTP Site - Ground Investigation**





**CAUSEWAY**  
—  
GEOTECH

## 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*



## 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

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

The works were conducted in accordance with:

UK Specification for Ground Investigation 2<sup>nd</sup> 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. 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 VR	Shear vane test (borehole)      Hand vane test (trial pit)      Shear strength stated in kPa V: undisturbed vane shear strength      VR: remoulded vane shear strength
dd/mm/yy: 1.0 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 8<sup>th</sup> January and 23<sup>rd</sup> 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<sub>(s)</sub>) or solid cone attachment (SPT<sub>(c)</sub>). 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<sub>(s)</sub>) or solid cone attachment (SPT<sub>(c)</sub>). 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) - 10 $\mu$ S/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<sup>2</sup>. 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<sup>3</sup> and 2000m<sup>3</sup> of phosphogypsum material situated in the northern site areas; in all likelihood the true value will be around 1500m<sup>3</sup> 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 and 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**





**Project No.:** 17-1455

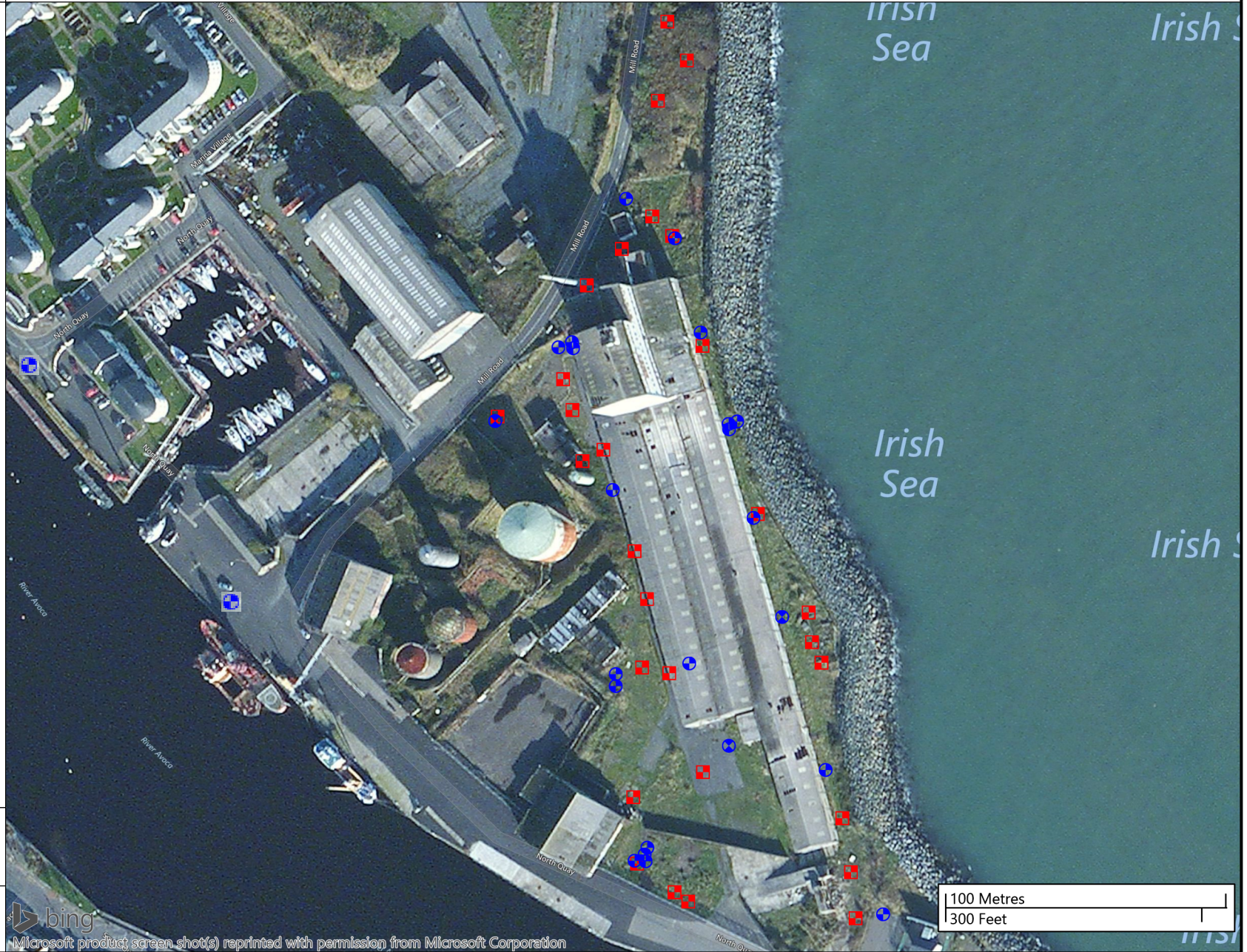
**Client:** Irish Water

**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



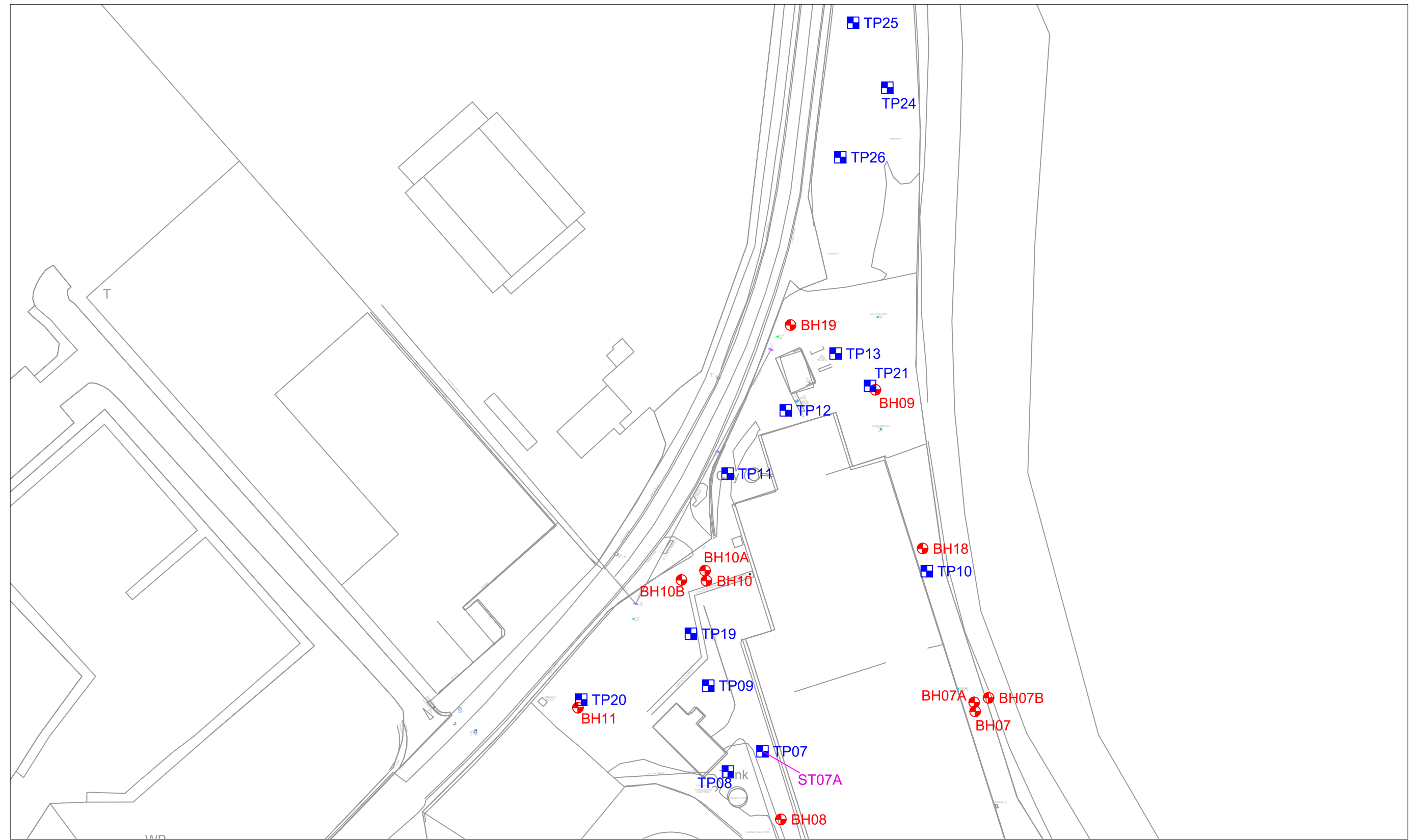
**Title:**  
Site Location Plan

**Last Revised:**  
17/04/2018

**Scale:**  
1:2000

bing  
Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

100 Metres  
300 Feet



PROJECT: Arklow WWTP Land GI

TITLE: Exploratory hole location plan

CLIENT: Irish Water

KEY:  
● Borehole  
■ Trial Pits  
□ SlitTrench



SCALE: NTS@A3

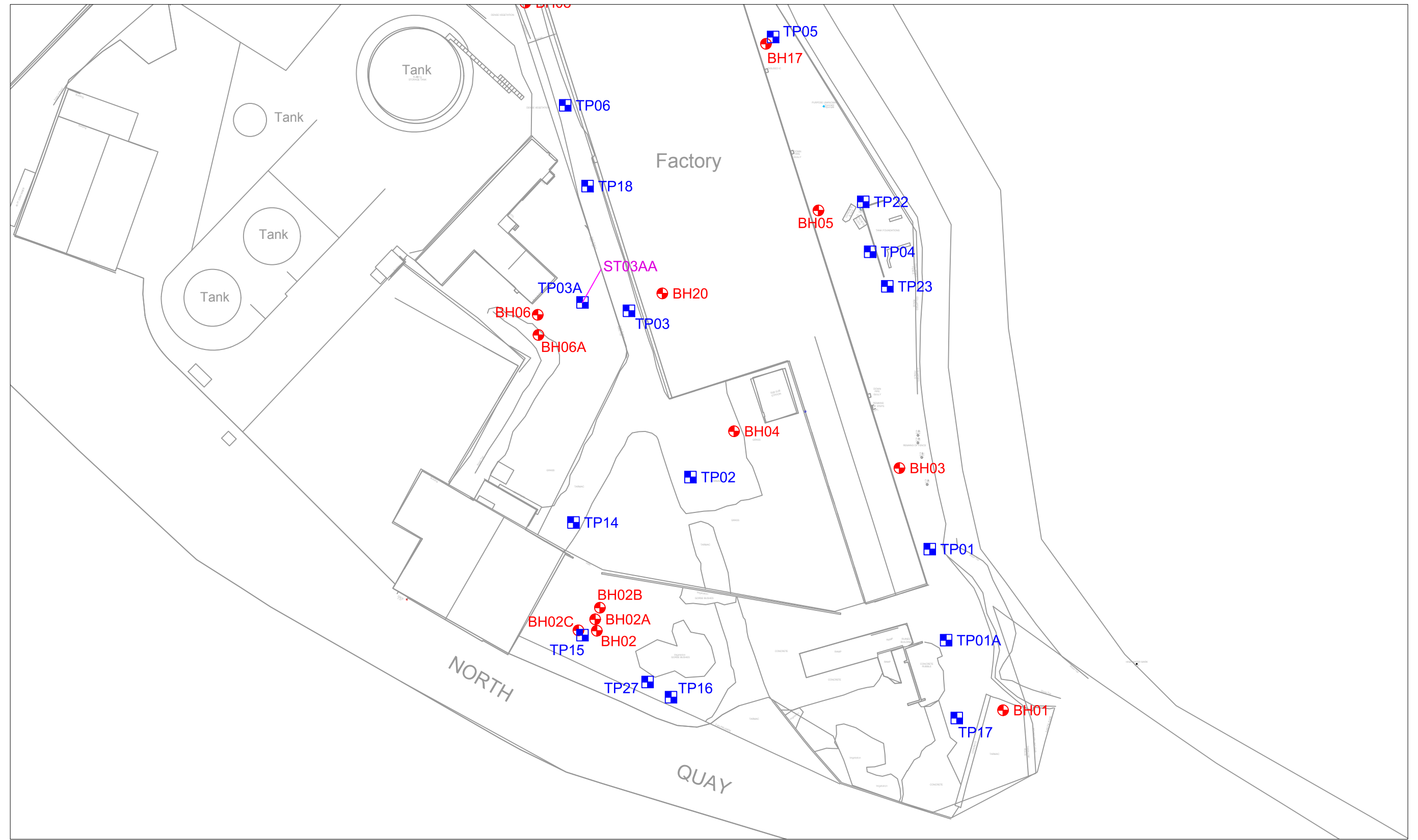
DATE: 27/04/2018

ENGINEER: Byrne Looby ARUP JV

DRWN: BS  
 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



SCALE: NTS@A3

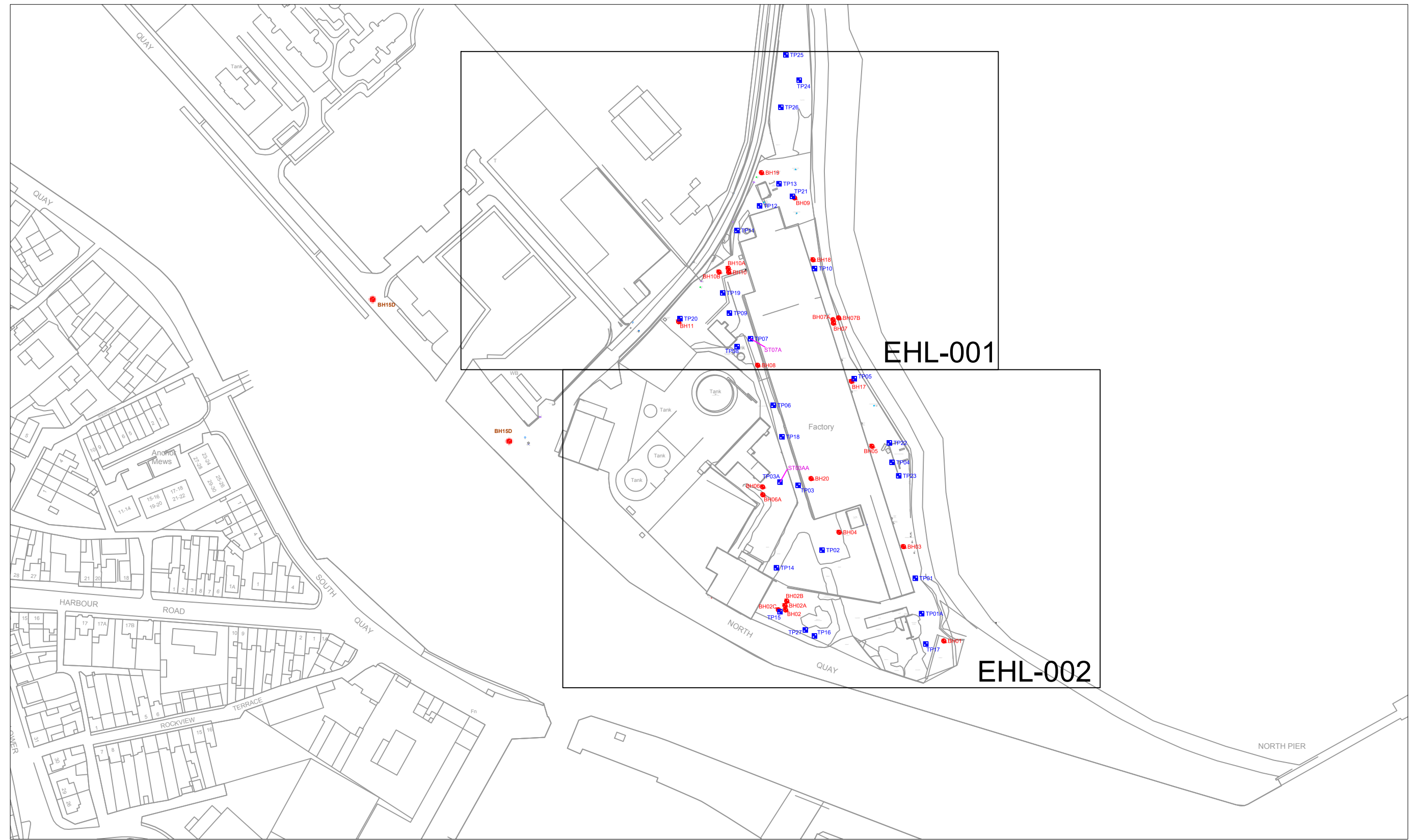
DATE: 27/04/2018

ENGINEER: Byrne Looby ARUP JV

DRWN: BS  
 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



SCALE: NTS@A3

DATE: 27/04/2018

ENGINEER: Byrne Looby ARUP JV

DRWN: BS  
 CHCK: NH

SERIES: 1 of 1

DWG No: 17-1455-EHL-Overview





**Project No.:** 17-1455

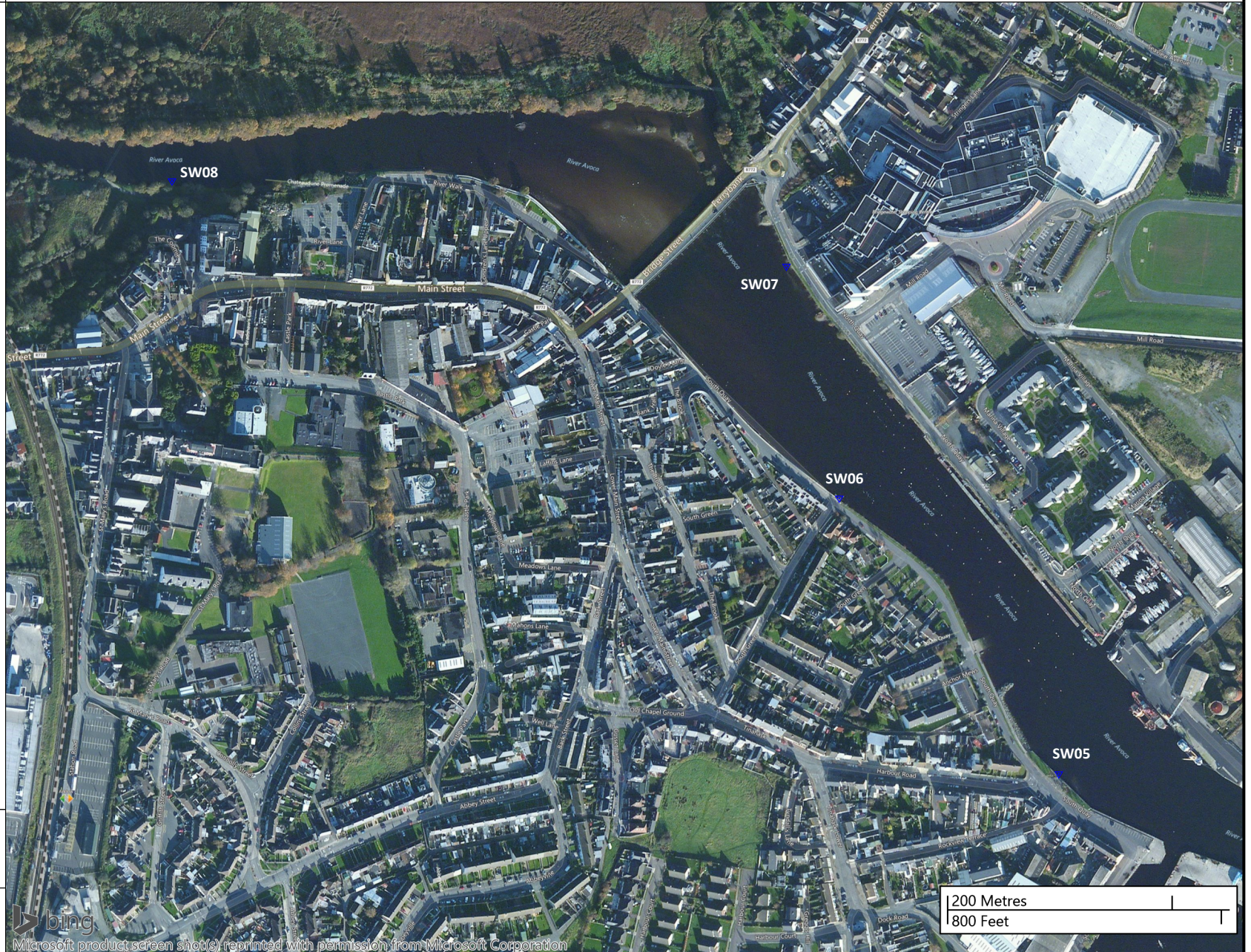
**Client:** Irish Water

**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:**  
05/07/2018

**Scale:**  
1:5000



**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



NO IMAGE AVAILABLE

NO IMAGE AVAILABLE

NO IMAGE AVAILABLE

**Title:**  
Site Location Plan

**Last Revised:**  
05/07/2018

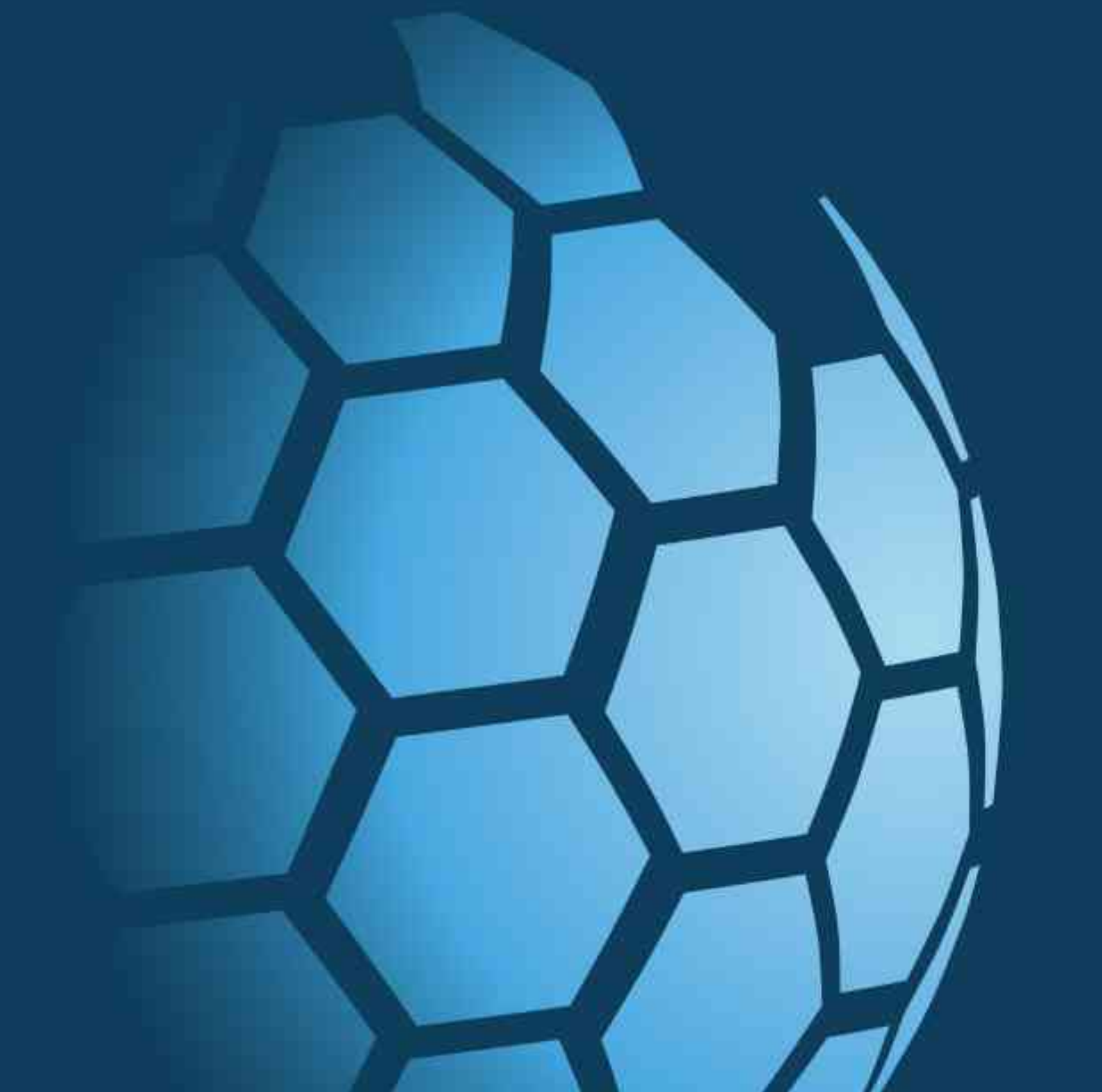
**Scale:**  
1:2500

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation



**CAUSEWAY**  
— GEOTECH

**APPENDIX B**  
**Borehole Logs**





**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH01
<b>Coordinates:</b> 325397.02 E	<b>Client:</b> Irish Water	Sheet 1 of 2
173032.78 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.54 mOD	<b>Dates:</b> 29/01/2018 - 30/01/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

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

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					7.00	7.50	01:00
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			
	1.20	7.50					



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH01
<b>Coordinates:</b> 325397.02 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 15.00	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.54 mOD	<b>Dates:</b> 29/01/2018 - 30/01/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50 10.50 - 10.95	B24 SPT (C) N=47	10.5 0		N=47 (3,5/8,10,12,17)				Very dense brown gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies.		
12.00 12.00 - 12.45	B25 D20 SPT (C) N=21	12.0 0		N=21 (2,3/1,3,7,10)	-9.06	11.60 (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]		
13.50 13.50 - 13.95	B26 D21 SPT (C) N=31	13.5 0		N=31 (4,6/6,7,9,9)	-9.86	12.40 (1.50)		Medium dense to dense brown very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
14.00 14.30	D22 U27			Ublow=50 100%	-11.36	13.90 (1.10)		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]		
					-12.46	15.00		End of Borehole at 15.00m		

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					7.00	7.50	01:00
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
		15.00	200				



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH02
<b>Coordinates:</b> 325311.13 E	<b>Client:</b> Irish Water	Sheet 1 of 1
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 0.20	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.30 mOD	<b>Dates:</b> 24/01/2018	<b>Driller:</b> MK
		<b>Logger:</b> 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		

<b>Remarks</b>  Terminated on boulder - moved to rebore position BH02A	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			



**Project No.:**  
17-1455

**Project Name:**  
Arklow WwTP Land GI

**Borehole No.:**  
BH02A

**Coordinates:**  
325310.78 E

**Client:**  
Irish Water

Sheet 1 of 1

173052.01 N

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

**Scale:** 1:50

**Ground Level:**  
2.29 mOD

**Dates:**  
24/01/2018

**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
					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**

**Water Strikes**

**Chiselling Details**

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)			

Terminated on boulder - moved to rebore position BH02B



**CAUSEWAY**  
— GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH02B
<b>Coordinates:</b> 325311.78 E	<b>Client:</b> Irish Water	Sheet 1 of 1
173054.45 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.28 mOD	<b>Dates:</b> 24/01/2018	<b>Driller:</b> MK
		<b>Logger:</b> NH

<b>Method</b>	<b>Plant Used</b>	<b>Top</b>	<b>Base</b>
Cable Percussion	Dando 2000	0.00	0.30

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		

<b>Remarks</b>    Terminated on boulder - moved to rebore position BH02C	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (h:mm)
	Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)				





**CAUSEWAY**  
GEOTECH

**Project No.:**  
17-1455

**Project Name:**  
Arklow WwTP Land GI

**Borehole No.:**  
BH02C

**Coordinates:**  
325307.25 E

**Client:**  
Irish Water

Sheet 1 of 2

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	18.20

173049.67 N

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

**Scale:** 1:50

**Ground Level:**  
2.28 mOD

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

**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
0.50	B1 D2 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 D5 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) N=2	2.00		N=2 (0,1/1,0,0,1) PID = 0.10ppm		(0.80)				
3.00	B7 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) N=11	3.00		N=11 (1,1/1,2,4,4) Water Strike at 3.00m Water Strike at 3.10m		(1.20)				
4.00	B9 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) N=7	4.00		N=7 (1,1/1,2,2,2)		(1.80)				
5.00	B11 D12				-3.52	5.80		Medium dense reddish brown silty gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies.		
5.00 - 5.45	SPT (C) N=8	5.00		N=8 (1,2/1,2,2,3)		(0.70)				
6.00	B13 D14				-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.		
6.00 - 6.45	SPT (C) N=12	6.00		N=12 (2,2/3,2,3,4)		(1.30)				
7.00	B15 D16				-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. [with shell fragments]		
7.00 - 7.45	SPT (C) N=3	7.00		N=3 (1,0/0,1,1,1)						
9.00	B17 D18									
9.00 - 9.45	SPT (C) N=8	9.00		N=8 (2,1/2,2,2,2)						

**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		

**Chiselling Details**

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

**Water Added**      **Casing Details**

From (m)	To (m)	To (m)	Diam (mm)
2.00	3.00		



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH02C
<b>Coordinates:</b> 325307.25 E	<b>Client:</b> Irish Water	Sheet 2 of 2
173049.67 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.28 mOD	<b>Dates:</b> 24/01/2018 - 29/01/2018	<b>Driller:</b> MK
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B19 D20 SPT (C) N=18	10.5	0	N=18 (2,2/3,5,5,5)		(4.50)		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]		
12.00	B21 D22 SPT (C) N=25	12.0	0	N=25 (5,6/8,7,6,4)	-10.02	12.30		Medium dense greyish brown silty fine to coarse SAND.		
13.50	B23 D24 SPT (S) N=27	13.5	0	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.		
15.00	B25 D26 SPT (C) N=29	15.0	0	N=29 (7,7/6,7,7,9)		(2.70)		Dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
17.00	B27 D28 SPT (C) N=38	17.0	0	N=38 (7,7/8,10,10,10)	-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.		
18.00 - 18.45	SPT (C) N=41	18.0	0	N=41 (8,10/9,10,11,11)	-15.92	18.20		End of Borehole at 18.20m		
18.20	B31 D32									

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at required depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					6.00	6.30	00:30
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
		18.20	200				



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH03
<b>Coordinates:</b> 325375.11 E	<b>Client:</b> Irish Water	Sheet 1 of 2
173083.98 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.39 mOD	<b>Dates:</b> 01/02/2018 - 06/02/2018	<b>Driller:</b> BM
		<b>Logger:</b> ST

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

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at required depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					13.00	14.60	02:30
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
1.40	6.00						



**CAUSEWAY**  
GEOTECH

**Project No.:**  
17-1455

**Project Name:**  
Arklow WwTP Land GI

**Borehole No.:**  
BH03

**Coordinates:**  
325375.11 E

**Client:**  
Irish Water

Sheet 2 of 2

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	15.70

173083.98 N

**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
10.50	D23	10.0	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 - 10.95	SPT (C) N=13	10.5	2.90	N=13 (2,3/2,3,3,5)						
11.00	B21					(3.00)				
12.00	D24	12.0	3.60	N=15 (3,3/3,3,4,5)						
12.00 - 12.45	SPT (C) N=15	12.0	3.60							
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	13.5	4.10	N=17 (3,4/3,4,5,5)						
13.50 - 13.95	SPT (C) N=17	13.5	4.10			(1.60)				
14.50 - 14.95	U27	15.0	3	Ublow=60 100%	-12.21	14.60		Soft to firm grey slightly sandy silty CLAY with 2-10cm thick lenses of fine to coarse SAND.		
		0			-12.61	15.00		Very stiff grey slightly sandy silty CLAY.		
15.30	D26	15.3	4.70	N=33 (4,5/7,7,9,10)						
15.30 - 15.75	SPT (S) N=33	15.3	4.70			(0.70)				
		15.7	3.40	06-02-2018	-13.31	15.70		End of Borehole at 15.70m		
		0								

**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)

**Chiselling Details**

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

**Water Added**

From (m)	To (m)

**Casing Details**

To (m)	Diam (mm)
15.70	200



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50	B3 D12 ES1			PID = 0.60ppm		(1.45)		MADE GROUND: Very soft brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse of mixed lithologies.		
1.00	B4 D13 SPT (C) N=3	1.00		N=3 (1,1/0,1,1,1)	1.06	(0.15)		MADE GROUND: Concrete slab		
1.00 - 1.45					0.91	(1.60)		NO RECOVERY: Piece of concrete stuck in lead length; pushed down the borehole.		
3.00	B5 D14 ES2 SPT (C) N=9	3.00		N=9 (3,2/1,2,3,3) PID = 0.40ppm	-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						(1.00)				
4.00	B6 D15 SPT (C) N=11	4.00		N=11 (3,3/2,2,3,4)	-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		4.50	2.80	01-02-2018						
		4.50	3.00	31-01-2018						
5.00	B7 D16 SPT (C) N=10	5.00		N=10 (2,3/2,2,3,3)		(3.80)				
5.00 - 5.45										
6.00	B8 D17 SPT (C) N=23	6.00		N=23 (4,5/5,6,6,6)						
6.00 - 6.45										
7.50	B9 D18 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. [Layer of cemented SAND at 10.00m]		
7.50 - 7.58										
9.00	B10 D19 SPT (C)	9.00		50 (5,8/50 for 195mm)		(2.70)				
9.00 - 9.35		10.5	3.00	05-02-2018						
		0								

<b>Remarks</b> 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	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>		1.50	3.00	01:00
		From (m)	To (m)	To (m)	Diam (mm)	7.60	7.90	01:00
	3.00	3.50			11.00	11.80	01:00	
					16.60	18.00	00:30	
					18.00	18.20	01:00	



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> <b>BH04</b>
<b>Coordinates:</b> 325340.14 E	<b>Client:</b> Irish Water	Sheet 2 of 3
173091.76 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.51 mOD	<b>Dates:</b> 01/02/2018 - 15/02/2018	<b>Driller:</b> MK+JR
		<b>Logger:</b> 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	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.		
10.50 - 10.95	SPT (C) N=18	10.5 0	3.20	N=18 (3,4/4,5,4,5)		(1.30)		[Layer of cemented SAND at 10.00m] Medium dense grey slightly silty gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
		10.5 0	4.00	01-02-2018						
12.00	B21 D24				-9.29	11.80		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	12.0 0	4.00	N=29 (5,5/7,7,8,7)		(2.70)				
13.50	B22 D25									
13.50 - 13.95	SPT (C) N=25	13.5 0	3.50	N=25 (5,5/5,7,7,6)						
15.00	B23 D26 U27				-11.99	14.50		Very stiff slightly sandy slightly gravelly brownish grey CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
		15.0 0	3	Ublow=35 100%		(2.10)				
		16.4 0	3.20	06-02-2018						
		16.4 0	3.50	05-02-2018						
16.50	B28 D30				-14.09	16.60		Dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
16.50 - 16.95	SPT (C) N=37	16.5 0	4.20	N=37 (5,8/6,9,10,12)		(1.40)				
18.00 - 18.20	SPT (C)	18.0 0	3.00	50 (25 for 125mm/50 for 75mm)	-15.49	18.00		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					(1.50)				
18.50 - 18.90	SPT (C)	18.5 0		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:		

<b>Remarks</b> 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	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>		1.50	3.00	01:00
		From (m)	To (m)	To (m)	Diam (mm)	7.60	7.90	01:00
			12.00	250	11.00	11.80	01:00	
			18.20	200	16.60	18.00	00:30	
					18.00	18.20	01:00	



**CAUSEWAY**  
GEOTECH

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

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
21.50	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.		
23.00	100	73	60	8			(5.00)				
24.50	100	69	62								
25.00	100	98	98			-22.49	25.00			End of Borehole at 25.00m	

<b>Remarks</b> 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	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>		1.50	3.00	01:00
		From (m)	To (m)	To (m)	Diam (mm)	7.60	7.90	01:00
			25.00	150	11.00	11.80	01:00	
					16.60	18.00	00:30	
					18.00	18.20	01:00	



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455		<b>Project Name:</b> Arklow WwTP Land GI		<b>Borehole No.:</b> BH05
<b>Coordinates:</b> 325357.99 E		<b>Client:</b> Irish Water		Sheet 1 of 3
<b>Method</b>		<b>Plant Used</b>		<b>Scale:</b> 1:50
Cable Percussion	Dando 2000	Top	Base	<b>Driller:</b> BM+JR
Rotary Percussion	Beretta T44	17.90	18.00	
Rotary Coring	Beretta T44	18.00	25.00	<b>Logger:</b> ST+NH
173138.45 N		<b>Client's Representative:</b> Byrne Looby ARUP JV		
<b>Ground Level:</b> 3.14 mOD		<b>Dates:</b> 06/02/2018 - 19/02/2018		

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

<b>Remarks</b> Cable Percussion / RC follow-on Groundwater monitoring standpipe installed  Terminated on instruction of Engineer after 6.50m of rock core recovered	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					7.50	7.70	01:00	
					17.80	17.90	01:00	
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>				
From (m)		To (m)	To (m)	Diam (mm)				
		1.20	6.00					





**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH05
<b>Coordinates:</b> 325357.99 E	<b>Client:</b> Irish Water	Sheet 2 of 3
173138.45 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 3.14 mOD	<b>Dates:</b> 06/02/2018 - 19/02/2018	<b>Driller:</b> BM+JR
		<b>Logger:</b> 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 SPT (C) N=33	10.50	3.40	N=33 (4,5/7,8,8,10)				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		12.00	2.80	08-02-2018		(3.30)				
12.00	B15 D24 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 - 12.45		12.00	3.30	07-02-2018						
13.50	B25 D30 SPT (C) N=25	13.50	3.10	N=25 (3,4/5,5,7,8)						
13.50 - 13.95						(3.40)				
15.00	B26 D31 SPT (C) N=13	15.00	2.90	N=13 (5,2/3,3,3,4)						
15.00 - 15.45					-12.56	15.70		Soft brownish grey sandy silty CLAY. Sand is fine to coarse.		
16.00	B27 U32	16.50	3.40	Ublow=60 100%		(0.60)				
16.00 - 16.45					-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)						
17.50					-14.66	17.80				
17.80 - 17.90	B29	17.90	3.00	50 (25 for 30mm/50 for 25mm)		(0.20)				
17.90 - 17.95	SPT (C)	17.80	3.00	08-02-2018	-14.86	18.00		BEDROCK (drillers description) 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						(2.90)				
20.50										

<b>Remarks</b> Cable Percussion / RC follow-on Groundwater monitoring standpipe installed  Terminated on instruction of Engineer after 6.50m of rock core recovered	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
GEOTECH

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

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
22.00	100	49	41	8		-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.		
				10					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.		
23.50	97	39	28	6			(4.10)		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.		
25.00	100	66	58			-21.86	25.00		End of Borehole at 25.00m		

<b>Remarks</b> Cable Percussion / RC follow-on Groundwater monitoring standpipe installed  Terminated on instruction of Engineer after 6.50m of rock core recovered	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH06
<b>Coordinates:</b> 325298.65 E	<b>Client:</b> Irish Water	Sheet 1 of 1
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 0.50	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.57 mOD	<b>Dates:</b> 09/02/2018	<b>Driller:</b> MK
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
					2.07	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.		
								End of Borehole at 0.50m		

<b>Remarks</b>  Terminated on concrete - moved to rebore position BH06A	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH06A
<b>Coordinates:</b> 325298.79 E	<b>Client:</b> Irish Water	Sheet 1 of 2
173112.12 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.52 mOD	<b>Dates:</b> 09/02/2018 - 13/02/2018	<b>Driller:</b> MK
		<b>Logger:</b> NH

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

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	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
<b>Water Added</b>		<b>Casing Details</b>		12.20	14.00	01:00	
From (m)	To (m)	To (m)	Diam (mm)				
1.50	4.50	1.50	250				



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH06A
<b>Coordinates:</b> 325298.79 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 15.00	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.52 mOD	<b>Dates:</b> 09/02/2018 - 13/02/2018	<b>Driller:</b> MK
		<b>Logger:</b> 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 D24 SPT (C) N=28	10.5 0	10.5 0	N=28 (5,4/4,6,8,10) 12-02-2018				Medium dense to dense brown slightly silty slightly gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine of mixed lithologies.		
10.50 - 10.95										
12.00	B25 D26 SPT (C) N=38	12.2 0	12.2 0	N=38 (7,7/9,10,10,9)	-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.		
12.20 - 12.65					-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]		
13.50	B27 D28 SPT (C) N=27	13.8 0	13.8 0	N=27 (4,5/6,6,7,8)		(2.00)				
13.80 - 14.25										
14.20	U31 B29 D30 SPT (S) N=17	14.2 0	14.2 0	Ublow=50 100%	-11.68	14.20 (0.60)		Firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine.		
14.40										
14.50 - 14.95					-12.28	14.80 (0.20)		Stiff grey slightly sandy silty CLAY. Sand is fine to coarse.		
		15.0 0	3.50 0	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)
0.30	1.00		
6.50	6.80		
7.00	7.30		
12.20	14.00		

**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

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



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH07
<b>Coordinates:</b> 325337.10 E	<b>Client:</b> Irish Water	Sheet 1 of 1
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 3000	<b>Top</b> 0.00
<b>Base</b> 0.80	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.55 mOD	<b>Dates:</b> 13/02/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(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	(0.80)		End of Borehole at 0.80m		

<b>Remarks</b>  Terminated on concrete - moved to rebore position BH07A	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			
			0.80	250			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH07A
<b>Coordinates:</b> 325336.90 E	<b>Client:</b> Irish Water	Sheet 1 of 1
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 0.80	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.51 mOD	<b>Dates:</b> 13/02/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(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	(0.80)		End of Borehole at 0.80m		

<b>Remarks</b>  Terminated on concrete - moved to rebore position BH07B	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			
			0.80	250			



**CAUSEWAY**  
GEOTECH

**Project No.:**

17-1455

**Project Name:**

Arklow WwTP Land GI

**Borehole No.:**

BH07B

**Coordinates:**

325339.93 E

**Client:**

Irish Water

Sheet 1 of 2

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	14.80

173208.08 N

**Client's Representative:**

Byrne Looby ARUP JV

Scale: 1:50

**Ground Level:**

2.59 mOD

**Dates:**

13/02/2018 - 15/02/2018

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
0.50	B7 ES1	0.00		13-02-2018 PID = 0.10ppm	2.29	(0.30) 0.30	[Cross-hatch pattern]	MADE GROUND: Grey hardcore sandy angular to subangular fine to coarse GRAVEL fill. Sand is fine to coarse.		
1.00	B8					(0.90)	[Cross-hatch pattern]	MADE GROUND: Grey subangular to subrounded fine to coarse GRAVEL fill.		
1.20 - 1.65	D19 SPT (C) N=12	1.20		N=12 (2,3/3,3,3,3)	1.39	1.20	[Cross-hatch pattern]	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)	[Cross-hatch pattern]			
2.00	B9 D20						[Cross-hatch pattern]			
2.00 - 2.30	SPT (C)	2.00	1.70	50 (6,12/50 for 145mm)	0.29	2.30	[Dotted pattern]	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			[Dotted pattern]			
3.00	B10 D21						[Dotted pattern]			
3.00 - 3.45	SPT (C) N=12	3.00	2.60	N=12 (3,2/3,3,3,3)	-1.61	4.20	[Dotted pattern]	Medium dense brownish grey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
3.50	ES4			PID = 0.20ppm			[Dotted pattern]			
4.00	B11 D22						[Dotted pattern]			
4.00 - 4.45	SPT (C) N=14	4.00	3.00	N=14 (2,3/4,3,3,4)			[Dotted pattern]			
4.50	ES5			PID = 0.10ppm			[Dotted pattern]			
5.00	B12 D23						[Dotted pattern]			
5.00 - 5.45	SPT (C) N=14	5.00	3.10	N=14 (3,3/3,4,3,4)			[Dotted pattern]			
5.50	ES6			PID = 0.20ppm			[Dotted pattern]			
6.00	B13 D24						[Dotted pattern]			
6.00 - 6.45	SPT (C) N=16	6.00	3.40	N=16 (3,4/3,4,4,5)	-4.11	6.70	[Dotted pattern]	Brown very sandy subangular to subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
		7.00	2.30	14-02-2018	-4.41	(0.30) 7.00	[Dotted pattern]	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						[Dotted pattern]			
7.50 - 7.95	SPT (C) N=14	7.50	2.30	N=14 (3,3/3,3,4,4)			[Dotted pattern]			
9.00	B15 D26						[Dotted pattern]			
9.00 - 9.45	SPT (C) N=15	9.00	2.80	N=15 (3,4/3,4,4,4)		(5.30)	[Dotted pattern]			

**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)

**Chiselling Details**

From (m)	To (m)	Time (hr:mm)
11.80	12.00	01:00

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)
1.20	7.00	5.00	250





**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH07B
<b>Coordinates:</b> 325339.93 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 14.80	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.59 mOD	<b>Dates:</b> 13/02/2018 - 15/02/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B16 D27 SPT (C) N=16	10.5	3.60	N=16 (3,3/3,4,4,5)				Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
10.50 - 10.95										
12.00	B17 D28 SPT (C) N=18	12.0	4.00	N=18 (3,3/5,4,4,5)	-9.71	12.30		Stiff brown slightly sandy CLAY. Sand is fine to coarse		
12.00 - 12.45						(0.50)				
12.50 - 12.95	U30	12.5	3	Ublow=30 100%	-10.21	12.80		Firm grey slightly sandy silty CLAY. Sand is fine to coarse.		
13.00	B18 D29 SPT (S) N=12	13.0	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.		
13.00 - 13.45		13.5	2.40	15-02-2018						
		13.5	3.00	14-02-2018		(1.40)				
14.50 - 14.80	SPT (C)	14.5	3.20	50 (25 for 125mm/50 for 175mm)	-12.21	14.80		End of Borehole at 14.80m		
		14.8	3.20	15-02-2018						

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
					11.80	12.00	01:00
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
		14.80	200				



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> Groundwater monitoring standpipe installed.  Terminated on instruction of Engineer.	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	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	
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			
	1.50	6.00	1.50	250			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH08
<b>Coordinates:</b> 325296.01 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 12.90	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.61 mOD	<b>Dates:</b> 21/02/2018 - 23/02/2018	<b>Driller:</b> MK
		<b>Logger:</b> ST

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B25 D26 SPT (C) N=19	10.5 0		N=19 (3,3/4,4,5,6)		(1.50)		Medium dense brown slightly silty slightly gravelly fine to coarse SAND. Gravel is subangular fine of mixed lithologies.		
10.50 - 10.95					-8.39	11.00 (0.70)		Grey gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies.		
12.00	B28 D27 U29	12.0 0		Ublow=50 100%	-9.09	11.70 (0.50)		Stiff grey slightly sandy silty CLAY with lenses of fine to medium sand 2-10mm thick.		
12.00 - 12.45					-9.59	12.20 (0.70)		Very dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
12.70 - 12.90	SPT (C)	12.0 0		50 (25 for 125mm/50 for 80mm)	-10.29	12.90		End of Borehole at 12.90m		
		12.9 0	3.00	22-02-2018						

<b>Remarks</b> Groundwater monitoring standpipe installed.  Terminated on instruction of Engineer.	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	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	
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			
			12.90	200			



**CAUSEWAY**  
GEOTECH

**Project No.:**  
17-1455

**Project Name:**  
Arklow WwTP Land GI

**Borehole No.:**  
BH09

**Coordinates:**  
325316.01 E

**Client:**  
Irish Water

Sheet 1 of 2

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	17.00

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

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50	B1	0.00		21-02-2018	1.81	(0.40) 0.40	[Cross-hatch pattern]	MADE GROUND: Greyish brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
1.00	B2 ES12 D17			PID = 0.10ppm		(1.00)	[Cross-hatch pattern]	MADE GROUND: Loose brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
1.20 - 1.65	SPT (S) N=8	1.00	Dry	N=8 (1,2/1,2,3,2)	0.81	1.40	[Cross-hatch pattern]	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	1.80	N=9 (2,1/2,2,3) PID = 0.20ppm		(3.00)	[Cross-hatch pattern]			
2.00 - 2.45	SPT (S) N=9									
3.00	B4 D19 ES14	3.00	2.10	N=12 (2,2/3,3,3,3) PID = 0.20ppm			[Cross-hatch pattern]			
3.00 - 3.45	SPT (S) N=12									
4.00	B5 D20 ES15	4.00	2.90	N=12 (2,3/2,3,3,4) PID = 0.00ppm	-2.19	4.40	[Dotted pattern]	Medium dense 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 (S) N=12									
5.00	B6 D21 ES16	5.00	3.50	N=13 (2,2/3,3,3,4) PID = 0.00ppm		(2.60)	[Dotted pattern]			
5.00 - 5.45	SPT (S) N=13									
6.00	B7 D22 ES17	6.00	3.70	N=18 (3,3/4,4,4,6)			[Dotted pattern]			
6.00 - 6.45	SPT (S) N=18									
7.50	B8 D23 ES18	7.50	4.10	N=18 (3,3/4,4,4,6)	-4.79	7.00	[Dotted pattern]	Medium dense greyish brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
7.50 - 7.95	SPT (S) N=18									
9.00	B9 D24 ES19	9.00	4.60	N=18 (3,4/5,4,4,5)		(4.90)	[Dotted pattern]			
9.00 - 9.45	SPT (S) N=18									

**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)

**Chiselling Details**

From (m)	To (m)	Time (hr:mm)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)
1.40	9.00	5.00	250



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH09
<b>Coordinates:</b> 325316.01 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 17.00	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.21 mOD	<b>Dates:</b> 21/02/2018 - 22/02/2018	<b>Driller:</b> BM
		<b>Logger:</b> ST

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B10 D25							Medium dense greyish brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
10.50 - 10.95	SPT (S) N=20	10.5 0	4.80	N=20 (3,4/5,5,5,5)						
		12.5 0	2.50	22-02-2018						
12.00	B11 D26				-9.69	11.90		Soft brownish grey slightly sandy silty CLAY with fine to coarse sand lenses 2 to 15cm thick.		
	UT28	12.0 0	5.2	Ublow=30 100%		(0.60)				
12.50	D27	12.5 0	5.00	21-02-2018	-10.29	12.50		Soft to firm brownish grey sandy silty CLAY. Sand is fine to coarse.		
		12.5 0			-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 D33									
13.50 - 13.95	SPT (S) N=25	13.5 0	2.90	N=25 (3,5/5,6,7,7)		(2.40)				
15.00	B30 B31 D34				-13.09	15.30		Soft to firm brown slightly sandy silty CLAY. Sand is fine to medium.		
15.30 - 15.75	U36	15.0 0	3.1	Ublow=30 100%		(0.90)				
16.50	B32 D35				-13.99	16.20		Very dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
16.50 - 16.84	SPT (S)	16.5 0	3.20	50 (5,6/50 for 190mm)		(0.80)				
		17.0 0	3.40	22-02-2018	-14.79	17.00		End of Borehole at 17.00m		

<b>Remarks</b> Groundwater monitoring standpipe installed    Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
		17.00	200				



**CAUSEWAY**  
GEOTECH

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

<b>Method</b>	<b>Plant Used</b>	<b>Top</b>	<b>Base</b>
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
0.50	B1 D2 ES3			PID = 0.50ppm	1.25	1.00		MADE GROUND: Greyish brown SAND and GRAVEL fill. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
								End of Borehole at 1.00m		

<b>Remarks</b>  Refusal met on red brick structure - moved to rebore position BH10A	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b>  Refusal met on red brick structure - next attempt will be BH10B	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
1.00	B1 D6 ES11 SPT (C) N=10	0.00		19-02-2018		(2.50)		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 - 1.45		1.00		N=10 (1,2/2,2,3,3) PID = 0.10ppm						
2.00	B2 D7 ES12 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.		
2.00 - 2.45										
3.00	B3 D8 ES13 SPT (C) N=8	3.00		N=8 (2,3/2,1,2,3) PID = 0.20ppm		(1.70)				
3.00 - 3.45										
4.00	B4 D9 ES14 SPT (C) N=12	4.00		N=12 (1,2/3,3,3,3) PID = 0.30ppm	-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		5.50	2.30	20-02-2018						
5.00	B5 D10 ES15 SPT (C) N=16	5.00		N=16 (2,3/3,4,5,4) PID = 0.40ppm		(2.10)				
5.00 - 5.45		5.50	1.80	19-02-2018						
6.00	B16 D23 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.		
6.00 - 6.45										
7.50	B17 D24 SPT (C) N=16	7.50		N=16 (2,4/4,3,5,4)		(4.20)				
7.50 - 7.95										
9.00	B18 D25 SPT (C)	9.00		50 (9,15/50 for 80mm)						
9.00 - 9.23										

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

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
2.50	2.50	20	2.50	4.50	5.50	01:00
				12.30	15.00	03:00
Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)			
1.00	5.50	5.00	250			

Terminated on instruction of Engineer at scheduled depth





**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH10B
<b>Coordinates:</b> 325274.99 E	<b>Client:</b> Irish Water	Sheet 2 of 3
173233.01 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.23 mOD	<b>Dates:</b> 19/02/2018 - 21/02/2018	<b>Driller:</b> MK
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B19 D26 SPT (C) N=40	10.5	0	N=40 (5,4/6,9,11,14)	-8.27	10.50	[Symbol]	Medium dense to dense brown slightly sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
10.50 - 10.95						(1.20)	[Symbol]	Dense brown slightly silty fine to coarse SAND.		
11.70	U30			Ublow=50 100%	-9.47	11.70	[Symbol]			
12.00	B20 D27 SPT (C) N=40	12.0	0	N=40 (4,6/8,10,10,12)	-10.07	12.30	[Symbol]	Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies.		
13.50	B21 D28 SPT (C) N=37	13.5	0	N=37 (5,6/8,10,9,10)	-12.07	14.30	[Symbol]	Dense brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
14.50	U31			Ublow=50 0%			[Symbol]	Stiff brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine of mixed lithologies.		
15.00	B22 D29	15.0	4.00	20-02-2018		(2.50)	[Symbol]			
16.50	B32 D35 SPT (C) N=21	15.0	0	N=21 (3,4/6,6,5,4)	-14.57	16.80	[Symbol]	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 SPT (C) N=17	18.0	0	N=17 (4,3/3,3,5,6)		(3.20)	[Symbol]			
19.00	U38			Ublow=50 100%			[Symbol]			
19.50	B34 D37						[Symbol]			
					-17.77	20.00	[Symbol]			

**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				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
				4.50	5.50	01:00
				12.30	15.00	03:00
Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)			
		15.00	200			



**CAUSEWAY**  
GEOTECH

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

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	19.5 0		N=44 (11,10/10,11,12,11)				End of Borehole at 20.00m		

**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				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
				4.50	5.50	01:00
				12.30	15.00	03:00
Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00				14-02-2018						
1.00	B6 D20 ES1					(1.80)		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 - 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					(2.60)				
3.00 - 3.45	SPT (C) N=10	3.00	2.90	N=10 (2,3/2,3,3,2) PID = 0.10ppm	-3.68	5.40		Medium dense brown very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
4.00	B9 D23 ES4					(2.10)				
4.00 - 4.45	SPT (C) N=18	4.00	3.10	N=18 (2,3/3,4,5,6) PID = 0.00ppm	-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.		
5.00	B10 D24 ES5					(1.50)				
5.00 - 5.45	SPT (C) N=18	5.00	3.30	N=18 (2,2/3,4,6,5) PID = 0.00ppm	-7.28	9.00		Loose dense grey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
6.00	B11 D25					(1.70)				
6.00 - 6.45	SPT (C) N=16	6.00 7.50	3.50 1.80	N=16 (2,3/3,3,4,6) 15-02-2018						
7.50	B12 D26									
7.50 - 7.95	SPT (C) N=15	7.50 7.50	3.90 4.00	N=15 (3,2/3,3,4,5) 14-02-2018						
9.00	B13 D27									
9.00 - 9.45	SPT (C) N=7	9.00	2.20	N=7 (2,3/3,2,1,1)						

<b>Remarks</b> 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	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			
	1.50	7.50	7.50	250				



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH11
<b>Coordinates:</b> 325253.12 E	<b>Client:</b> Irish Water	Sheet 2 of 3
<b>Method</b> Cable Percussion Rotary Coring	<b>Plant Used</b> Dando 2000 Beretta T44	<b>Top</b> 0.00
<b>Base</b> 17.50 26.50	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 1.72 mOD	<b>Dates:</b> 13/02/2018 - 20/02/2018	<b>Driller:</b> MK+JR
		<b>Logger:</b> ST+TH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
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	10.5	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		Grey very gravelly silty fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
						(1.20)				
12.20 - 12.65	U34	12.2	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		Loose brownish grey very sandy subangular fine to coarse GRAVEL. Sand is fine to coarse.		
						(1.60)				
13.50	B17 D31									
13.50 - 13.95	SPT (C) N=9	13.5	3.40	N=9 (1,0/0,2,3,4)	-12.28	14.00		Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
						(1.70)				
15.00	B18 D32									
15.00 - 15.45	SPT (C) N=24	15.0	3.80	N=24 (2,3/4,5,7,8)	-13.98	15.70		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.		
						(1.70)				
16.50	B19 D33									
16.50 - 16.95	U35	16.5	3.1	Ublow=50 100%	-15.68	17.40		Grey sandy subangular fine to coarse GRAVEL (predominantly coarse). Sand is fine to coarse.		
17.00 - 17.40	SPT (S)	17.0	3.10	N=50 (11,11/50 for 255mm)	-15.78	17.50		Very stiff slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.		
						(2.50)				
19.00 - 19.34				50 (8,10/50 for 190mm)						
					-18.28	20.00		Dark grey BOULDER of weak massive sandstone.		
						(1.00)				

<b>Remarks</b> 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	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> <b>BH11</b>
<b>Coordinates:</b> 325253.12 E	<b>Client:</b> Irish Water	Sheet 3 of 3
<b>Method</b> Cable Percussion Rotary Coring	<b>Plant Used</b> Dando 2000 Beretta T44	<b>Top</b> 0.00 17.50
<b>Base</b> 17.50 26.50	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 1.72 mOD	<b>Dates:</b> 13/02/2018 - 20/02/2018	<b>Driller:</b> MK+JR
		<b>Logger:</b> ST+TH

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
22.50	98	0	0	NA		-19.28	21.00		Dark grey BOULDER of weak massive sandstone.		
							(0.90)		Stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to coarse of mixed lithologies.		
24.00	99	17	17			-20.18	21.90		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.		
							(2.10)				
25.50	100	26	7	9	19-02-2018	-22.28	24.00		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. Discontinuities: 1. 0 to 30 degree fractures medium spaced (140/240/370) planar, rough, with patchy reddish brown staining on fracture surface. 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)				
26.50	100	56	56	3		-24.78	26.50		End of Borehole at 26.50m		

<b>Remarks</b> 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	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	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		
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			
				26.50	150			



**CAUSEWAY**  
GEOTECH

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

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

Continued on Next Page

<b>Remarks</b>	<b>Water Added</b>		<b>Water Strike - General</b>		
	From (m)	To (m)	Struck at (m)	Casing to (m)	Rose to (m)
			3.50		3.20
	<b>Casing Details</b>		<b>Chiselling Details</b>		
	To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)



**CAUSEWAY**  
— GEOTECH

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

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
11.00 11.00 - 11.45	B15 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 14.00 - 14.45	D20 SPT (C) N=47			N=47 (7,7/10,10,10,17)						
						15.00		End of borehole at 15.000m		

<b>Remarks</b>	<b>Water Added</b>		<b>Water Strike - General</b>		
	From (m)	To (m)	Struck at (m)	Casing to (m)	Rose to (m)
			3.50		3.20
	<b>Casing Details</b>		<b>Chiselling Details</b>		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)	



**CAUSEWAY**  
GEOTECH

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

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

Continued on Next Page

<b>Remarks</b>	<b>Water Added</b>		<b>Water Strike - General</b>			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
	1.60		4.00		20	3.90
	<b>Casing Details</b>		<b>Chiselling Details</b>			
	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

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

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.00 - 10.80 10.00 - 10.45	D16 SPT (C) N=22			N=22 (4,5/5,5,6,6)						
10.70 - 11.15 10.70 - 10.70	U17 SPT (C)			40 (0 for 0mm/40 for 0mm)		10.80 (0.50)		Hard grey/brown CLAY.		
10.80 - 11.30 10.80 - 11.30 11.15 - 11.60	B18 D19 SPT (C) N=23			N=23 (6,6/5,6,4,8)		11.30 (0.70)		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 11.30 - 12.00 12.00 - 13.50	B20 D21 B22 D23					12.00		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 13.50 - 15.00	B24 D25					13.50		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 15.00 - 16.00	B26 D27					15.00		Soft to firm, brown/grey CLAY		
16.00 - 16.45 16.00 - 17.50 16.00 - 17.50	U28 B30 D31									
16.50 - 16.95 16.50 - 16.95	SPTLS29 SPT (S) N=8			N=8 (2,2/1,2,3,2)		(3.50)				
17.50 - 18.50 17.50 - 18.50	B32 D33									
18.00 - 18.45	SPT (S) N=25			N=25 (3,4/5,7,6,7)				<i>Below 18.0m: Stiff to very stiff.</i>		
18.50 - 20.00 18.50 - 20.00	B34 D35					18.50 (1.50)		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.		
						20.00				

Continued on Next Page

<b>Remarks</b>	<b>Water Added</b>		<b>Water Strike - General</b>		
	From (m)	To (m)	Struck at (m)	Casing to (m)	Rose to (m)
	1.60		4.00		3.90
	<b>Casing Details</b>		<b>Chiselling Details</b>		
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

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

<b>Remarks</b>	<b>Water Added</b>		<b>Water Strike - General</b>			
	From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
	1.60		4.00		20	3.90
	<b>Casing Details</b>		<b>Chiselling Details</b>			
	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

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

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

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	0.00	6.00	9.20	250			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH17
<b>Coordinates:</b> 325346.90 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 15.90	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 3.15 mOD	<b>Dates:</b> 09/02/2018 - 13/02/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B13 D25 SPT (C) N=13	10.50	4.00	N=13 (3,4/3,3,3,4)		(4.00)		Medium dense brown gravelly fine to coarse SAND with shell fragments. Gravel is subangular fine to coarse of mixed lithologies.		
12.00	B14 D26 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	3.60	Ublow=20 50%	-10.25	13.40		Brown very sandy subangular to subrounded fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. [slightly clayey]		
15.00	B16 D27 U29	15.00	3.40	Ublow=60 75%	-11.95	15.10		Stiff brownish grey sandy silty CLAY. Sand is fine to coarse.		
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		

<b>Remarks</b> Groundwater monitoring standpipe installed [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
		15.90	200				



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH18
<b>Coordinates:</b> 325326.00 E	<b>Client:</b> Irish Water	Sheet 1 of 2
173239.66 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.71 mOD	<b>Dates:</b> 16/02/2018 - 20/02/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

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

<b>Remarks</b> Groundwater monitoring standpipe installed  Terminated on instruction of Engineer at scheduled depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			
	0.00	6.00	4.00	250			



**CAUSEWAY**  
GEOTECH

**Project No.:**

17-1455

**Project Name:**

Arklow WwTP Land GI

**Borehole No.:**

BH18

**Coordinates:**

325326.00 E

**Client:**

Irish Water

Sheet 2 of 2

**Scale:** 1:50

**Client's Representative:**

Byrne Looby ARUP JV

**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	Water	Backfill
10.50	B3 D18 ES11							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 - 10.95	SPT (C) N=15	10.5 0	4.30	N=15 (2,3/4,3,4,4) PID = 0.00ppm						
11.50	ES12			PID = 0.20ppm						
12.00	B4 D19 U22			Ublow=40 75%	-9.09	11.80		Grey very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse		
12.00 - 12.45						(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 D20 ES14									
13.50 - 13.95	SPT (C) N=17	13.5 0	5.00	N=17 (3,3/4,4,4,5) PID = 0.10ppm		(1.80)				
14.50	ES15			PID = 0.20ppm						
15.00	B6 D21				-12.29	15.00		End of Borehole at 15.00m		
15.00 - 15.45	SPT (C) N=19	15.0 0 15.0 0	4.20	N=19 (3,3/4,4,5,6) 19-02-2018						

**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)

**Chiselling Details**

From (m)	To (m)	Time (hr:mm)

**Water Added**

From (m)	To (m)

**Casing Details**

To (m)	Diam (mm)
15.00	200



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH19	
<b>Coordinates:</b> 325298.06 E	<b>Client:</b> Irish Water	Sheet 1 of 2	
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00	<b>Base</b> 18.00
173286.91 N		<b>Client's Representative:</b> Byrne Looby ARUP JV	
<b>Ground Level:</b> 1.34 mOD		<b>Dates:</b> 23/01/2018 - 26/01/2018	
		<b>Scale:</b> 1:50	
		<b>Driller:</b> BM	
		<b>Logger:</b> NH	

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.50	B1 ES2			PID = 0.70ppm 0.2				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					(1.80)				
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								
2.00 - 2.45	SPT (C) N=1			N=1 (2,1/0,0,0,1)						
2.50	ES8					(1.70)				
3.00	B10 D9	3.00								
3.00 - 3.45	SPT (C) N=2			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								
4.00 - 4.12	SPT (C)			50 (25 for 75mm/50 for 50mm)		(2.50)				
5.00	B14 D13	5.00								
5.00 - 5.22	SPT (C) N=49			50 (12,14/50 for 75mm)						
6.00	B15 D16	6.00			-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			N=49 (3,4/7,9,15,18)						
7.50	B17 D18	7.50								
7.50 - 7.92	SPT (C)			N=50 (3,5/50 for 265mm)		(4.20)				
9.00	B19 D20	9.00								
9.00 - 9.41	SPT (C)			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				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
1.80	1.80	20	1.60	15.40	16.50	03:00
Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH19
<b>Coordinates:</b> 325298.06 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 18.00	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 1.34 mOD	<b>Dates:</b> 23/01/2018 - 26/01/2018	<b>Driller:</b> BM
		<b>Logger:</b> NH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B21 D22				-8.86	10.20 (0.40)		Very dense brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
10.50 - 10.95	SPT (C) N=21	10.5 0		N=21 (2,3/3,6,6,6)	-9.26	10.60 (0.60)		Grey slightly silty gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
10.80	B23							Stiff grey sandy CLAY. Sand is fine to coarse		
11.00 - 11.45	UT30	11.0 0		Ublow=50 100%	-9.86	11.20				
12.00	B25 D24							Medium dense to dense grey very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse		
12.00 - 12.45	SPT (C) N=22	12.0 0		N=22 (4,5/5,5,6,6)		(3.50)				
13.50	B27 D26									
13.50 - 13.95	SPT (C) N=31	13.5 0		N=31 (5,5/7,7,8,9)						
15.00	B29 D28				-13.36	14.70 (0.70)		Firm to stiff grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse		
15.00 - 15.50	UT31			Ublow=50 100%	-14.06	15.40 (1.40)		Medium dense to dense grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.		
16.50	B32 D34									
16.50 - 16.95	SPT (C) N=35	16.5 0		N=35 (4,6/9,10,8,8)	-15.46	16.80 (1.20)		Very stiff brownish grey slightly sandy gravelly CLAY. Gravel is subangular fine to coarse of mixed lithologies.		
17.00	B33									
17.50	D35									
17.50 - 17.94	SPT (S)	17.5 0		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				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
				15.40	16.50	03:00
Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)			
		18.00	200			





**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH20
<b>Coordinates:</b> 325324.98 E	<b>Client:</b> Irish Water	Sheet 1 of 2
173120.91 N	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.59 mOD	<b>Dates:</b> 07/02/2018 - 08/02/2018	<b>Driller:</b> MK
		<b>Logger:</b> ST

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
		0.00	0.00	07-02-2018		(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									
1.00 - 1.45	SPT (C) N=4	3.00	2.80	N=4 (0,1/1,1,1,1) PID = 0.40ppm		1.29 (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									
2.00 - 2.45	SPT (C) N=12	3.50	3.00	N=12 (2,2/3,3,3,3) PID = 0.20ppm		0.39 (1.10)		Medium dense slightly gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies.		
3.00	B4 D12 ES20									
3.00 - 3.45	SPT (C) N=10	3.00	2.80	N=10 (2,1/2,2,3,3) PID = 0.10ppm		-0.71 3.30		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 ES21									
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 ES22									
5.00 - 5.45	SPT (C) N=12	3.50	3.30	N=12 (2,3/4,3,2,3)						
6.00	B7 D15 ES23									
6.00 - 6.45	SPT (C) N=42	3.00	3.00	N=42 (3,3/6,7,15,14)		-3.41 6.00		Dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies.		
7.50	B8 D16 ES24									
7.50 - 7.95	SPT (C) N=43	3.00	2.80	N=43 (5,7/9,10,12,12)		(3.20)				
9.00	B21 D26 ES25									
9.00 - 9.32	SPT (C)	9.00	3.00	50 (5,8/50 for 165mm)		-6.61 9.20		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						

<b>Remarks</b> Groundwater monitoring standpipe installed  Terminated on instruction of Engineer at required depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	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
<b>Water Added</b>		<b>Casing Details</b>					
From (m)	To (m)	To (m)	Diam (mm)				
1.50	3.00	9.00	250				



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Borehole No.:</b> BH20
<b>Coordinates:</b> 325324.98 E	<b>Client:</b> Irish Water	Sheet 2 of 2
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2000	<b>Top</b> 0.00
<b>Base</b> 16.20	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:50
<b>Ground Level:</b> 2.59 mOD	<b>Dates:</b> 07/02/2018 - 08/02/2018	<b>Driller:</b> MK
		<b>Logger:</b> ST

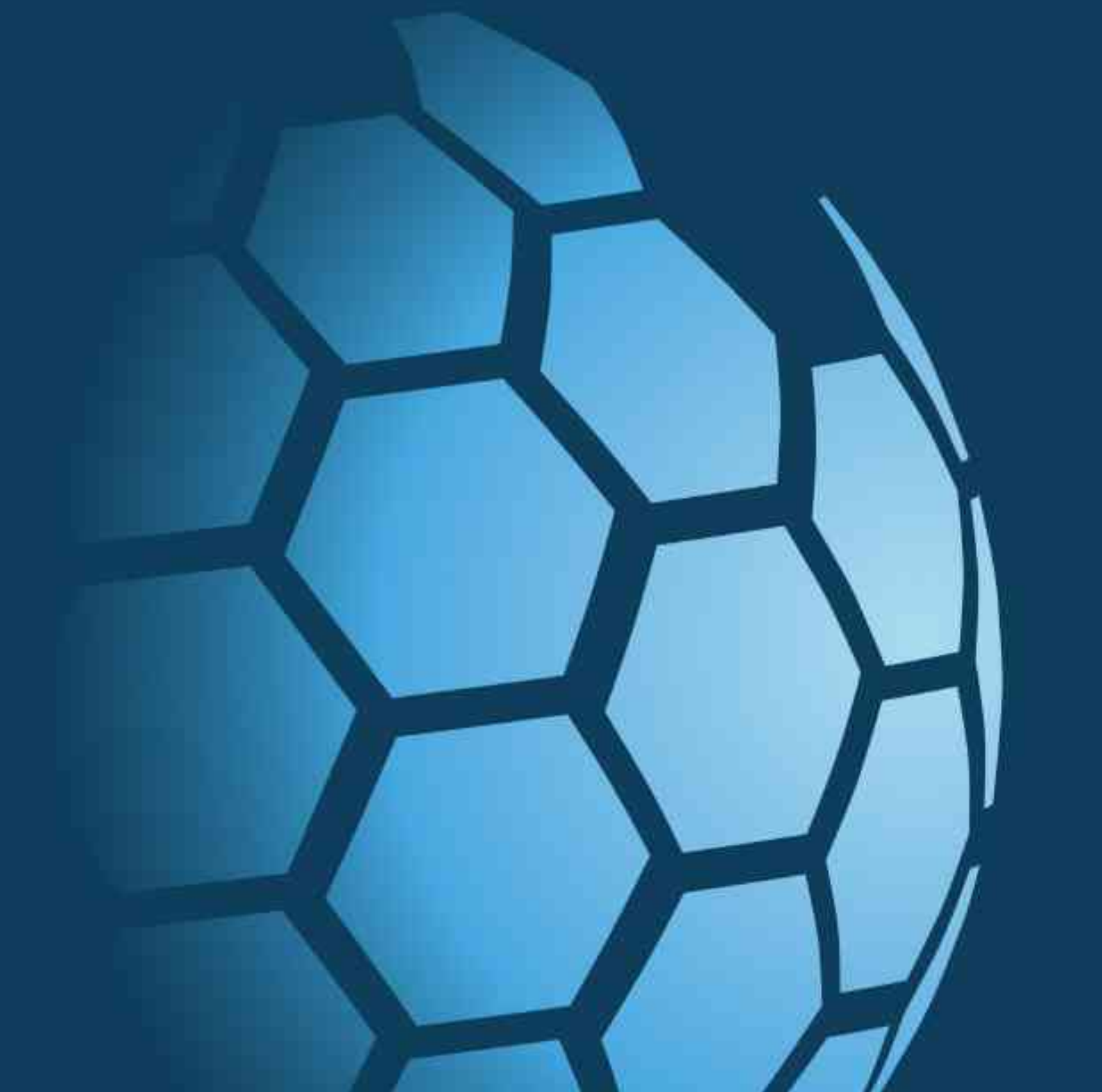
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.50	B22 D27 SPT (C) N=23	10.5	2.80	N=23 (5,7/9,10,2,2)		(3.10)		Dense brown slightly gravelly silty fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies.		
12.00	B23 D28 SPT (C)	12.0	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.		
13.50	B24 D29 SPT (C) N=14	13.5	3.50	N=14 (2,1/3,4,4,3)	-9.91	(2.70)		Medium dense brown slightly silty very gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies.		
15.00	U31	15.0	3.2	Ublow=35 100%		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.		
15.00 - 15.45	SPT (C) N=39	15.5	3.20	N=39 (4,5/4,7,12,16)	-12.61	(1.00)		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 D30	16.2	3.50	08-02-2018	-13.61	16.20		End of Borehole at 16.20m		

<b>Remarks</b> Groundwater monitoring standpipe installed  Terminated on instruction of Engineer at required depth	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	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	
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			
			16.20	200			



**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

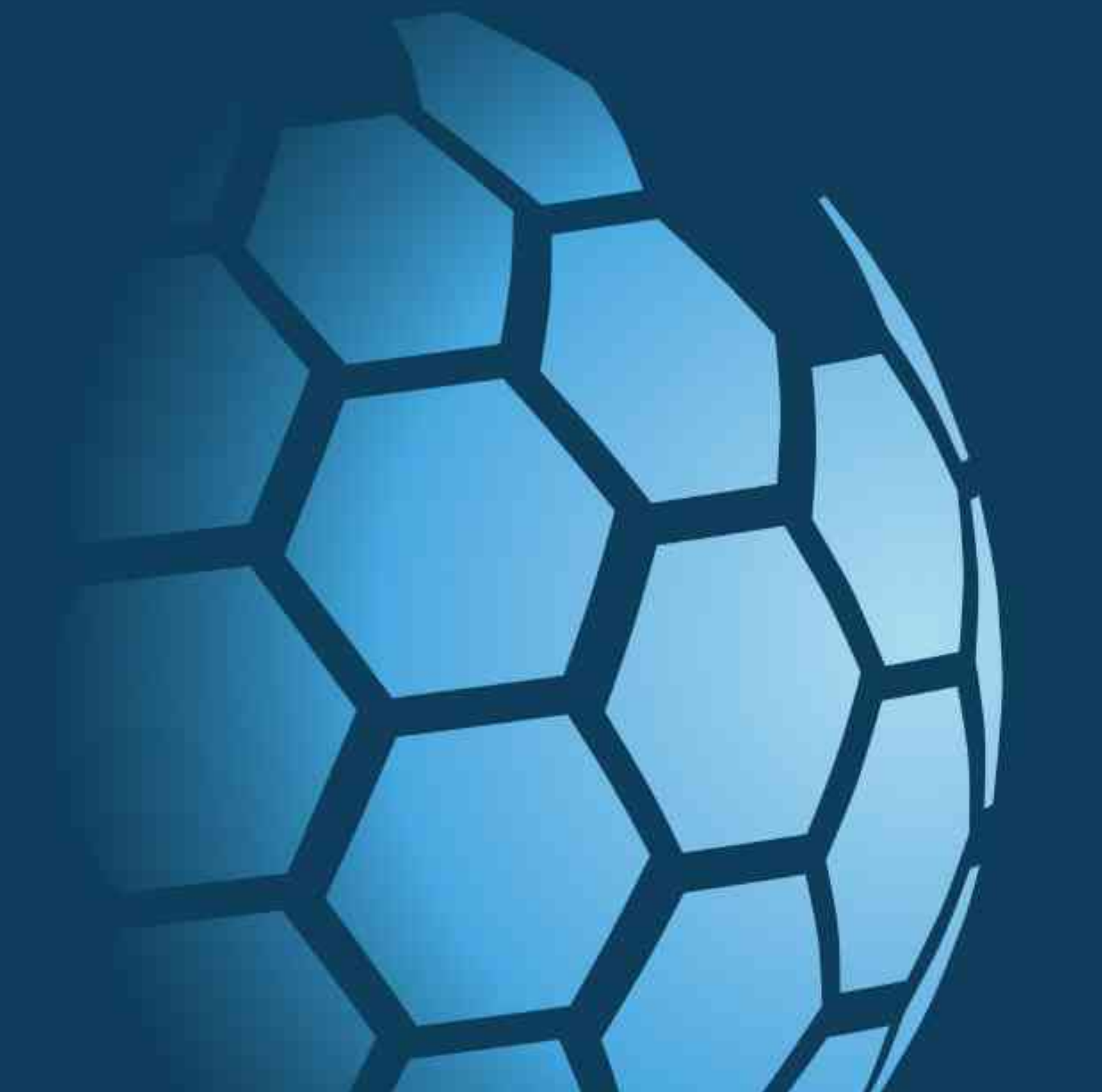


BH11 25.50m to 26.00m



**CAUSEWAY**  
— GEOTECH

**APPENDIX D**  
**Trial Pit Logs**





**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> No groundwater encountered  Terminated on instruction of engineer. Base of trial pit obstructed by slab or concrete.	<b>Water Strikes:</b>		<b>Stability:</b> Stable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00
		<b>Length:</b> 3.00	





**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.30 - 1.60	ES7	PID = 0.20ppm	2.14	(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. MG	
0.50 0.50 0.50	B4 D5 ES6			0.30		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. [Patches of orange, yellow, and purple staining on GRAVEL] [Asbestos sample taken] MG <i>Suspected ACM found at 0.30m - sample ES7</i>	
1.50 1.50 1.50	B1 D2 ES3			1.60 (0.20)		MADE GROUND: Concrete Slab MG	
		PID = 0.10ppm	0.64	1.80		End of trial pit at 1.80m	

<b>Remarks</b> 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.	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00 <b>Length:</b> 5.00



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.40	Slight seepage	<b>Width:</b> 1.50 <b>Length:</b> 3.00



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 17-1455	<b>Project Name:</b> Arklow WwTP Land GI	<b>Trial Pit No.:</b> TP03
<b>Co-ordinates:</b> 325317.93 E	<b>Client:</b> Irish Water	Sheet 1 of 1
<b>Method:</b> Trial Pitting	<b>Client's Representative:</b> Byrne Looby ARUP JV	<b>Scale:</b> 1:25
<b>Plant:</b> 14T Tracked Excavator	<b>Ground Level:</b> 2.46 mOD	<b>Date:</b> 15/01/2018
		<b>Logger:</b> 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)		MADE GROUND: Concrete slab MG	
			1.81	(0.85)		End of trial pit at 0.60m	

<b>Remarks</b> No groundwater encountered  Terminated on instruction of Engineer on slab of concrete	<b>Water Strikes:</b>		<b>Stability:</b> Stable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	B1	PID = 0.10ppm	2.41	(0.10)		MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.	
0.50	D2			(0.10)			
0.50	ES3			2.21	0.30		MADE GROUND: Concrete slab
1.00	ES7			(0.70)		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]	0.5
1.50	B4	PID = 0.00ppm	1.51	1.00		MADE GROUND: Light brown fine to coarse SAND with suspected asbestos sheeting. [possible fill of channel/chamber]	1.0
1.50	D5				(0.60)		
1.50	ES6			0.91	1.60		End of trial pit at 1.60m
							2.0
							2.5
							3.0
							3.5
							4.0
							4.5

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 5.00 <b>Length:</b> 7.00



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> No groundwater encountered	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	Terminated on instruction of Engineer due to pit walls collapsing		



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> [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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.70	Flow at 2.70	<b>Width:</b> 1.00 <b>Length:</b> 3.00



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	B1	PID = 1.50ppm	2.45	(0.10)		MADE GROUND: Tarmac	
0.50	D2			0.10		MG	
0.50	ES5			2.25	(0.20)		
				0.30		MG	
				(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)	0.5
			1.45	1.10		MG	1.0
1.50	B3	PID = 0.10ppm				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]	1.5
1.50	D4				(1.20)	SA	2.0
1.50	ES6			0.25	2.30		2.5
		Flow at 2.20m				End of trial pit at 2.30m	3.0
							3.5
							4.0
							4.5

<b>Remarks</b> [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to groundwater inflow	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.20	Flow at 2.20m	<b>Width:</b> 1.50
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	B1	PID = 0.50ppm	2.35	(0.10)	MADE GROUND: Tarmac		
0.50	D5			0.10	MG		
0.50	ES2			2.15	(0.20)	MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.	
				0.30	MG		
				(0.40)	MADE GROUND: Brown silty very sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. [pieces of wood present] [purple and orange staining throughout]		0.5
			1.75	0.70	MG		
				(0.90)	MADE GROUND: Black sandy subangular fine to coarse GRAVEL of mixed lithologies predominately bricks and cement. Sand is fine to coarse. (Strong hydrocarbon smell)		1.0
					MG		
1.50	B3	PID = 0.10ppm	0.85	1.60	MADE GROUND: Concrete slab		1.5
1.50	D6			0.75	(0.10)	MG	
1.50	ES4				1.70		
						End of trial pit at 1.70m	

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b>
	Struck at (m):	Remarks:	Stable
			<b>Width:</b> 1.50
		<b>Length:</b> 9.00	





**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES8	PID = 0.00ppm	1.90	(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	
1.00 1.00 1.00	B3 D4 ES9	PID = 1.30ppm	1.00	(0.90)		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	
2.00 2.00 2.00	B5 D6 ES7	PID = 0.00ppm	-0.30	(1.30)		Orangey brown silty very gravelly fine to coarse SAND (predominantly medium). Gravel is subangular fine to coarse of mixed lithologies. SA	
		Flow at 2.70m				End of trial pit at 2.80m	▼

<b>Remarks</b> [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to groundwater inflow	<b>Water Strikes:</b>		<b>Stability:</b> Stable
	Struck at (m):	Remarks:	
	2.70	Flow at 2.70m	<b>Width:</b> 2.00
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES3	PID = 0.00ppm	1.48	(1.00)		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	
1.50 1.50 1.50 1.70	B4 D5 ES6 ES10	PID = 1.80ppm		(1.50)		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  <i>Red brick structure observed in part of pit</i>  <i>Suspected Gun Cotton sample at 1.70m</i>	
2.50 2.50 2.50	B7 D8 ES9	Flow at 2.40m  PID = 1.20ppm	-0.02	2.50		End of trial pit at 2.50m	▼

<b>Remarks</b> [A 200m thick concrete slab was encountered at 1.0m 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	<b>Water Strikes:</b>		<b>Stability:</b> Stable
	Struck at (m):	Remarks:	
	2.40	Flow at 2.40m	<b>Width:</b> 2.00 <b>Length:</b> 3.00



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> No groundwater encountered [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to pit walls collapsing	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00 <b>Length:</b> 3.00



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES3	PID = 0.10ppm	2.17	(0.10) 0.10	MADE GROUND: Tarmac MG		
1.20 1.20 1.20	B4 D5 ES6	PID = 0.20ppm	1.27	(0.90) 1.00	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. [pieces of glass] MG		0.5 1.0
1.50 1.60 1.60 1.60	ES10 B7 D8 ES9	PID = 0.10ppm	0.77	(0.50) 1.50 (0.40) 1.90	MADE GROUND: Light brown sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. MG		1.5 2.0
			0.37		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. [minor yellow staining observed] MG		2.0 2.5 3.0 3.5 4.0 4.5
						<i>Suspected Gun Cotton sample at 1.50m</i> End of trial pit at 1.90m	

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.80 <b>Length:</b> 3.00



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			2.18	(0.10)		MADE GROUND: Tarmac	
			2.08	(0.10)		MADE GROUND: Grey slightly sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse.	
0.50	B1	PID = 0.00ppm		(0.10)		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. [some red staining observed]	
0.50	D2			(0.10)		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. [some red staining observed]	
0.50	ES3			(1.20)		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. [some red staining observed]	
1.50	B4	PID = 0.00ppm	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. [some red staining observed]	
1.50	D5					[some red staining observed]	
1.50	ES6			(0.90)		MADE GROUND: Dark brown silty very gravelly fine to coarse SAND. Gravel is subangular of mixed lithologies including some red bricks and broken pipe. [some red staining observed]	
2.30	B7	Flow at 2.20m					
2.30	D8	PID = 0.10ppm	-0.02	2.30		End of trial pit at 2.30m	
2.30	ES9						

<b>Remarks</b> [Backfilled pipe encountered in the southern part of the pit at approximately 1.00m] [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.20	Flow at 2.20m	<b>Width:</b> 1.00
Terminated on instruction of Engineer due to pit walls collapsing			<b>Length:</b> 3.00



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.60	B1	PID = 0.00ppm	1.35	0.30 (0.10)		MADE GROUND: Brown slightly clayey gravelly fine to coarse SAND. Gravel is subangular fine to coarse of mixed lithologies. MG	0.5
0.60	D2		1.25	0.40		MADE GROUND: Concrete slab MG	
0.60	ES3		0.85	0.80		MADE GROUND: Brown slightly gravelly fine to coarse SAND. Gravel is subangular fine to medium of mixed lithologies. MG	
						End of trial pit at 0.80m	
							1.5
							2.0
							2.5
							3.0
							3.5
							4.0
							4.5

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b> Stable
	Struck at (m):	Remarks:	
			<b>Width:</b> 2.00
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES3	PID = 0.10ppm	2.01	(0.10) 0.10		MADE GROUND: Concrete slab MG	
				(1.10)		MADE GROUND: Reddish brown very sandy subangular fine to coarse GRAVEL of mixed lithologies predominately red brick. Sand is fine to coarse. MG	0.5 1.0
1.50 1.50 1.50 1.60	B4 D5 ES6 ES7	PID = 0.00ppm	0.91	1.20		Light brown slightly silty gravelly fine to coarse SAND (predominantly medium). Gravel is subrounded fine to coarse of mixed lithologies. SA	1.5
				(0.80)		ES sample retrieved from infilled culvert at 1.60m - black organic material	2.0
			0.11	2.00		End of trial pit at 2.00m	2.5 3.0 3.5 4.0 4.5

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.50 <b>Length:</b> 3.50



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	B1	PID = 0.00ppm	1.99	(0.30)		MADE GROUND: Grey sandy subangular fine to coarse GRAVEL of mixed lithologies. Sand is fine to coarse. MG	
0.50	D2		1.89	0.30 (0.10)		MADE GROUND: Concrete slab MG	
0.50	ES3			0.40		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. [occasional possible large gravel sized oyster shells which appear to be stained green on the inside] MG	0.5
1.00	B4	PID = 0.20ppm		(1.30)			1.0
1.00	D5						
1.00	ES6						
1.50	B7	PID = 0.10ppm	0.59	1.70		Light brown slightly silty gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies. [possible lenses of soft brown CLAY material] [occasional possible large gravel sized oyster shells which appear to be stained green on the inside] SA	1.5
1.50	D8						
1.50	ES9						
2.00	B10	PID = 0.30ppm Seepage at 2.20m	0.09	2.20			2.0
2.00	D11						
2.00	ES12						
						End of trial pit at 2.20m	▼
2.5							
3.0							
3.5							
4.0							
4.5							

<b>Remarks</b> Old asbestos pipe encountered in trial pit at 1.50m bgl [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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.20	Seepage at 2.20m	<b>Width:</b> 1.00 <b>Length:</b> 5.00





**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.40 0.40 0.40	B1 D2 ES3	PID = 0.10ppm	1.89	(0.50)		MADE GROUND: Greyish brown sandy subangular fine to coarse GRAVEL of mixed lithologies predominately red brick. Sand is fine to coarse. MG	
1.00 1.00 1.00	B4 D5 ES6	PID = 0.20ppm	0.99	(0.90)		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	
1.70	ES10					Light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine to medium of mixed lithologies. SA <i>Green staining visible</i>	
2.00 2.00 2.00	B7 D8 ES9	PID = 0.00ppm	-0.41	(1.40)			
		Flow at 2.70m					
						End of trial pit at 2.80m	

<b>Remarks</b> [Sand with green staining is well cemented] [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to groundwater inflow	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.70	Flow at 2.70m	<b>Width:</b> 1.00 <b>Length:</b> 2.00



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 2.50
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to groundwater inflow	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	3.00	Flow at 3.00m	<b>Width:</b> 1.50 <b>Length:</b> 4.00



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	B1 D2 ES3	PID = 0.00ppm	1.95	(0.30)	[Cross-hatched pattern]	MADE GROUND: Brown sandy subangular fine to coarse GRAVEL of mixed lithologies. MG	[Water level indicator]
0.50				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				(1.00)	[Dotted pattern]	0.95	
1.50	B4 D5 ES6	PID = 0.00ppm	0.15	(0.80)		End of trial pit at 2.10m	
1.50				2.10			
1.50							

<b>Remarks</b> [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	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.00	Flow at 2.00m	<b>Width:</b> 3.00
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> 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	<b>Water Strikes:</b>		<b>Stability:</b>
	Struck at (m):	Remarks:	Unstable
			<b>Width:</b> 3.00
		<b>Length:</b> 5.00	



**CAUSEWAY**  
GEOTECH

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


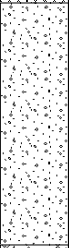
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES3	PID = 0.10ppm			[Cross-hatched pattern]	MADE GROUND: Red silty gravelly fine to coarse SAND (predominantly medium) with medium cobble content, and pieces of pipe and plastic. Gravel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

<b>Remarks</b> [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to pit walls collapsing	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	1.20	Trickle at 1.20m	<b>Width:</b> 3.00
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES3	PID = 0.10ppm	1.76	0.60  (0.80)		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	0.5  1.0
1.50 1.50 1.50	B4 D5 ES6	PID = 0.00ppm	0.96	1.40  (0.90)		Light brown slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mixed lithologies. SA	1.5  2.0
			0.06	2.30		End of trial pit at 2.30m	2.5  3.0  3.5  4.0  4.5

<b>Remarks</b> No groundwater encountered [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to pit walls collapsing	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00 <b>Length:</b> 4.00



**CAUSEWAY**  
GEOTECH

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

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


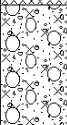
<b>Remarks</b> [Possible wall structure encountered on western side of pit] [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer due to groundwater inflow	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
	2.50	Flow at 2.50m	<b>Width:</b> 2.00
		<b>Length:</b> 3.00	





**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES3	PID = 0.10ppm		(1.00)		MADE GROUND: Light brown/cream SILT (possible phosphogypsum deposit) MG	
			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. SA	
1.40 1.40 1.40	B4 D5 ES6	PID = 0.00ppm	0.71	1.40		End of trial pit at 1.40m	

<b>Remarks</b> No groundwater encountered  Terminated on instruction of Engineer	<b>Water Strikes:</b>		<b>Stability:</b> Stable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00 <b>Length:</b> 3.00



**CAUSEWAY**  
GEOTECH

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



Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50 0.50 0.50	B1 D2 ES3	PID = 0.20ppm		(2.00)		MADE GROUND: Light brown/cream SILT (possible phosphogypsum deposit) MG	0.5 1.0
1.50 1.50 1.50	B4 D5 ES6	PID = 0.30ppm					1.5
			0.09	2.00 (0.30)		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	2.0
2.30 2.30 2.30	B7 D8 ES9	PID = 0.30ppm	-0.21	2.30		End of trial pit at 2.30m	2.5 3.0 3.5 4.0 4.5

<b>Remarks</b> No groundwater encountered  Terminated on instruction of Engineer	<b>Water Strikes:</b>		<b>Stability:</b> Stable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00
		<b>Length:</b> 3.00	



**CAUSEWAY**  
GEOTECH

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

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

<b>Remarks</b> No groundwater encountered  Terminated on instruction of Engineer	<b>Water Strikes:</b>		<b>Stability:</b>
	Struck at (m):	Remarks:	Stable
			<b>Width:</b> 1.00
		<b>Length:</b> 2.50	



**CAUSEWAY**  
GEOTECH

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

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water				
0.10	B1	PID = 0.20ppm	2.27	(0.20)		MADE GROUND: Brown very sandy subangular fine to coarse GRAVEL of mixed lithologies including brick fragments. Sand is fine to coarse.					
0.10	D2			(0.20)				MADE GROUND: Concrete slab			
0.10	ES3			(0.20)					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]		
			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]	0.5				
				(0.80)					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]	1.0	
1.00	B4	PID = 0.10ppm	1.27	1.20		End of trial pit at 1.20m					
1.00	D5										1.5
1.00	ES6										
								2.5			
								3.0			
								3.5			
								4.0			
								4.5			

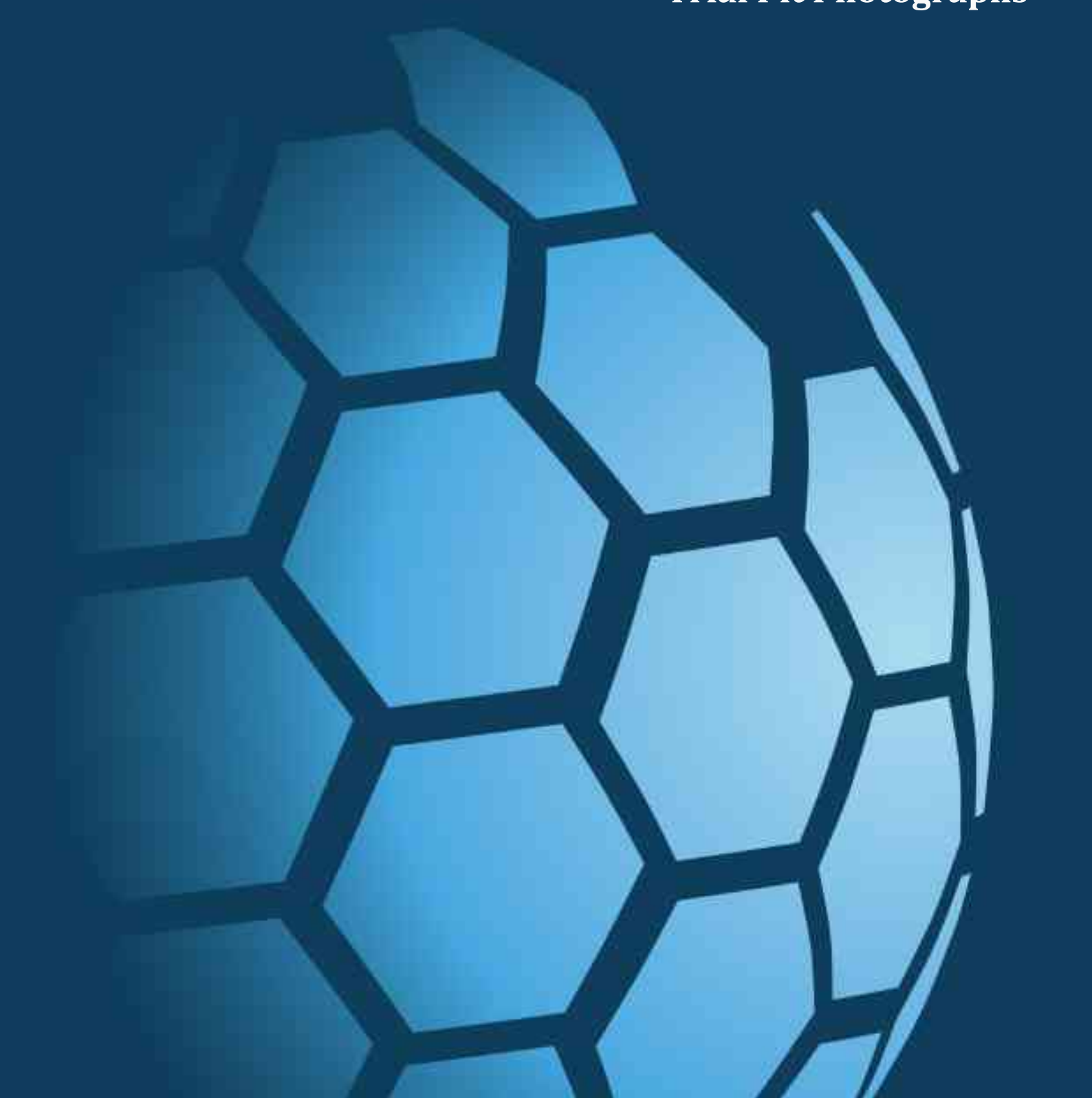
<b>Remarks</b> No groundwater encountered [COMMENTS IN BRACES ADDED BY CLIENTS REPRESENTATIVE]  Terminated on instruction of Engineer	<b>Water Strikes:</b>		<b>Stability:</b> Unstable
	Struck at (m):	Remarks:	
			<b>Width:</b> 1.00
		<b>Length:</b> 2.50	



**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

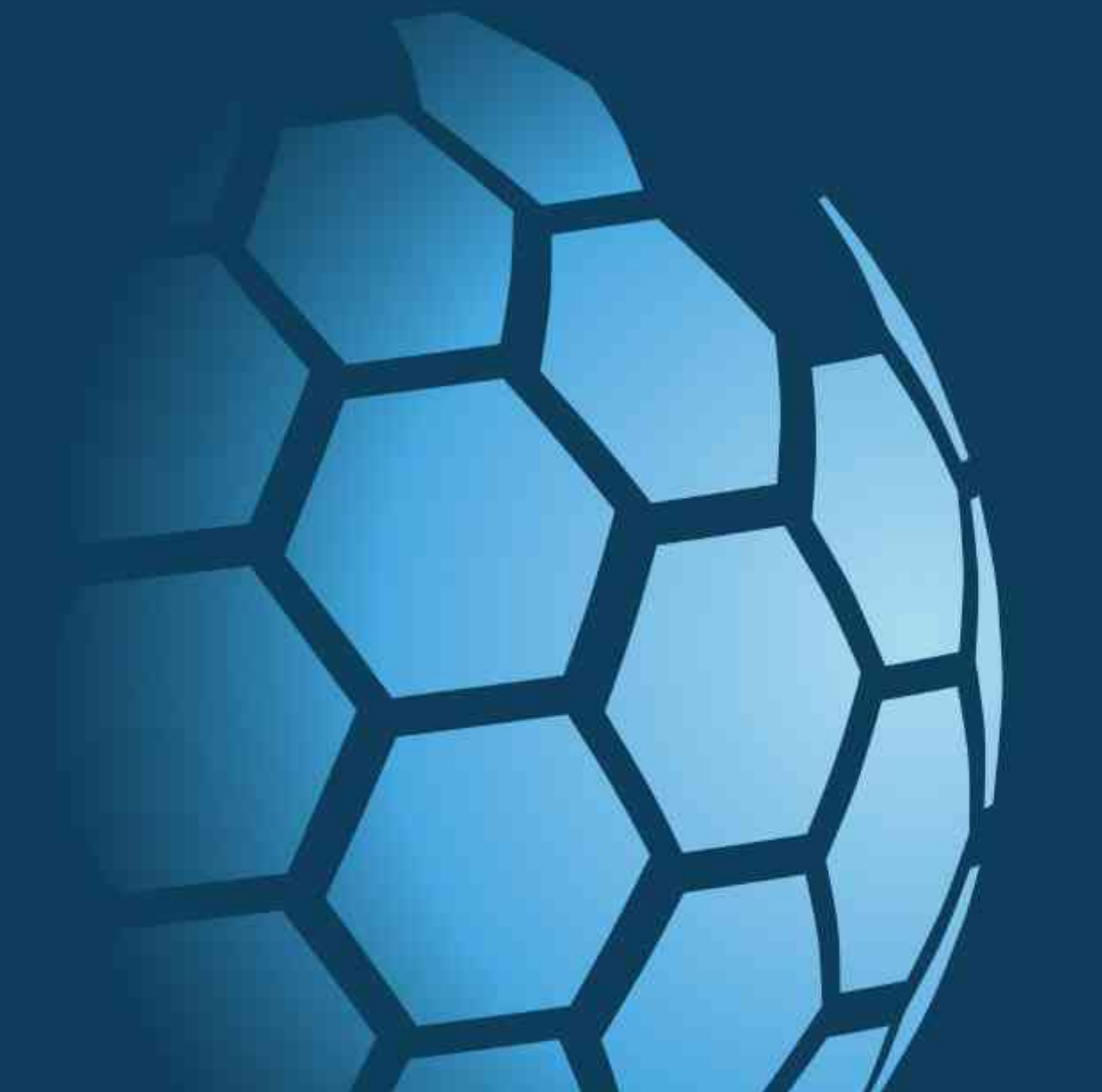


TP27



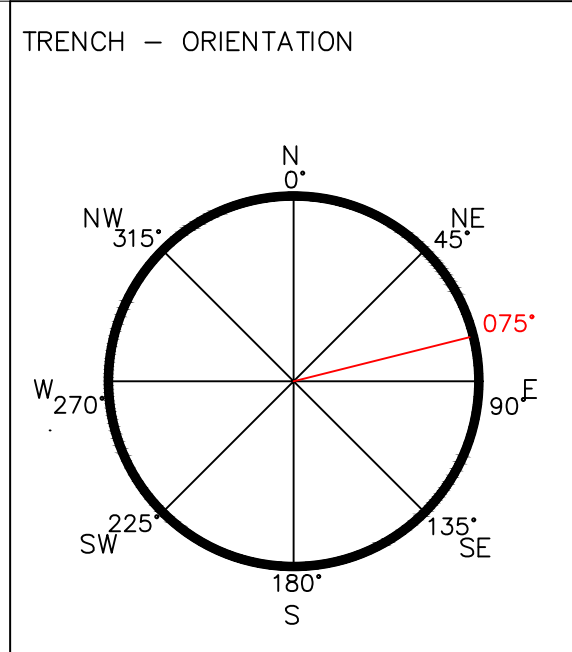
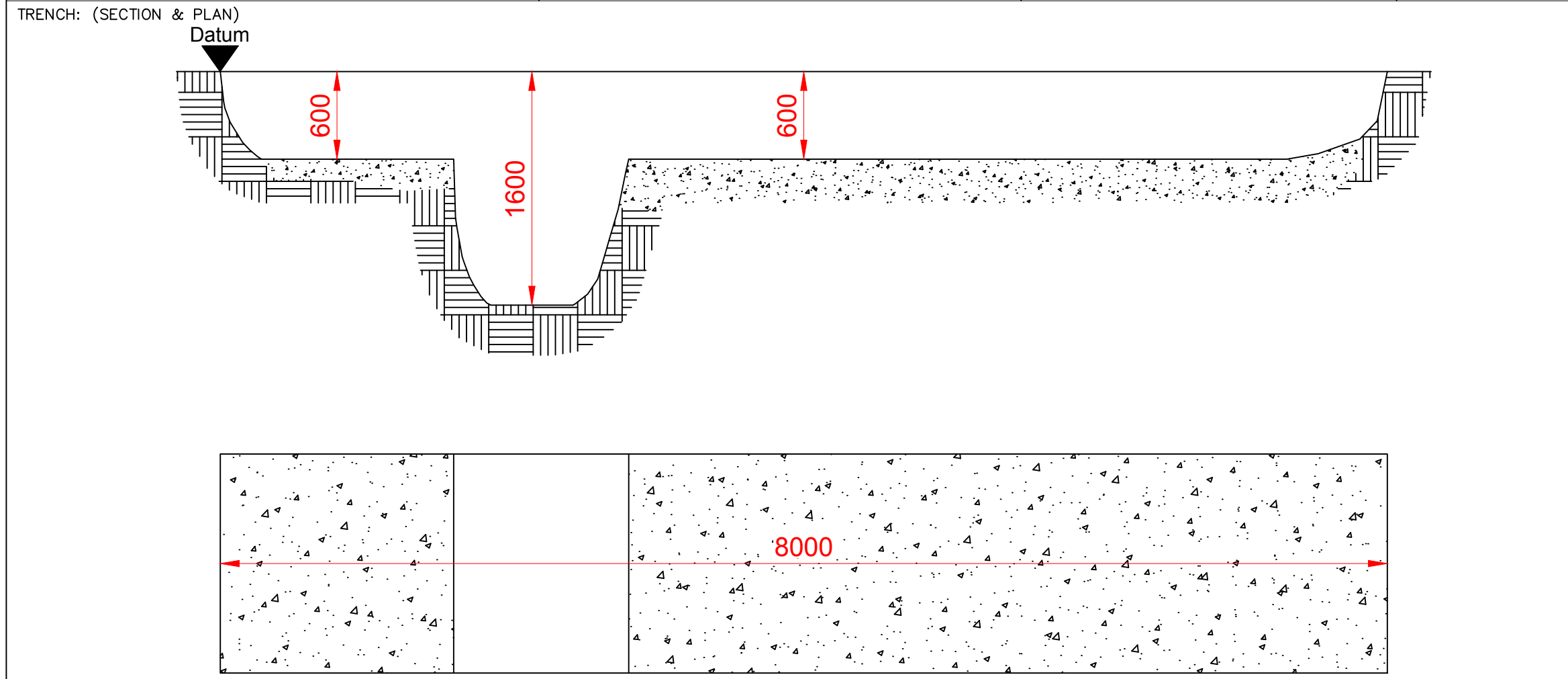
**CAUSEWAY**  
— GEOTECH

**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 ORIENTATED : 075° FROM NORTH

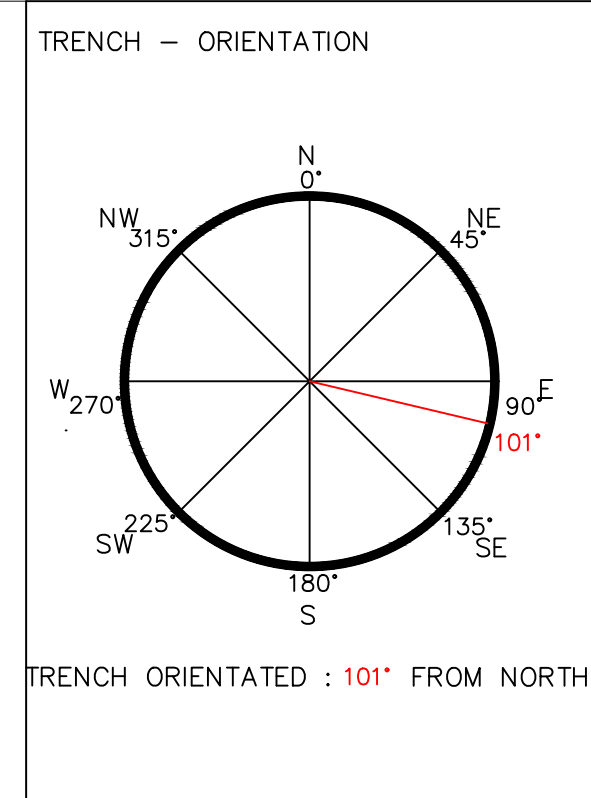
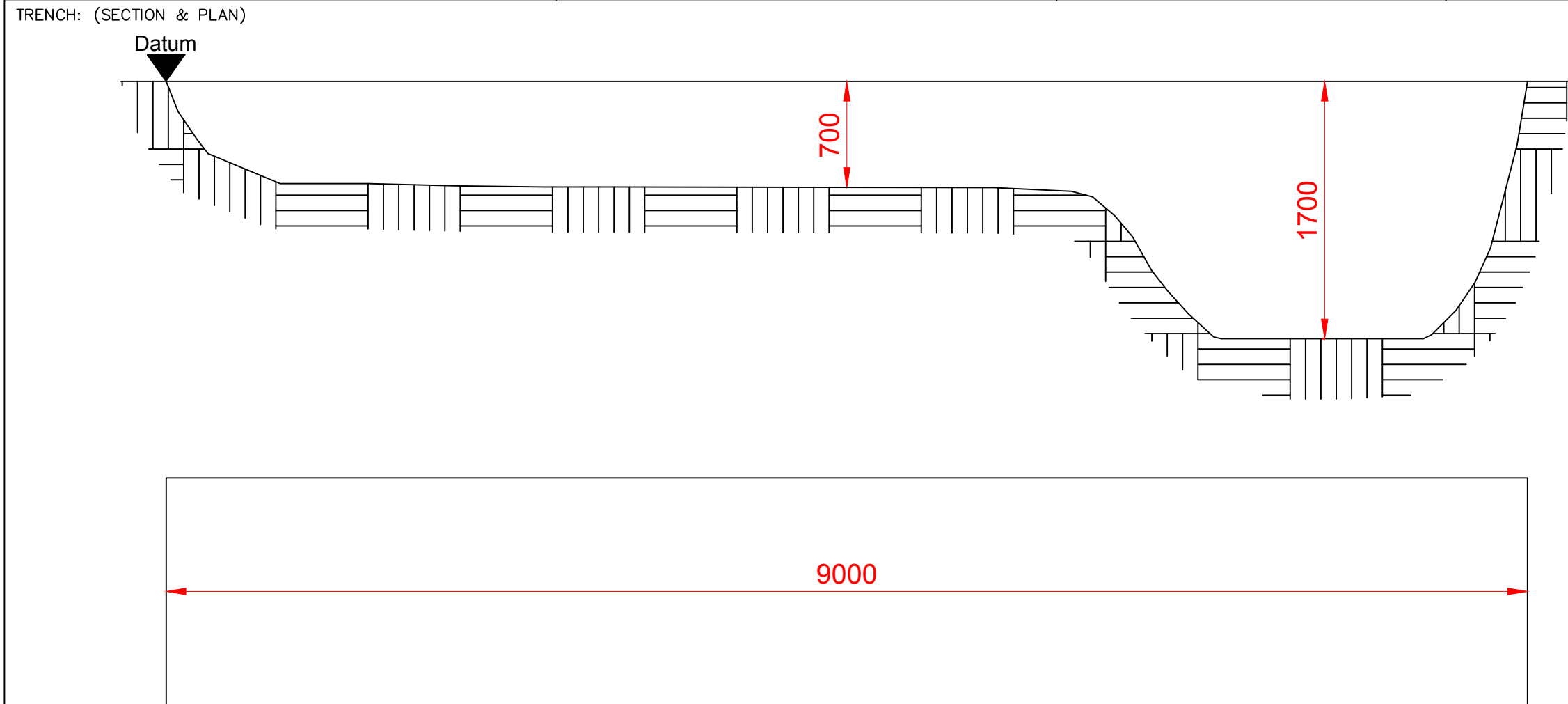
COORDINATES: DATUM  
 EASTING: - 325308.102  
 NORTHING: - 173119.002  
 ELEVATION: - 2.509

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) : 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



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



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

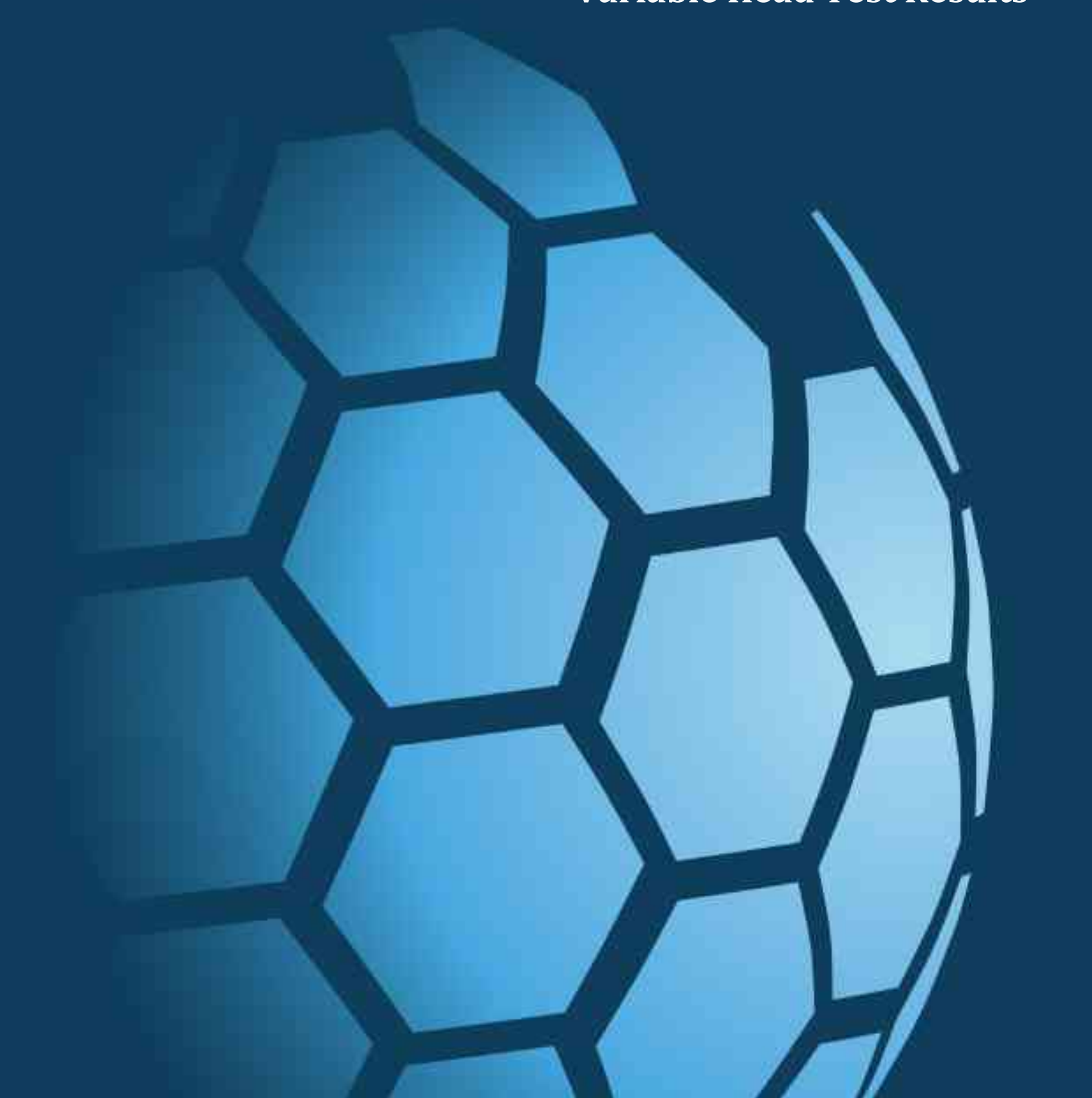




**CAUSEWAY**  
— GEOTECH

**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):  
Depth to centre of piezo. tip below ground level (m)  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
	(m)
2.20	(m)
9.70	(m)
200	(mm)
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**



# 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):  
Depth to centre of piezo. tip below ground level (m):  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
	(m)
4.30	(m)
10.70	(m)
250	(mm)
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**

**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):  
Depth to centre of piezo. tip below ground level (m)  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
	(m)
3.40	(m)
9.40	(m)
250	(mm)
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**

# 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):  
Depth to centre of piezo. tip below ground level (m):  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
0	(m)
3.00	(m)
10.70	(m)
200	(mm)
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**

# 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):  
Depth to centre of piezo. tip below ground level (m):  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
0	(m)
3.30	(m)
10.20	(m)
200	(mm)
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**

**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):  
Depth to centre of piezo. tip below ground level (m)  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
	(m)
2.00	(m)
14.00	(m)
150	(mm)
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  
 $F/D = 2.32 * \pi * (L/D) / \log_e [1.1 * (L/D) + \{1 + 1.1 * (L/D)^2\}^{0.5}]$

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

hence, k = 2.4E-07 m/s

**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):  
Depth to centre of piezo. tip below ground level (m):  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
	(m)
2.00	(m)
14.00	(m)
150	(mm)
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**

## 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):  
Depth to centre of piezo. tip below ground level (m)  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
	(m)
2.50	(m)
16.15	(m)
150	(mm)
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

$$F/D = 2.32 * \pi * (L/D) / \log_e [1.1 * (L/D) + \{1 + 1.1 * (L/D)^2\}^{0.5}]$$

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

hence, k = 1.7E-06 m/s

**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):  
Depth to centre of piezo. tip below ground level (m):  
Depth to top of filter below ground level (m):  
Depth to bottom of filter below ground level (m):  
Diameter of filter (D):  
Standing ground water level SWL (mbgl):

50	(mm)
	(m)
2.50	(m)
16.15	(m)
150	(mm)
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

**APPENDIX H**

**Groundwater Monitoring Results**















**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)	Dissoved 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	
					<b>12.92</b>	<b>-71.90</b>	<b>39.10</b>	<b>3.95</b>	<b>"21.41"</b>	<b>11.02</b>	<b>14.53</b>	<b>N</b>	<b>42</b>	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 (10/04/2018)					13.01	-50.40	84.80	8.30	"26.33"	10.30	14.51	N	26	
					13.02	-49.00	72.60	7.18	"26.23"	10.33	14.51	N	32	
					<b>13.13</b>	<b>-48.50</b>	<b>70.50</b>	<b>7.10</b>	<b>"26.15"</b>	<b>10.32</b>	<b>14.51</b>	<b>N</b>	<b>39</b>	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	
					<b>7.00</b>	<b>236.00</b>	<b>18.80</b>	<b>1.97</b>	<b>9466</b>	<b>9.66</b>	<b>14.50</b>	<b>N</b>	<b>39</b>	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	
					<b>6.67</b>	<b>250.60</b>	<b>23.70</b>	<b>2.48</b>	<b>9553</b>	<b>10.40</b>	<b>14.56</b>	<b>N</b>	<b>42</b>	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 (10/04/2018)					7.12	303.70	28.20	3.06	1231	11.08	14.56	N	24	
					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	
					<b>6.94</b>	<b>307.50</b>	<b>36.30</b>	<b>3.91</b>	<b>1177</b>	<b>11.08</b>	<b>14.58</b>	<b>N</b>	<b>48</b>	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)	Dissoved 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	
					<b>6.9</b>	<b>240.10</b>	<b>4.20</b>	<b>0.46</b>	<b>1602</b>	<b>10.26</b>	<b>14.54</b>	<b>N</b>	<b>42</b>	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	
					<b>6.64</b>	<b>293.10</b>	<b>8.10</b>	<b>0.82</b>	<b>7132</b>	<b>11.46</b>	<b>14.60</b>	<b>N</b>	<b>51</b>	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	
					<b>7.49</b>	<b>236.60</b>	<b>18.60</b>	<b>1.93</b>	<b>3590</b>	<b>12.43</b>	<b>14.49</b>	<b>N</b>	<b>96</b>	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	
					<b>7.38</b>	<b>286.70</b>	<b>10.70</b>	<b>1.11</b>	<b>2778</b>	<b>12.52</b>	<b>14.46</b>	<b>N</b>	<b>84</b>	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	
					<b>7.19</b>	<b>276.60</b>	<b>38.00</b>	<b>4.19</b>	<b>6288</b>	<b>9.33</b>	<b>14.48</b>	<b>N</b>	<b>42</b>	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)	Dissoved 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 (10/04/2018)					8.02	234.20	66.20	7.45	3661	8.97	14.46	N	26	
					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	
					<b>7.93</b>	<b>254.80</b>	<b>62.40</b>	<b>7.06</b>	<b>2338</b>	<b>8.83</b>	<b>14.46</b>	<b>N</b>	<b>42</b>	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	
					<b>11.31</b>	<b>37.40</b>	<b>3.50</b>	<b>0.37</b>	<b>5647</b>	<b>11.08</b>	<b>14.48</b>	<b>N</b>	<b>56</b>	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 (10/04/2018)					6.21	270.60	23.50	2.49	5506	10.47	13.52	N	28	
					6.92	258.40	29.10	3.22	3311	10.33	14.53	N	35	
					<b>6.11</b>	<b>269.70</b>	<b>19.80</b>	<b>2.01</b>	<b>4650</b>	<b>10.43</b>	<b>14.52</b>	<b>N</b>	<b>42</b>	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		
					<b>13.45</b>	<b>-53.34</b>	<b>32.90</b>	<b>2.84</b>	<b>"19.63"</b>	<b>10.12</b>	<b>14.62</b>	<b>N</b>	<b>42</b>	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		
					13.31	-63.20	36.40	3.34	"21.80"	10.10	14.62	N	24		
					13.36	-100.03	36.89	4.01	"19.30"	10.25	14.62	N	30		
					<b>13.24</b>	<b>-126.80</b>	<b>37.70</b>	<b>4.16</b>	<b>"18.36"</b>	<b>10.35</b>	<b>14.63</b>	<b>N</b>	<b>36</b>	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		
					<b>7.36</b>	<b>238.60</b>	<b>43.21</b>	<b>4.71</b>	<b>"22.35"</b>	<b>11.68</b>	<b>14.65</b>	<b>N</b>	<b>39</b>	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		
					<b>7.21</b>	<b>218.10</b>	<b>43.20</b>	<b>4.77</b>	<b>6231</b>	<b>10.93</b>	<b>14.65</b>	<b>N</b>	<b>42</b>	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		
					7.54	173.00	42.60	4.34	6423	10.81	14.64	N	32		
					7.43	200.21	39.98	4.01	6892	10.89	14.65	N	40		
					<b>7.32</b>	<b>241.30</b>	<b>38.30</b>	<b>3.64</b>	<b>7346</b>	<b>11.21</b>	<b>14.65</b>	<b>N</b>	<b>48</b>	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		
					<b>7.11</b>	<b>146.50</b>	<b>33.10</b>	<b>3.31</b>	<b>7165</b>	<b>10.97</b>	<b>14.65</b>	<b>N</b>	<b>42</b>	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	
					<b>7.60</b>	<b>123.80</b>	<b>34.60</b>	<b>3.86</b>	<b>7328</b>	<b>11.23</b>	<b>14.65</b>	<b>N</b>	<b>51</b>	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	
					<b>8.63</b>	<b>243.80</b>	<b>76.20</b>	<b>8.24</b>	<b>"306"</b>	<b>10.18</b>	<b>14.52</b>	<b>N</b>	<b>72</b>	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	
					<b>7.28</b>	<b>294.30</b>	<b>34.30</b>	<b>3.72</b>	<b>3851</b>	<b>11.64</b>	<b>14.54</b>	<b>N</b>	<b>66</b>	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	
					<b>8.35</b>	<b>134.60</b>	<b>46.21</b>	<b>3.84</b>	<b>"24.51"</b>	<b>11.41</b>	<b>14.63</b>	<b>N</b>	<b>42</b>	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	
					<b>7.21</b>	<b>226.30</b>	<b>39.70</b>	<b>4.11</b>	<b>"21.68"</b>	<b>11.81</b>	<b>14.65</b>	<b>N</b>	<b>39</b>	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	
					<b>13.21</b>	<b>-98.40</b>	<b>38.60</b>	<b>3.89</b>	<b>"18.42"</b>	<b>9.68</b>	<b>14.64</b>	<b>N</b>	<b>42</b>	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	
					<b>7.20</b>	<b>146.30</b>	<b>36.20</b>	<b>3.26</b>	<b>"18.92"</b>	<b>10.83</b>	<b>14.62</b>	<b>N</b>	<b>42</b>	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)	Dissoved 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	
					<b>12.79</b>	<b>-18.40</b>	<b>100.80</b>	<b>10.17</b>	<b>"22.87"</b>	<b>11.59</b>	<b>14.78</b>	<b>N</b>	<b>30</b>	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	
					<b>12.84</b>	<b>-36.30</b>	<b>98.30</b>	<b>9.46</b>	<b>"20.75"</b>	<b>14.12</b>	<b>14.89</b>	<b>N</b>	<b>24</b>	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	
					<b>12.60</b>	<b>-37.60</b>	<b>81.30</b>	<b>8.55</b>	<b>"12.87"</b>	<b>10.54</b>	<b>14.64</b>	<b>N</b>	<b>30</b>	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	
					<b>7.59</b>	<b>83.90</b>	<b>74.90</b>	<b>7.99</b>	<b>"17.40"</b>	<b>11.63</b>	<b>15.34</b>	<b>N</b>	<b>48</b>	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	
					<b>6.90</b>	<b>32.00</b>	<b>62.00</b>	<b>6.19</b>	<b>"22.89"</b>	<b>10.52</b>	<b>14.59</b>	<b>N</b>	<b>39</b>	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	
					<b>7.13</b>	<b>112.10</b>	<b>61.30</b>	<b>6.47</b>	<b>"13.47"</b>	<b>11.06</b>	<b>14.90</b>	<b>N</b>	<b>45</b>	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	
					<b>7.41</b>	<b>140.20</b>	<b>62.20</b>	<b>6.22</b>	<b>"25.71"</b>	<b>10.54</b>	<b>14.56</b>	<b>N</b>	<b>48</b>	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)	Dissoved 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 (07.05.2018)					7.60	168.40	66.30	7.04	"11.49"	11.46	15.06	N	32	
					7.51	166.40	53.00	5.68	"11.44"	11.46	15.11	N	40	
					<b>7.61</b>	<b>171.50</b>	<b>65.00</b>	<b>6.94</b>	<b>9172</b>	<b>11.41</b>	<b>15.20</b>	<b>N</b>	<b>48</b>	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	
					<b>7.49</b>	<b>76.50</b>	<b>54.50</b>	<b>5.40</b>	<b>"23.95"</b>	<b>11.06</b>	<b>14.51</b>	<b>N</b>	<b>48</b>	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	
					<b>7.19</b>	<b>45.60</b>	<b>63.60</b>	<b>6.50</b>	<b>7209</b>	<b>11.32</b>	<b>14.61</b>	<b>N</b>	<b>45</b>	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	
					<b>7.21</b>	<b>77.00</b>	<b>64.30</b>	<b>6.55</b>	<b>9109</b>	<b>11.66</b>	<b>14.68</b>	<b>N</b>	<b>51</b>	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	
					<b>7.44</b>	<b>171.00</b>	<b>58.00</b>	<b>6.01</b>	<b>3733</b>	<b>12.14</b>	<b>14.77</b>	<b>N</b>	<b>72</b>	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	
					<b>7.40</b>	<b>272.20</b>	<b>56.80</b>	<b>5.88</b>	<b>1694</b>	<b>12.56</b>	<b>14.75</b>	<b>N</b>	<b>78</b>	3 well volumes removed
BH17	??	08/05/2018	10:20	???	<b>7.87</b>	<b>216.30</b>	<b>90.90</b>	<b>9.75</b>	<b>2417</b>	<b>11.29</b>	<b>14.57</b>	<b>N</b>	<b>1</b>	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)	Dissoved 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	
					<b>7.16</b>	<b>206.30</b>	<b>58.70</b>	<b>6.14</b>	<b>9553</b>	<b>10.23</b>	<b>14.54</b>	<b>N</b>	<b>48</b>	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	
					<b>8.73</b>	<b>28.10</b>	<b>60.80</b>	<b>6.40</b>	<b>7784</b>	<b>10.85</b>	<b>14.53</b>	<b>N</b>	<b>48</b>	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	
					<b>7.36</b>	<b>15.50</b>	<b>63.60</b>	<b>6.76</b>	<b>"15.39"</b>	<b>11.07</b>	<b>14.93</b>	<b>N</b>	<b>42</b>	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 Round 1 - Ground Gas Monitoring 09/04/2018  Neil Haggan Causeway Geotech Ltd  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 Round 2 - Ground Gas Monitoring 23/04/2018  Sean Toomey Causeway Geotech Ltd  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 Investigation Round 3 - Ground Gas Monitoring 08/05/2018  Neil Haggan Causeway Geotech Ltd  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](mailto:rgunson@prosoils.co.uk)  
[awatkins@prosoils.co.uk](mailto:awatkins@prosoils.co.uk)

Page 1 of

# 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.



Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1057</b>
<b>Client Ref:</b>
<b>17-1455</b>

# 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.



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
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.



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1057</b>
<b>Client Ref:</b>
<b>17-1455</b>

# 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 <sup>3</sup> 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.



**PSL**  
Professional Soils Laboratory

Arklow WWTP Land GI

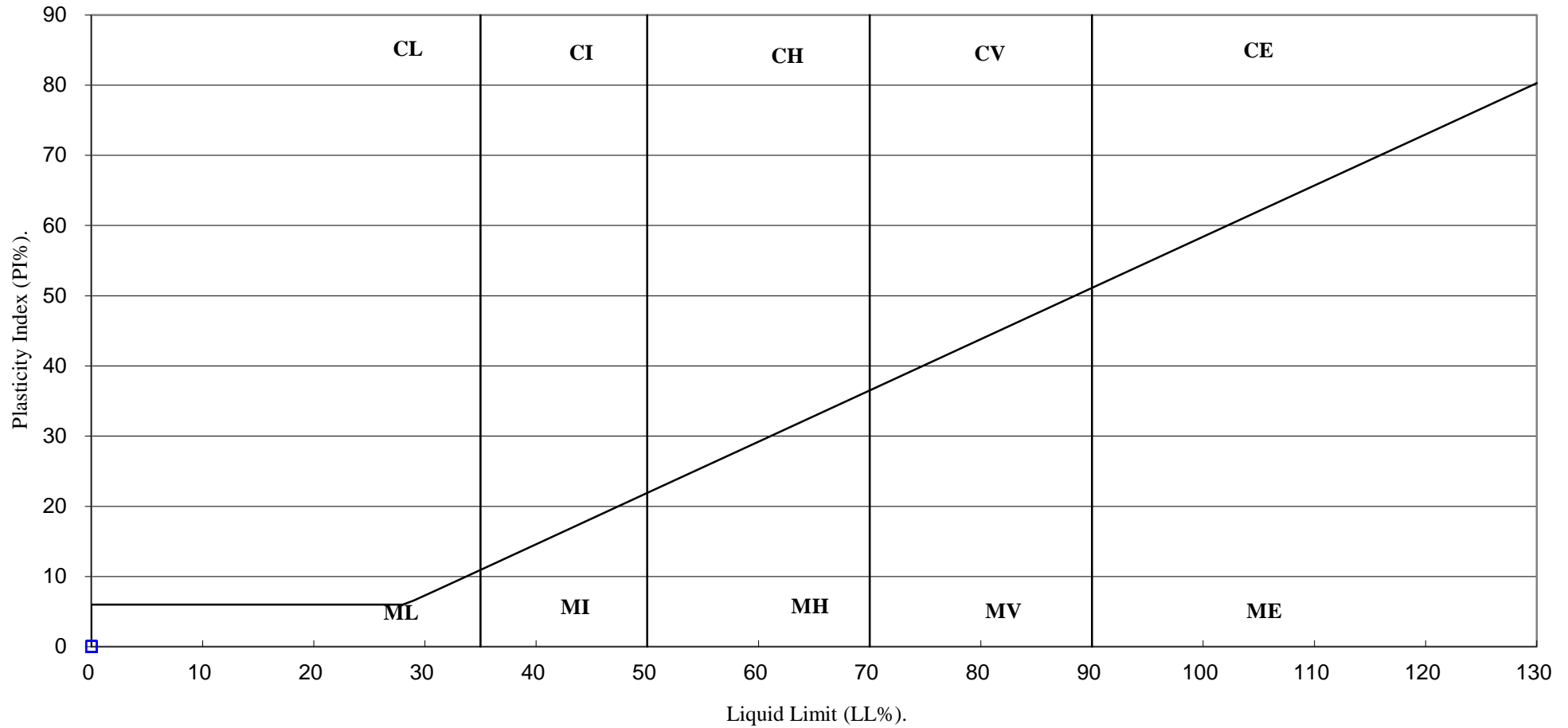
Contract No:

PSL18/1057

Client Ref:

17-1455

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



**PSL**  
Professional Soils Laboratory  
UKAS TESTING  
4043

**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1057</b>
<b>Client Ref:</b>
<b>17-1455</b>

# 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 <sup>3</sup> 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.



**PSL**  
Professional Soils Laboratory

Arklow WWTP Land GI

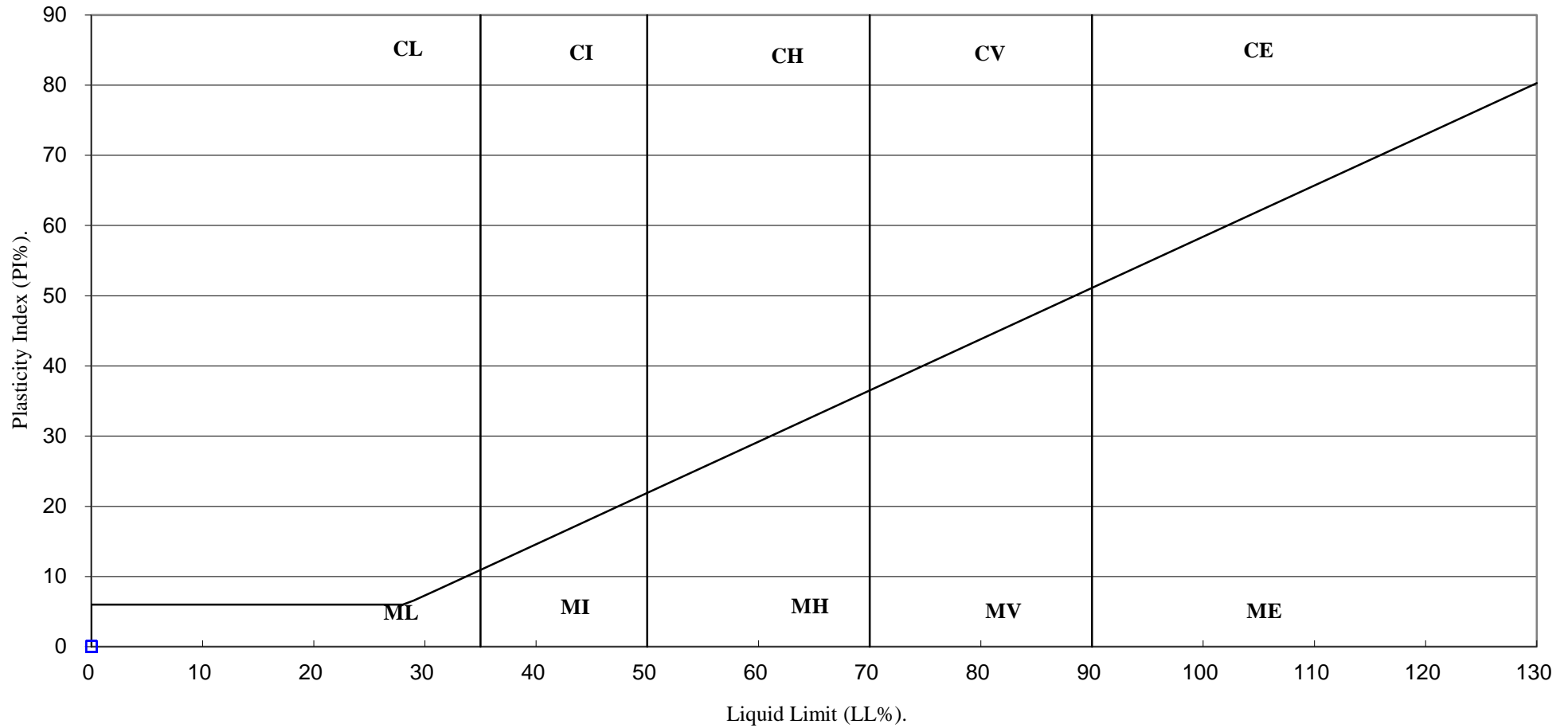
Contract No:

PSL18/1057

Client Ref:

17-1455

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



**PSL**  
Professional Soils Laboratory  
UKAS TESTING  
4043

**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1057</b>
<b>Client Ref:</b>
<b>17-1455</b>

# SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % <small>Clause 3.2</small>	Linear Shrinkage % <small>Clause 6.5</small>	Particle Density Mg/m <sup>3</sup> <small>Clause 8.2</small>	Liquid Limit % <small>Clause 4.3/4</small>	Plastic Limit % <small>Clause 5.3</small>	Plasticity Index % <small>Clause 5.4</small>	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							

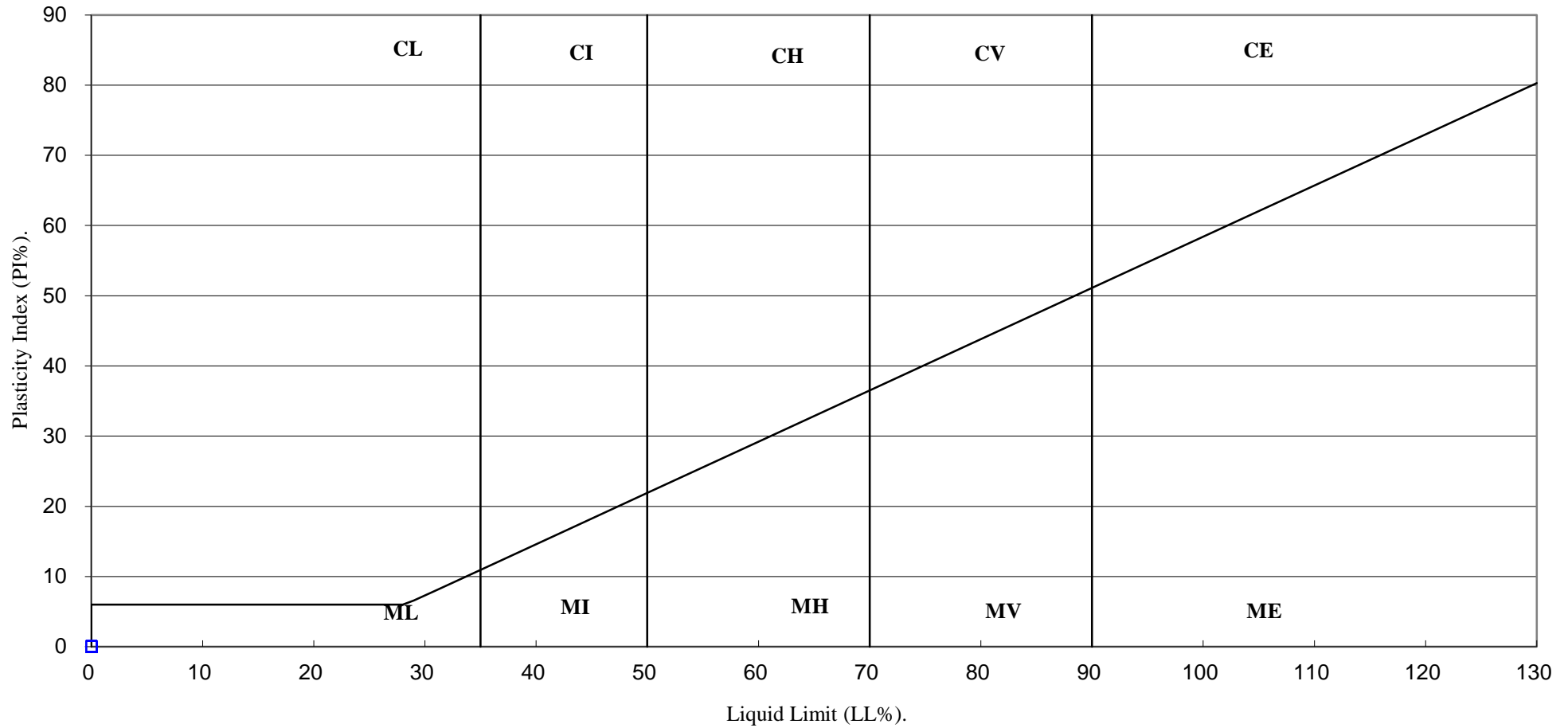
SYMBOLS : NP : Non Plastic                      \* : Liquid Limit and Plastic Limit Wet Sieved.



Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1057</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



**PSL**  
Professional Soils Laboratory  
UKAS TESTING  
4043

**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1057</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

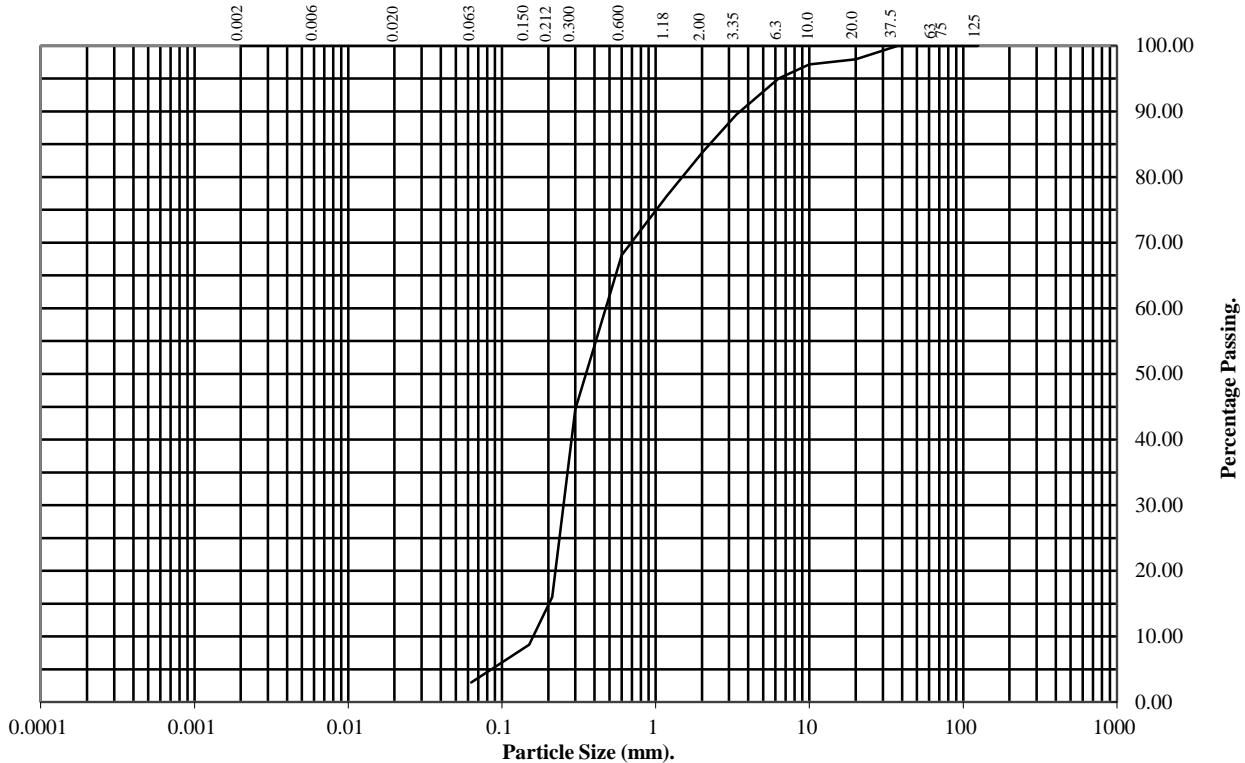
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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



# PARTICLE SIZE DISTRIBUTION TEST

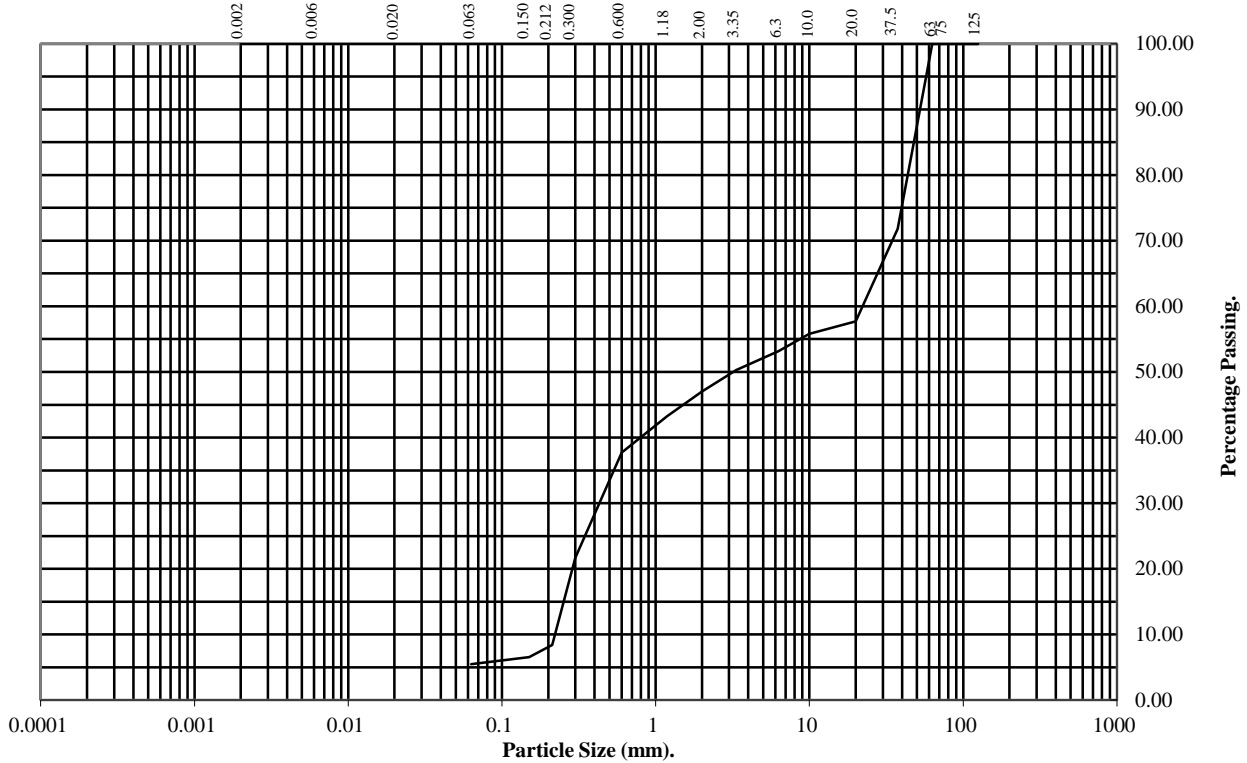
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

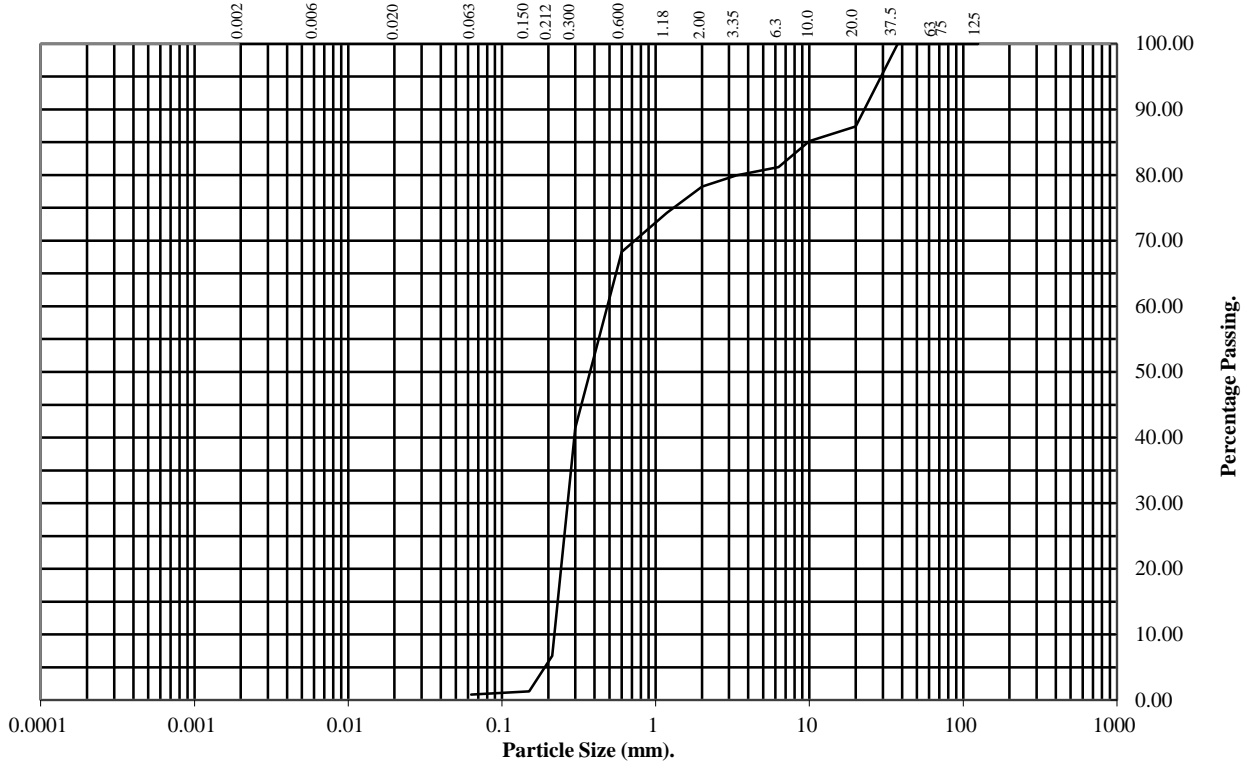
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

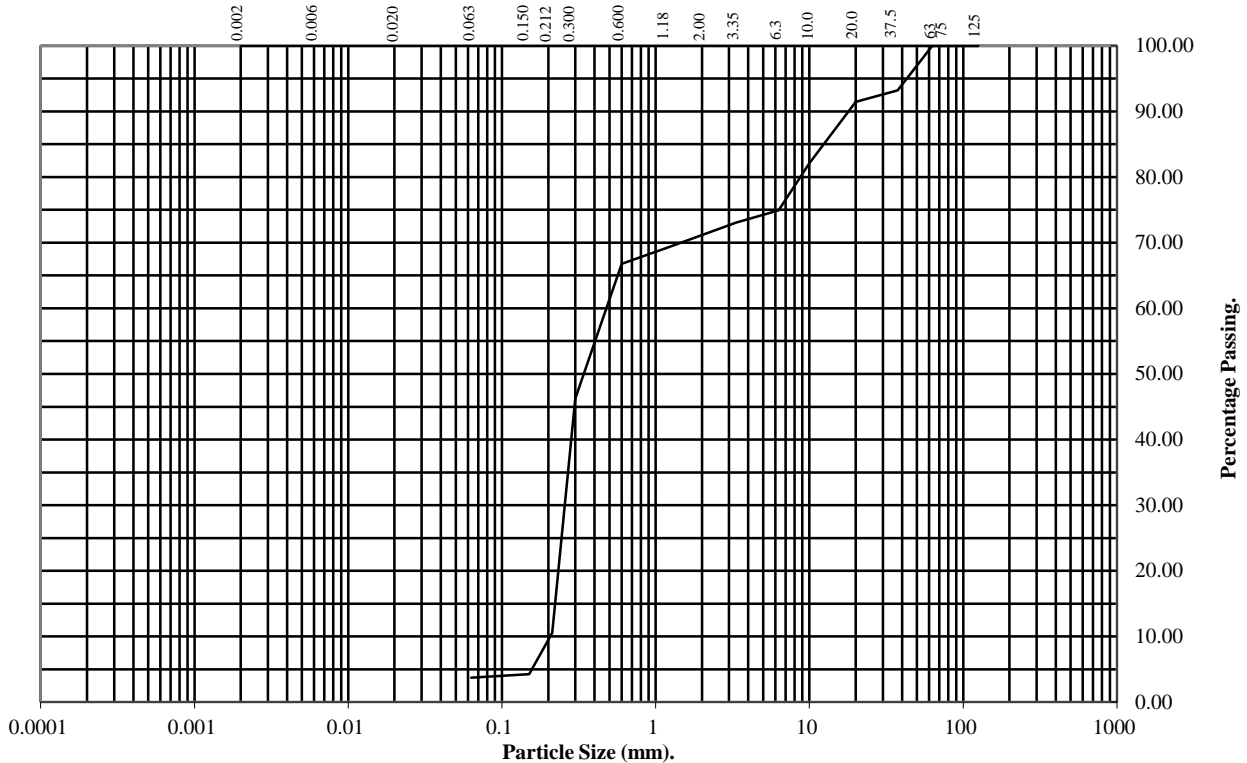
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

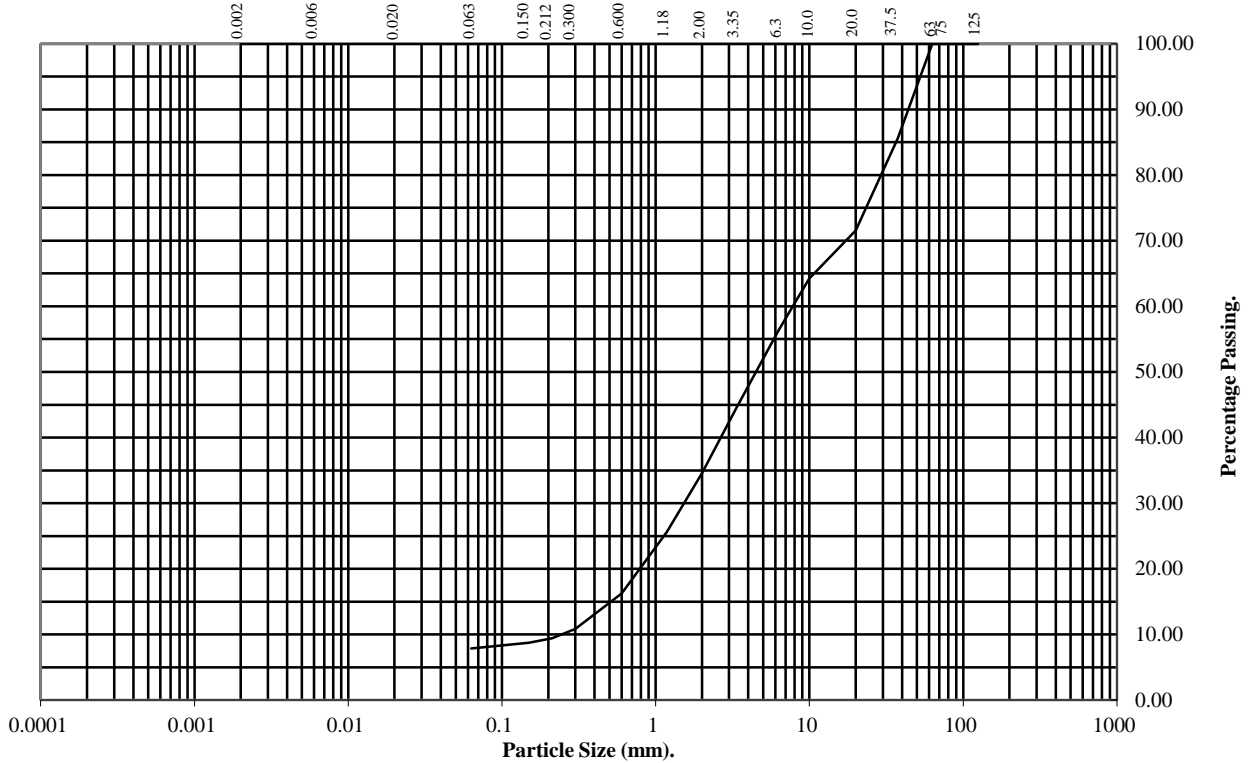
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

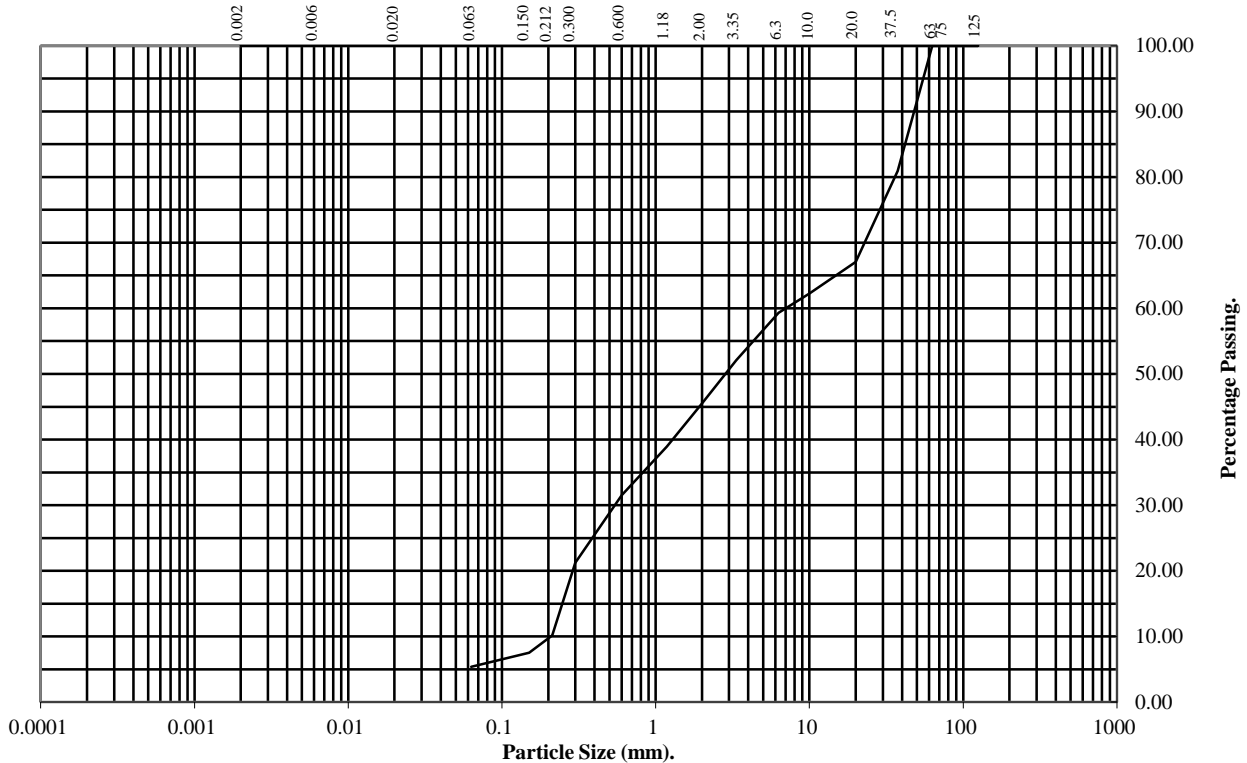
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

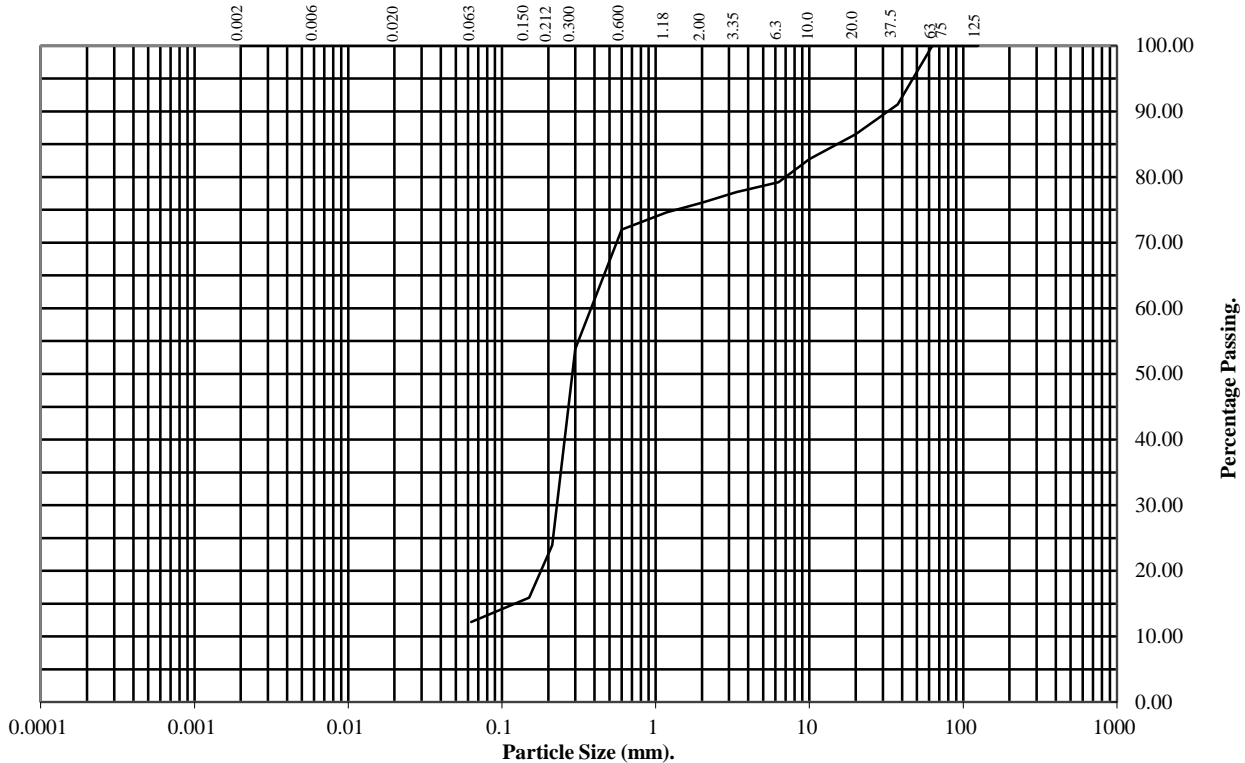
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

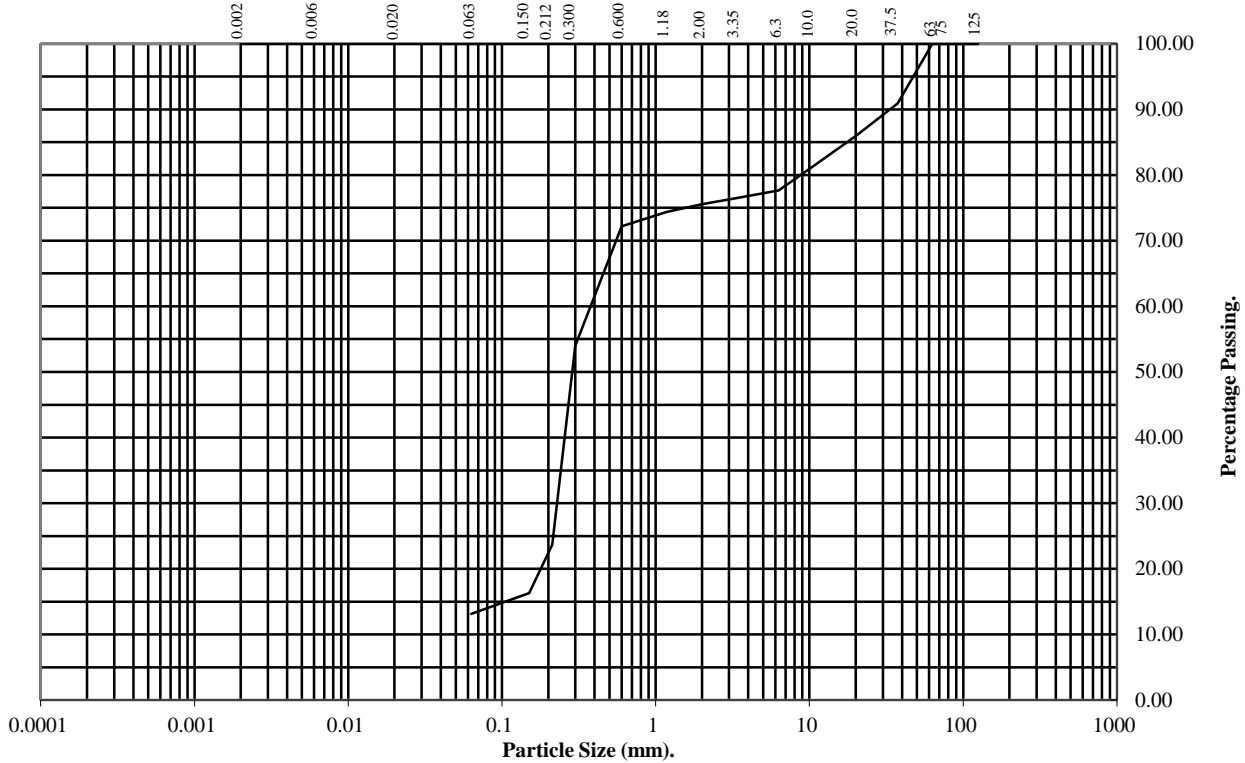
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

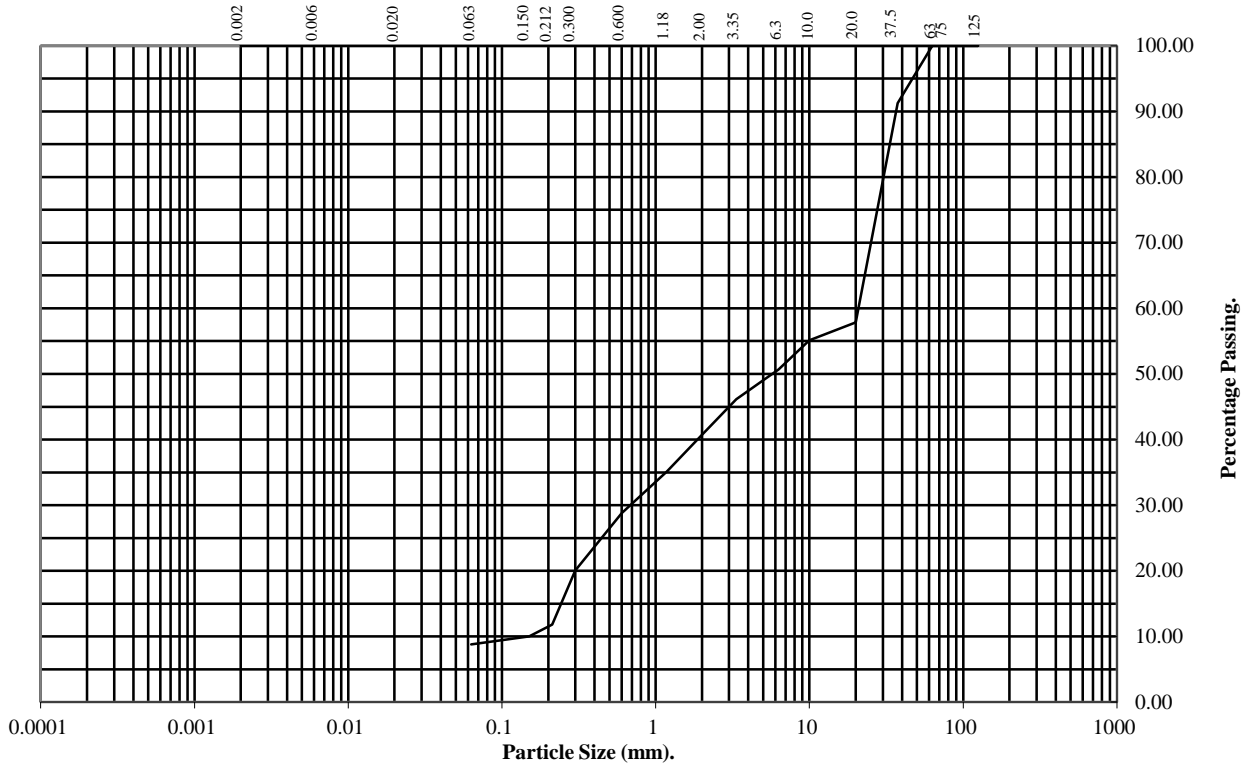
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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



# PARTICLE SIZE DISTRIBUTION TEST

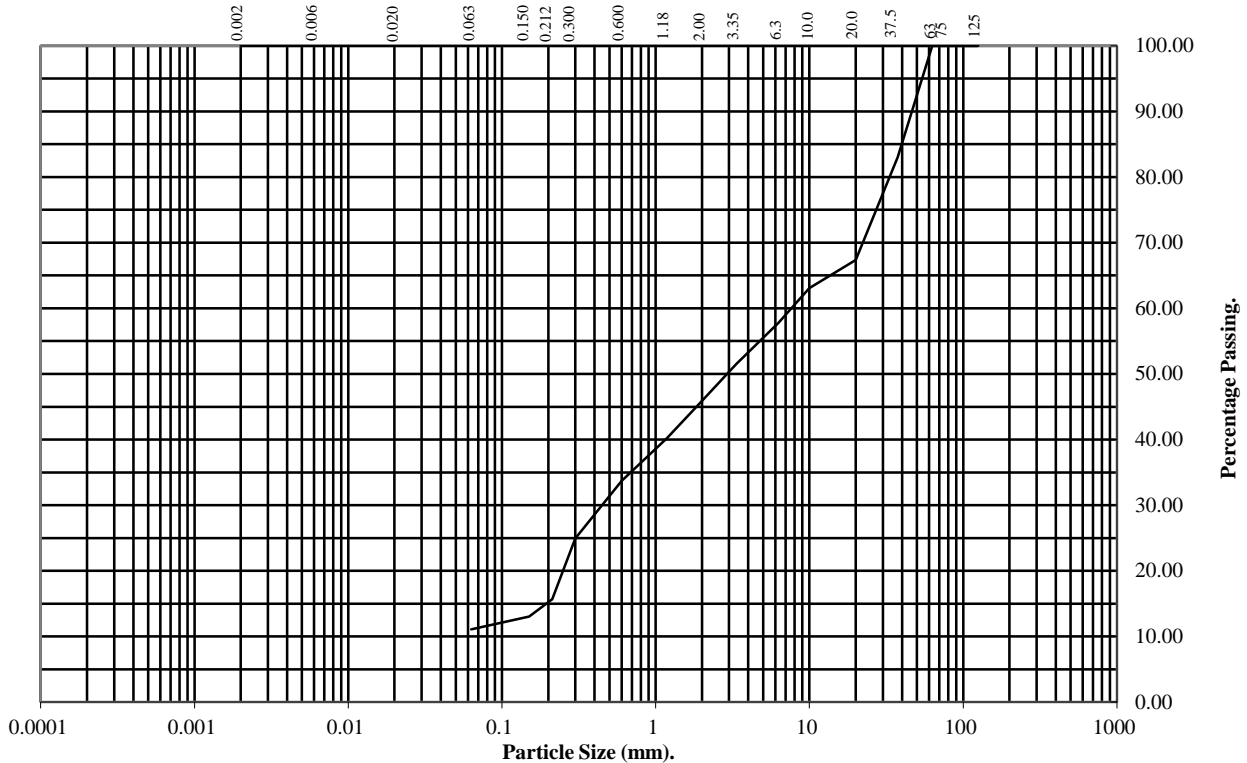
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP11 Top Depth (m): 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



Arklow WWTP Land GI

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

# PARTICLE SIZE DISTRIBUTION TEST

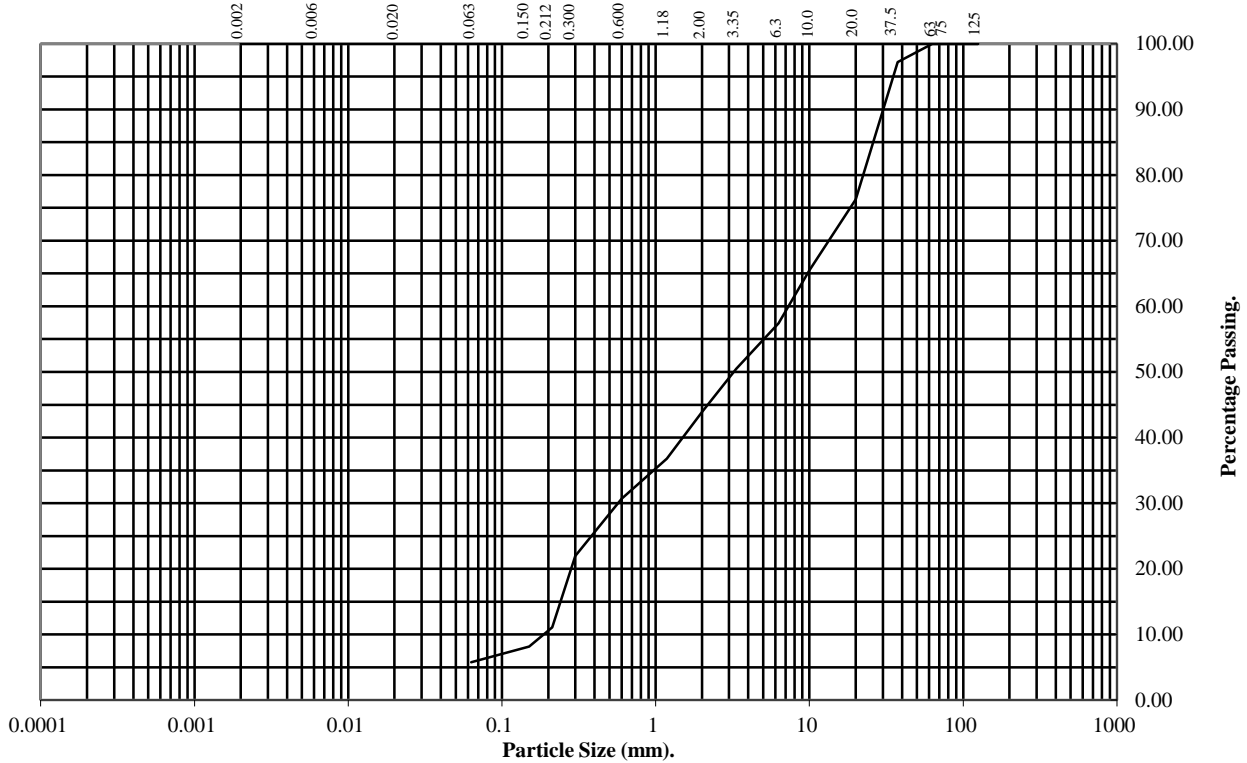
BS1377 : Part 2 : 1990

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



Arklow WWTP Land GI

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

# PARTICLE SIZE DISTRIBUTION TEST

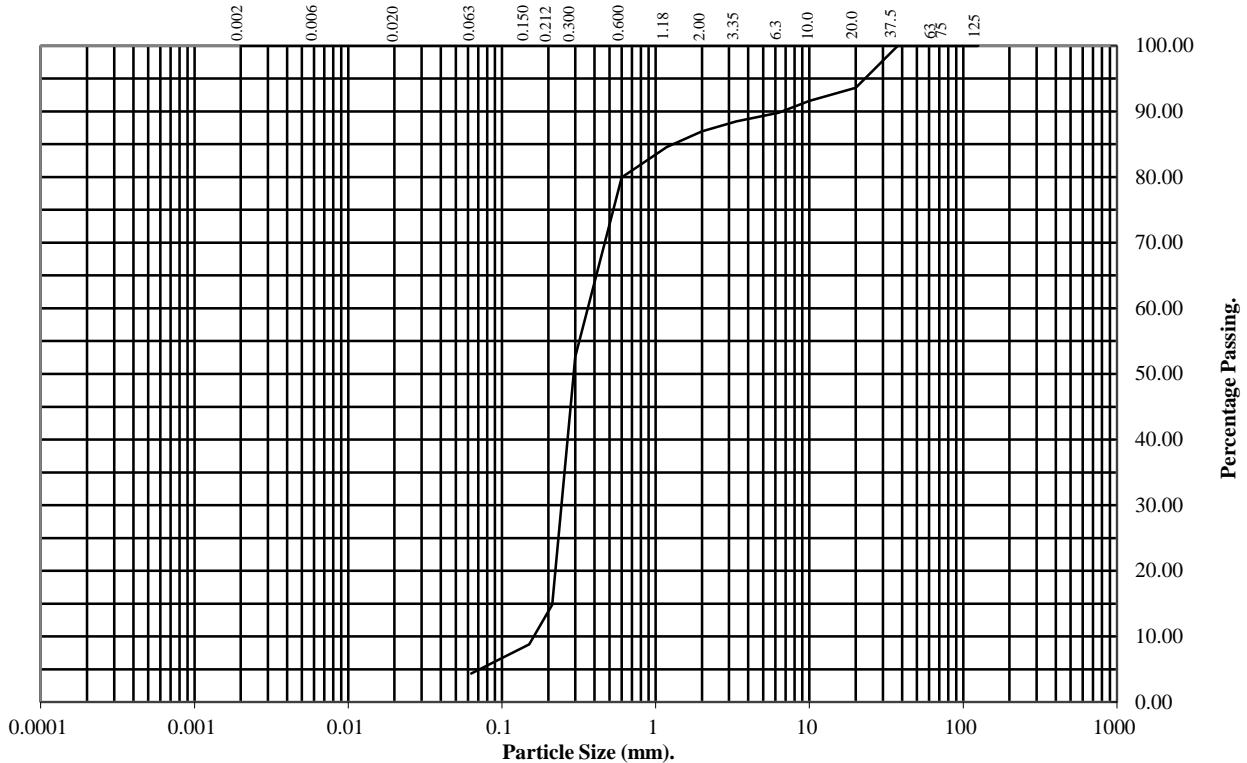
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

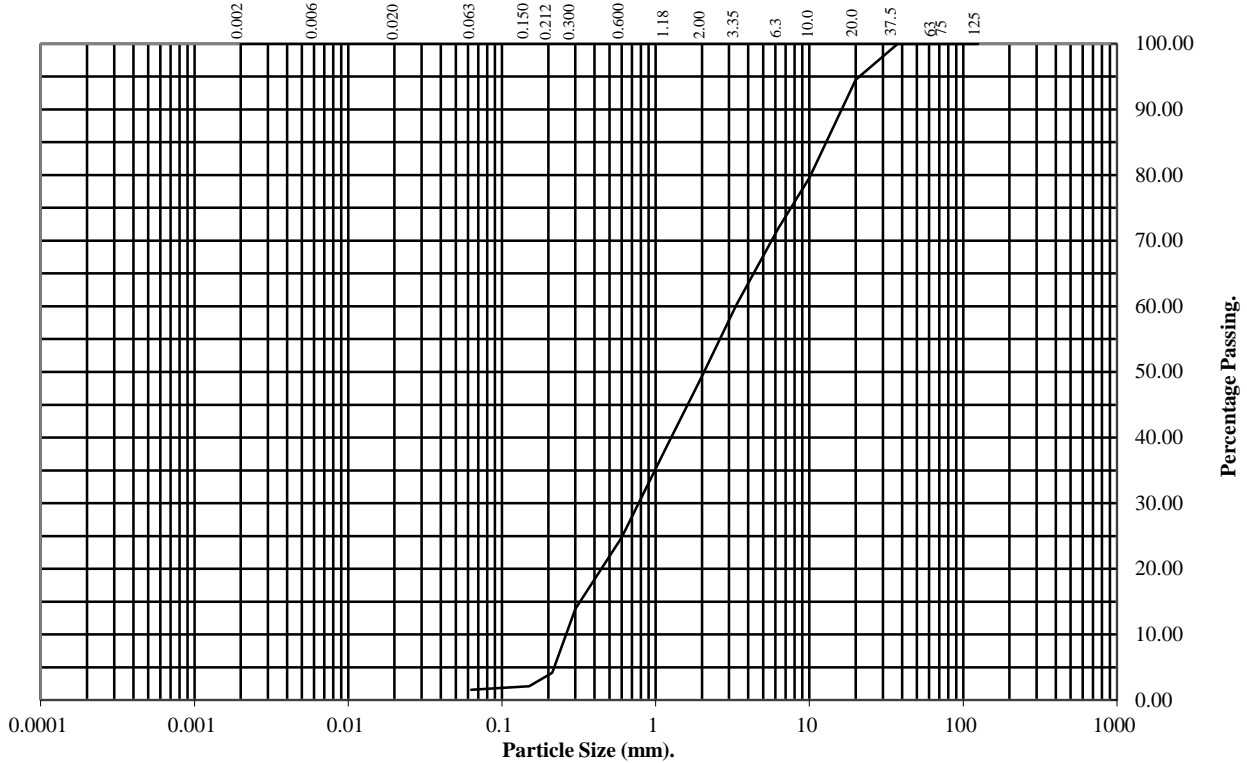
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

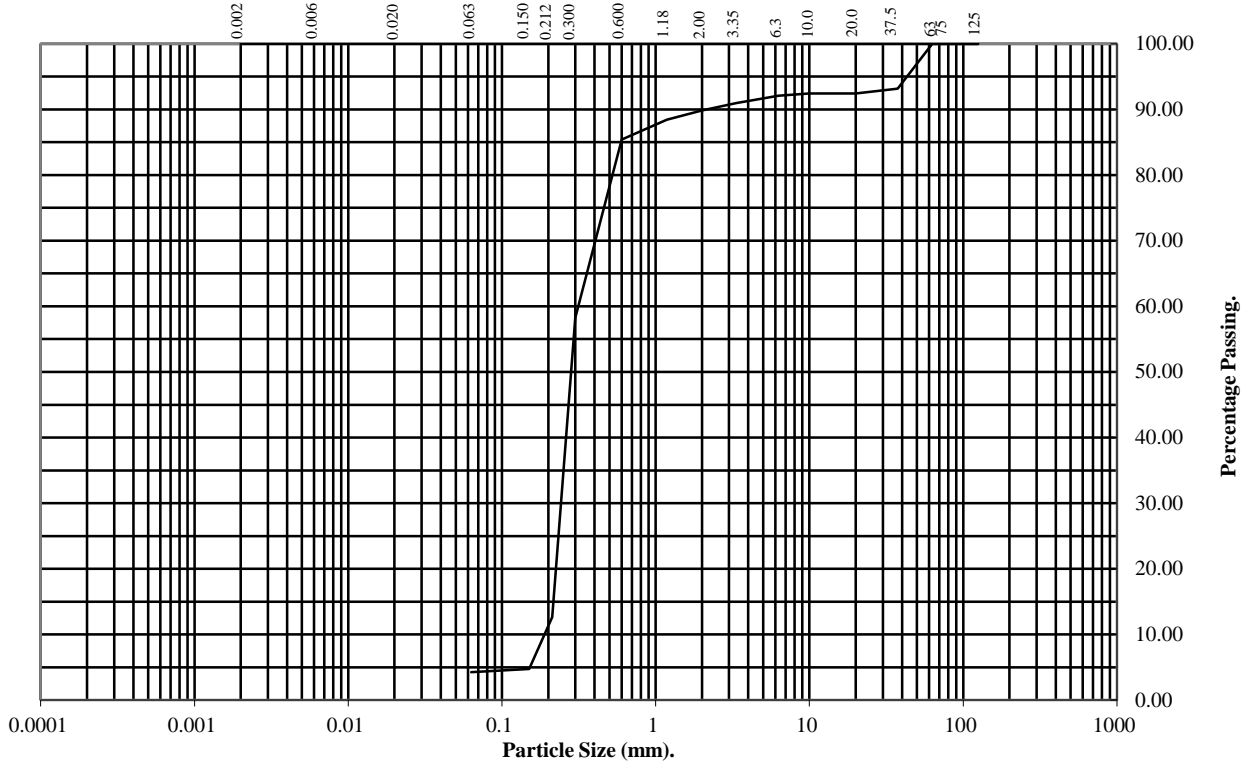
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

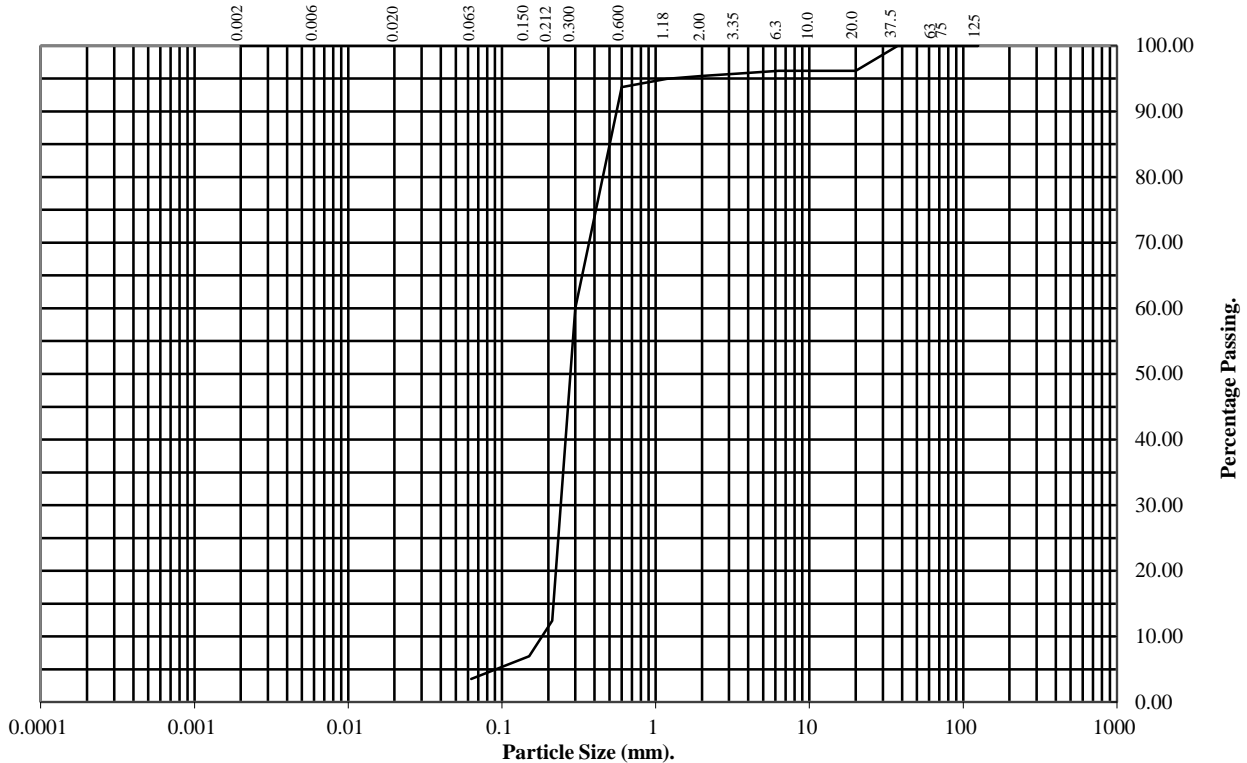
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

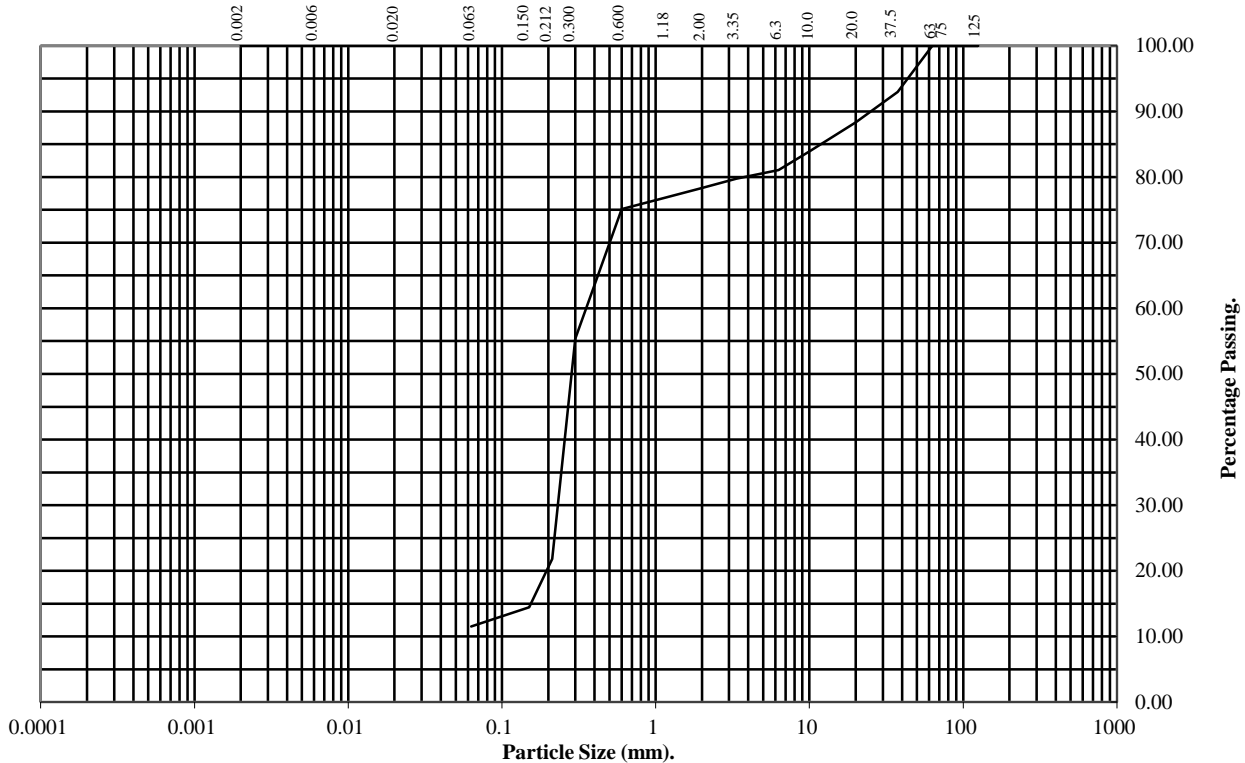
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

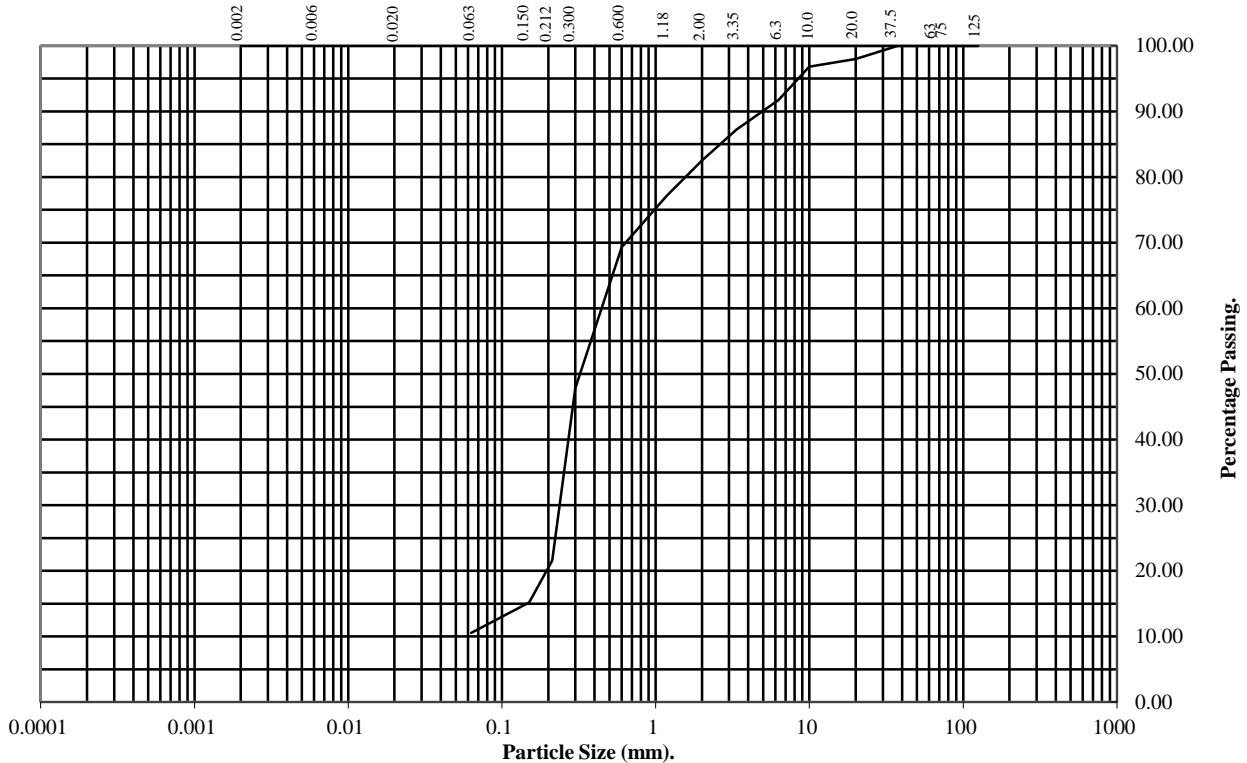
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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



# PARTICLE SIZE DISTRIBUTION TEST

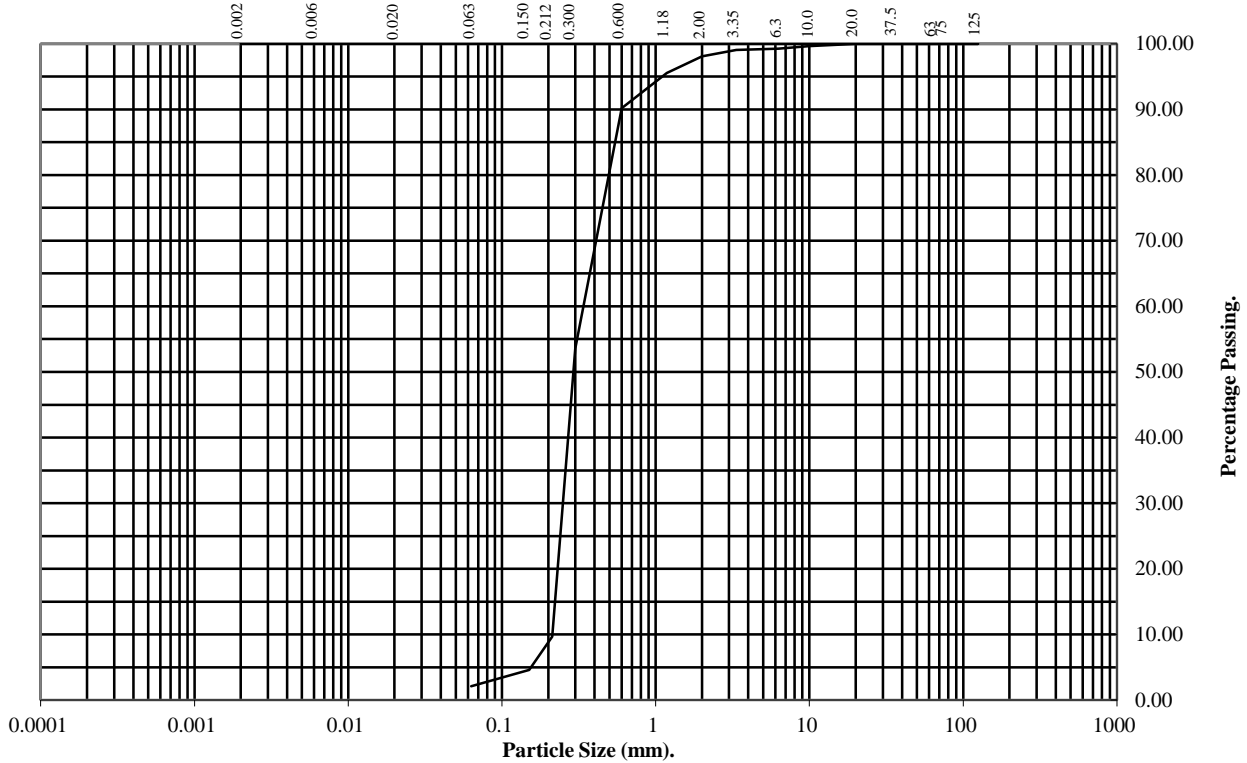
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

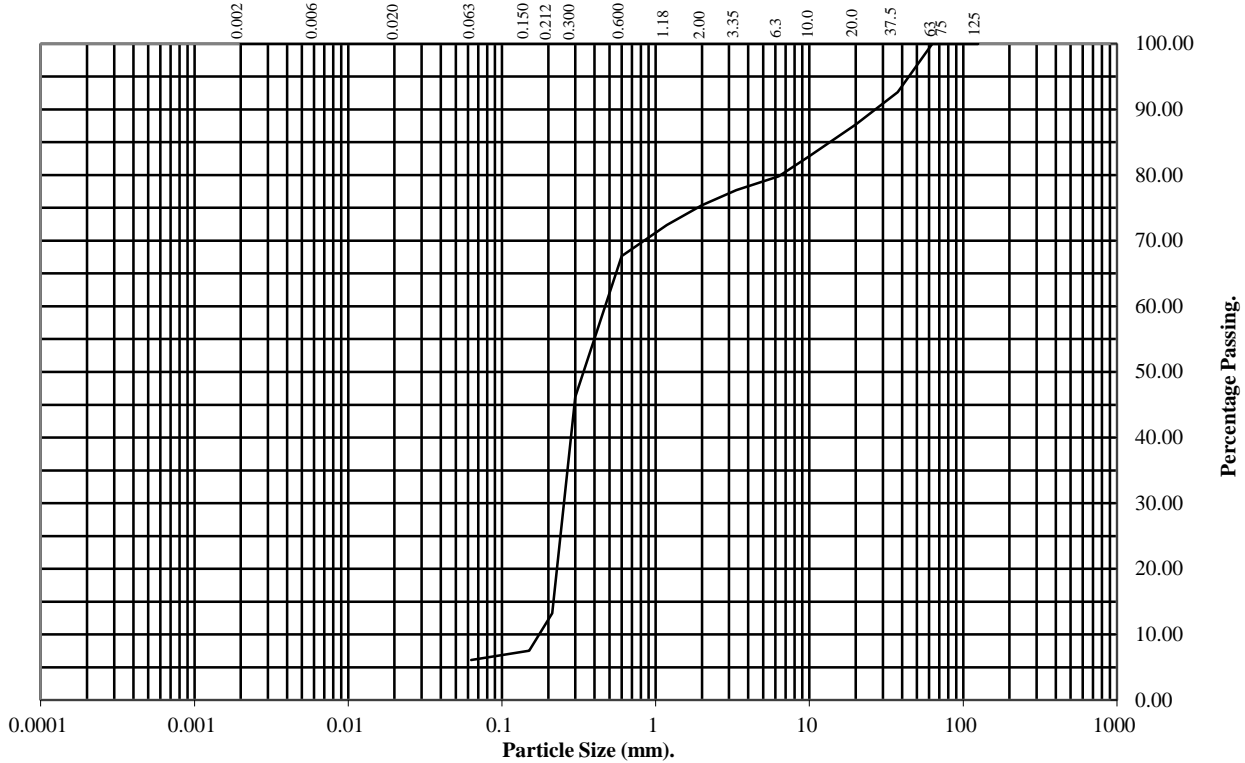
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

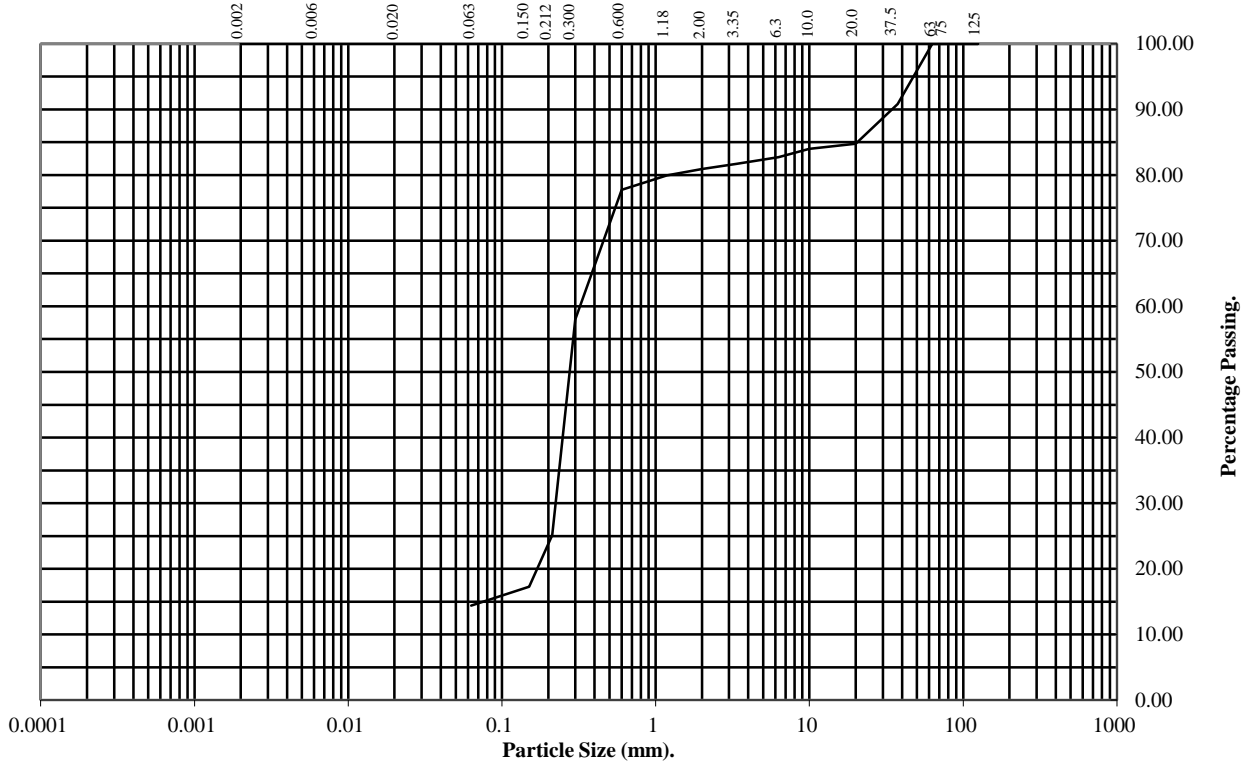
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

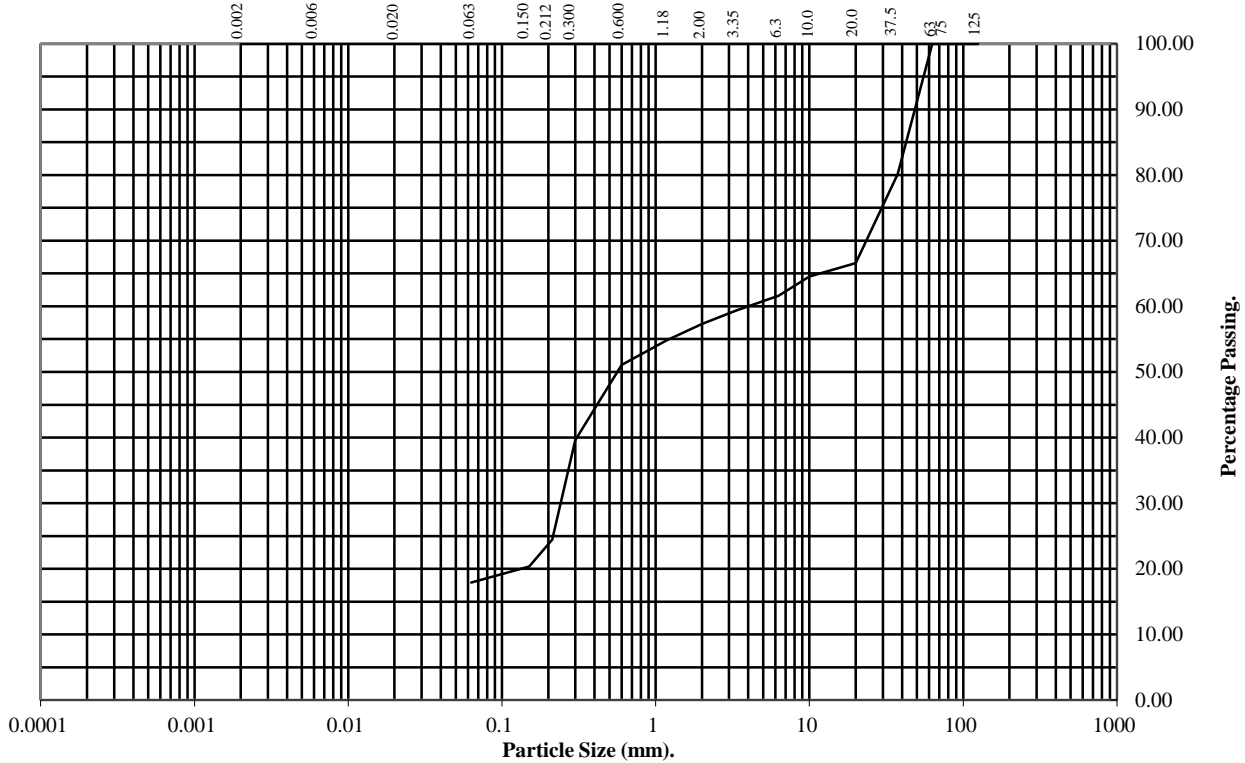
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

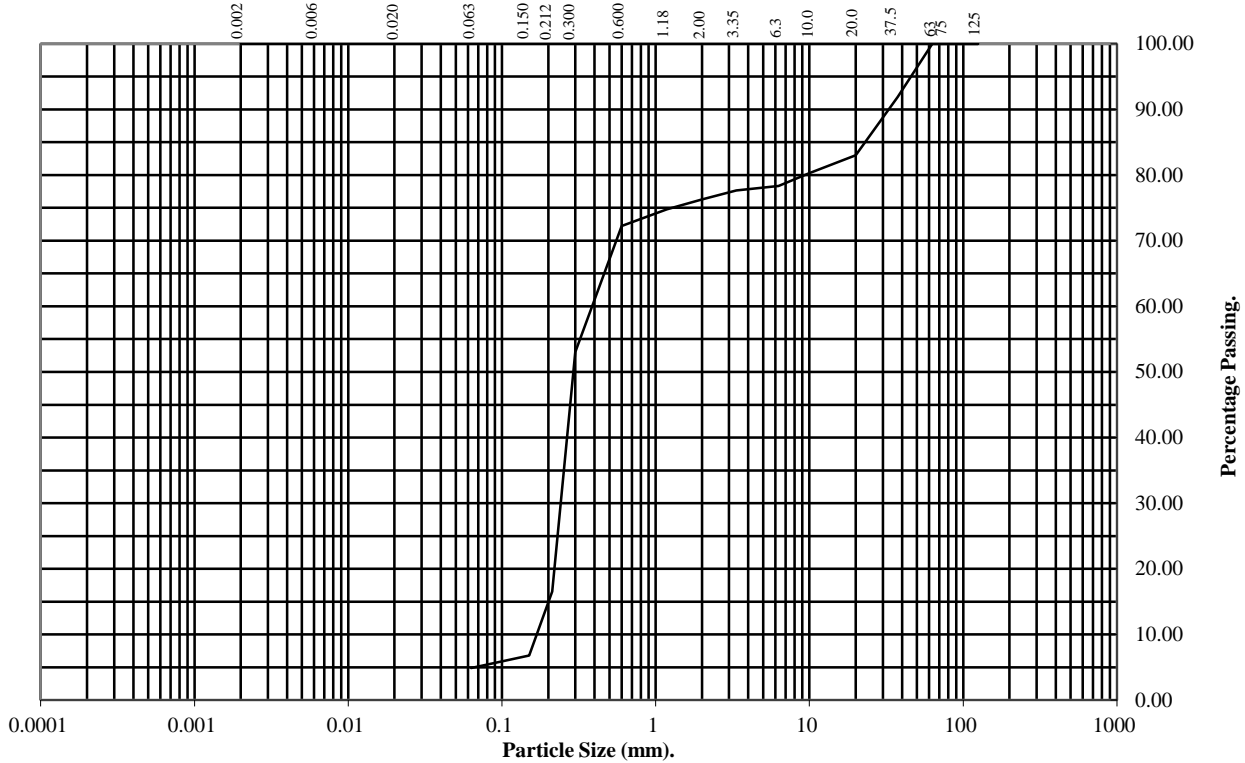
**BS1377 : Part 2 : 1990**

Wet Sieve, Clause 9.2

**Hole Number:** 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



**Arklow WWTP Land GI**

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

# PARTICLE SIZE DISTRIBUTION TEST

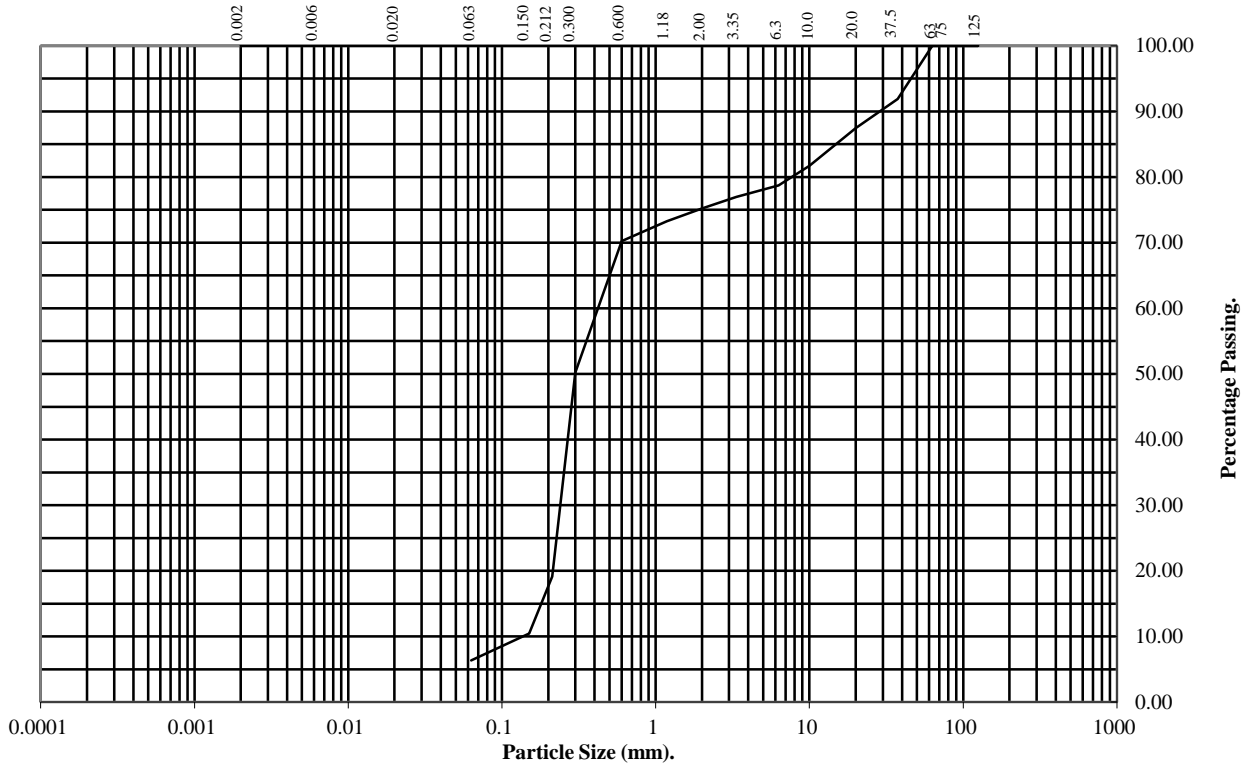
**BS1377 : Part 2 : 1990**

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



**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





## Summary of Chemical Analysis Soil Samples

Our Ref 18-05528

Client Ref PSL18/1057

Contract Title Arklow WWTP Land

<b>Lab No</b>	1308213	1308214	1308215	1308216	1308217
<b>Sample ID</b>	TP02	TP07	TP10	TP18	TP19
<b>Depth</b>	0.50	0.50	0.50	1.50	1.50
<b>Other ID</b>	1	1	2	4	4
<b>Sample Type</b>	B	B	D	B	B
<b>Sampling Date</b>	08/03/18	08/03/18	08/03/18	08/03/18	08/03/18
<b>Sampling Time</b>	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units					
<b>Inorganics</b>								
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



## 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  
(Director)

A Watkins  
(Director)

R Berriman  
(Quality Manager)

L Knight  
(Senior Technician)

C Marshall  
(Laboratory Manager)

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](mailto:rgunson@prosoils.co.uk)  
[awatkins@prosoils.co.uk](mailto:awatkins@prosoils.co.uk)

Page 1 of

# 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.



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.



Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# 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 <sup>3</sup> 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 CL.
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.



Arklow WWTP Land GI

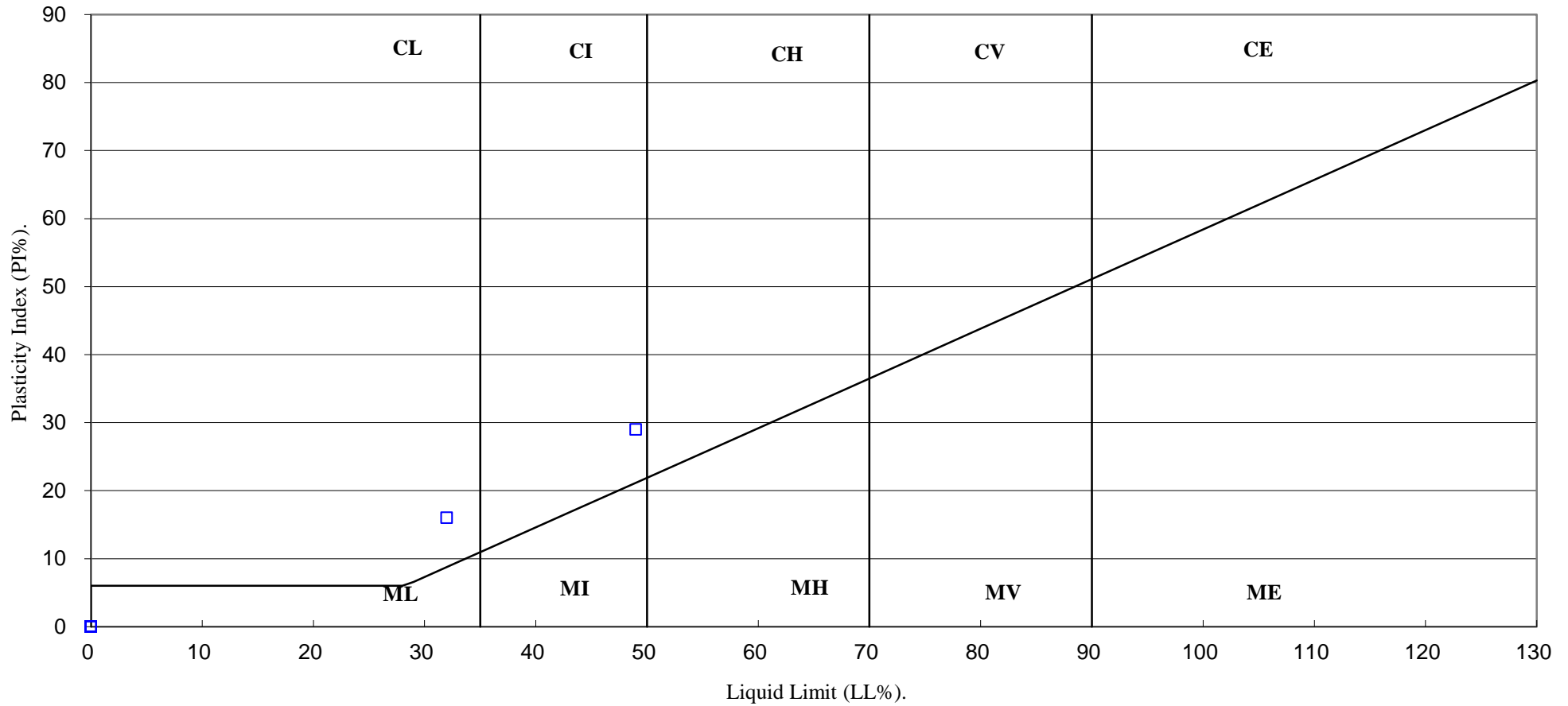
Contract No:

PSL18/1055

Client Ref:

17-1455

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



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)

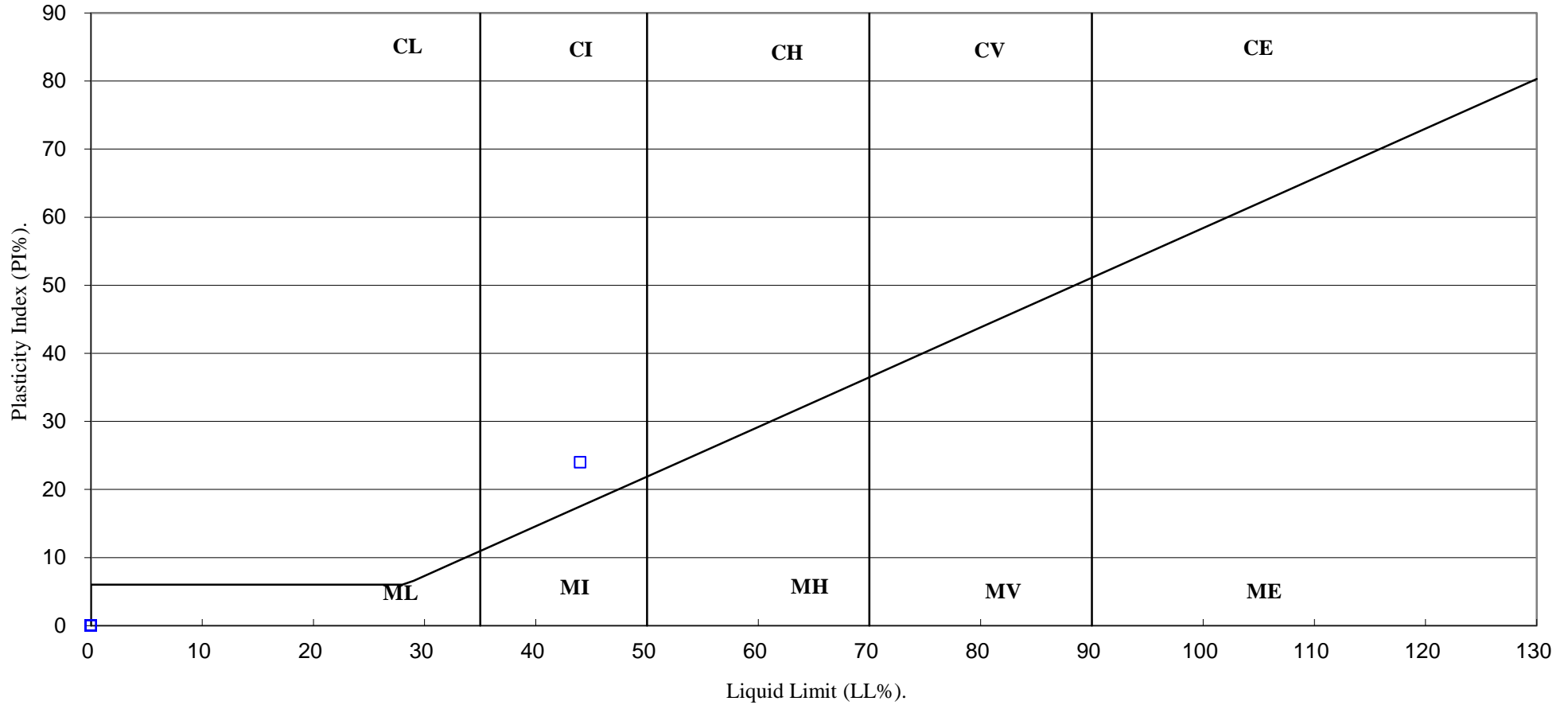
Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % <small>Clause 3.2</small>	Linear Shrinkage % <small>Clause 6.5</small>	Particle Density Mg/m <sup>3</sup> <small>Clause 8.2</small>	Liquid Limit % <small>Clause 4.3/4</small>	Plastic Limit % <small>Clause 5.3</small>	Plasticity Index % <small>Clause 5.4</small>	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.

 4043		Arklow WWTP Land GI	Contract No:
			PSL18/1055
			Client Ref:
			17-1455

# PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

**PSL**  
Professional Soils Laboratory

Arklow WWTP Land GI

Contract No:

PSL18/1055

Client Ref:

17-1455



# PARTICLE SIZE DISTRIBUTION TEST

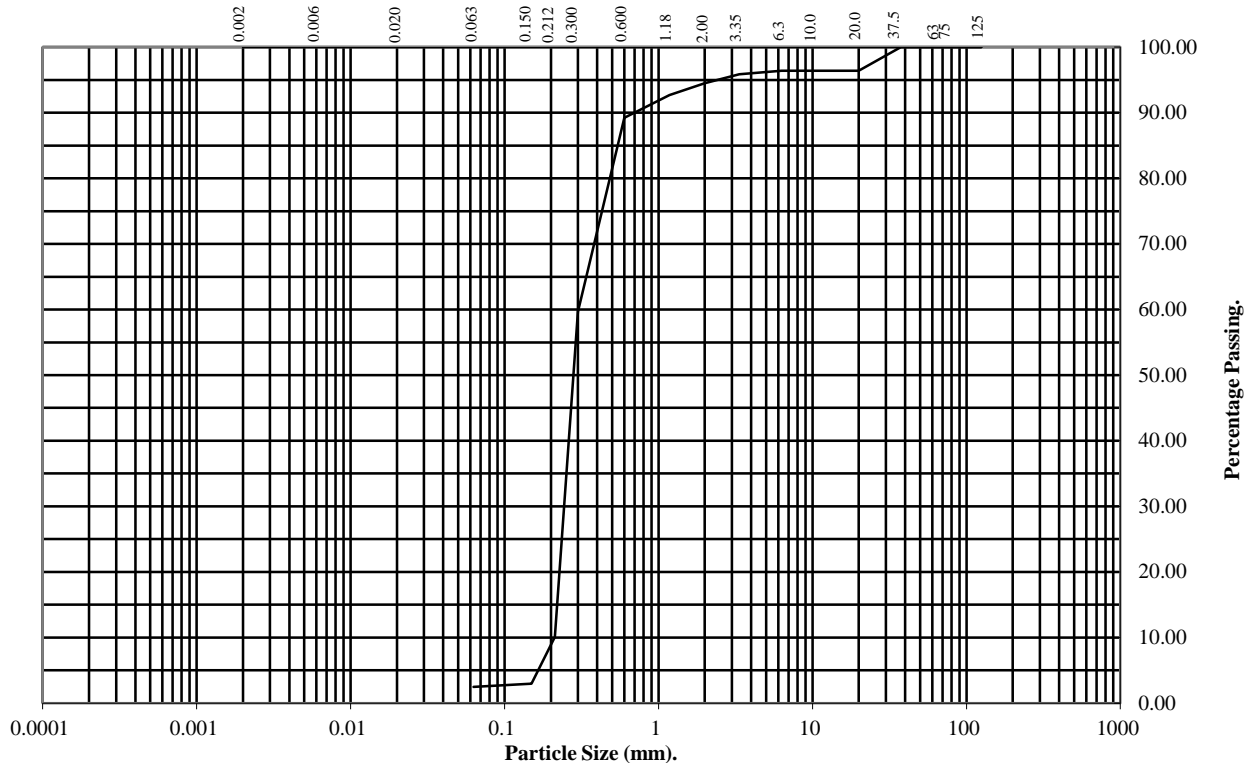
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

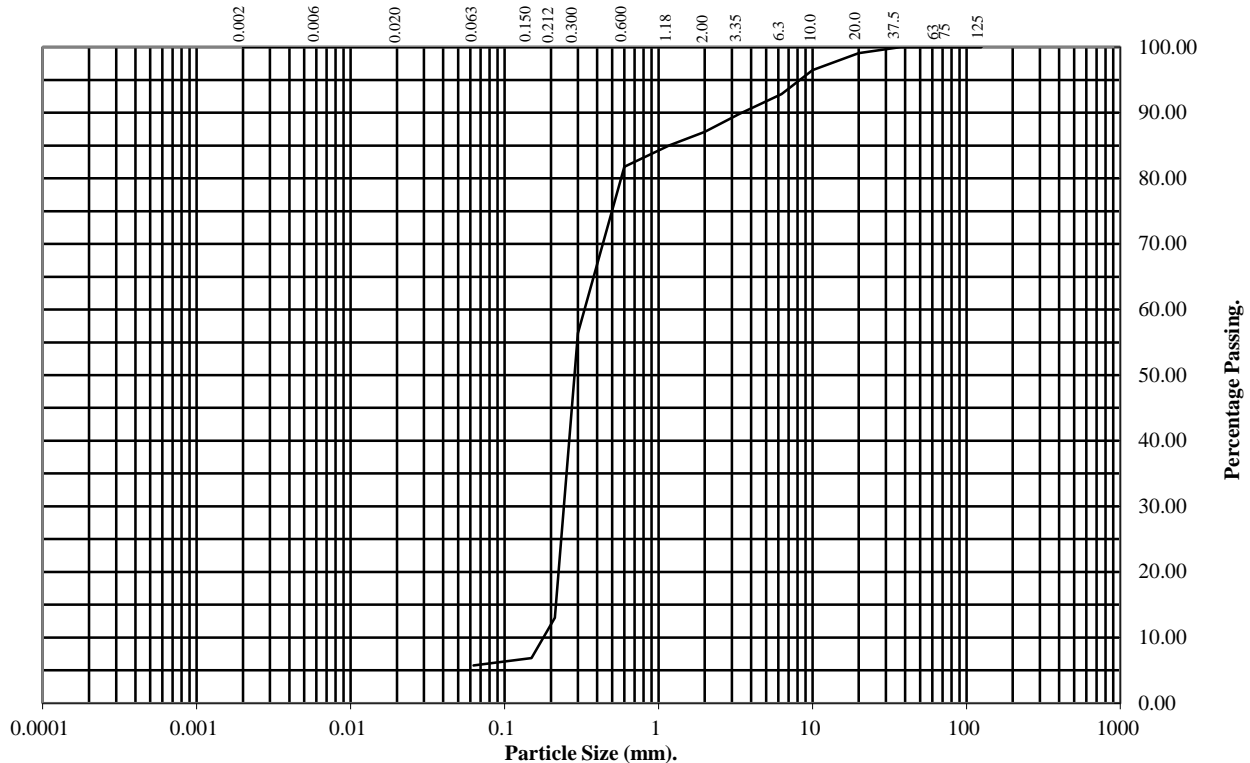
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

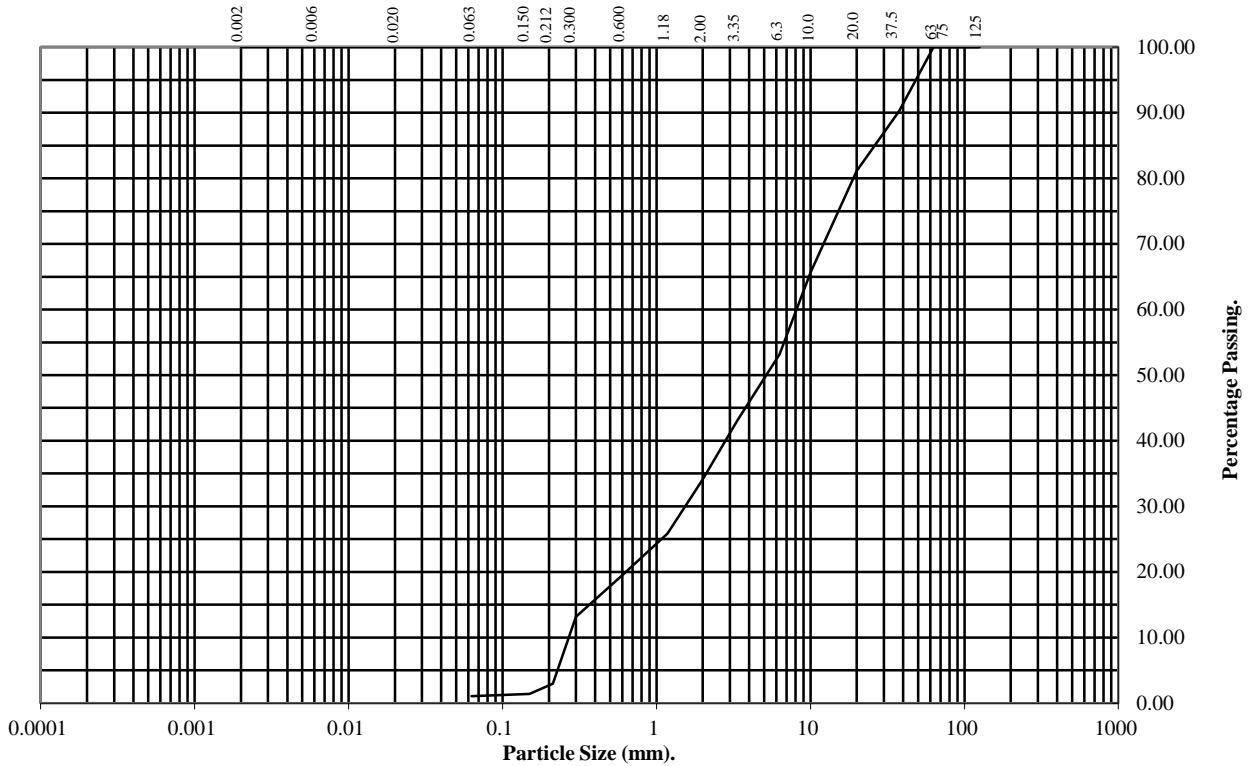
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

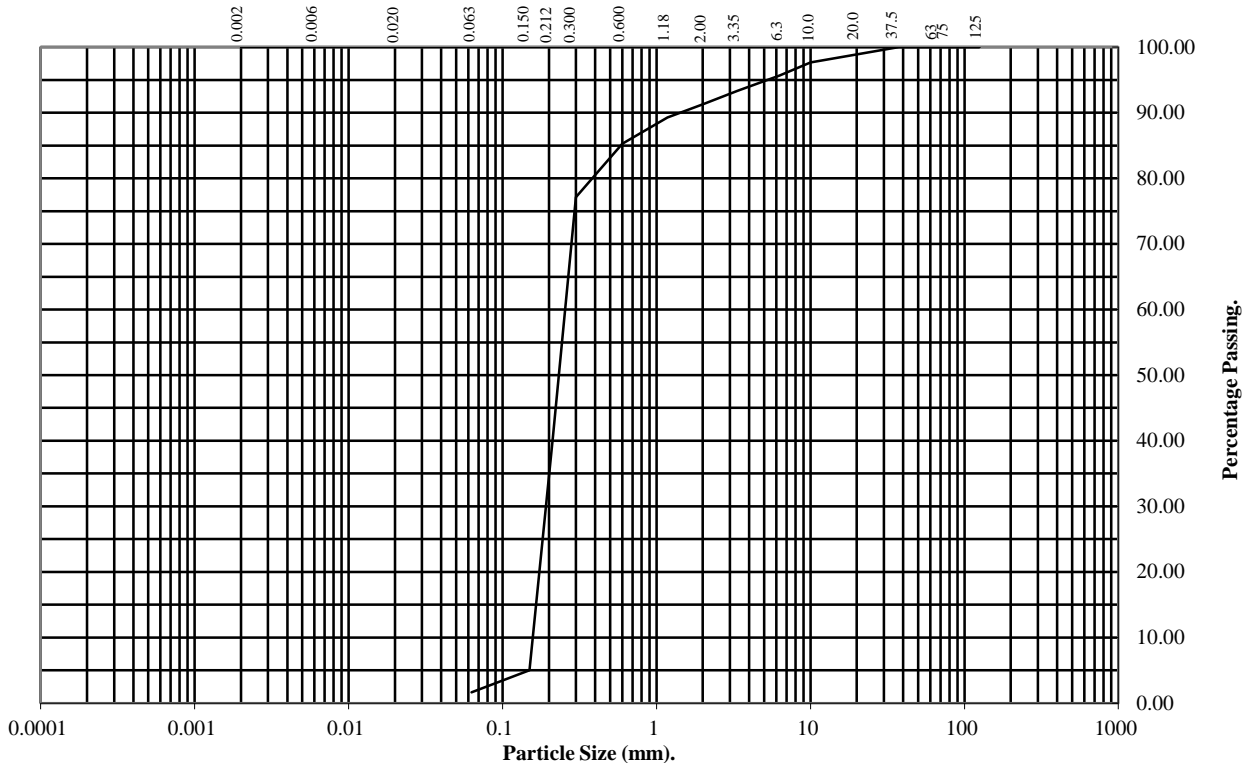
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

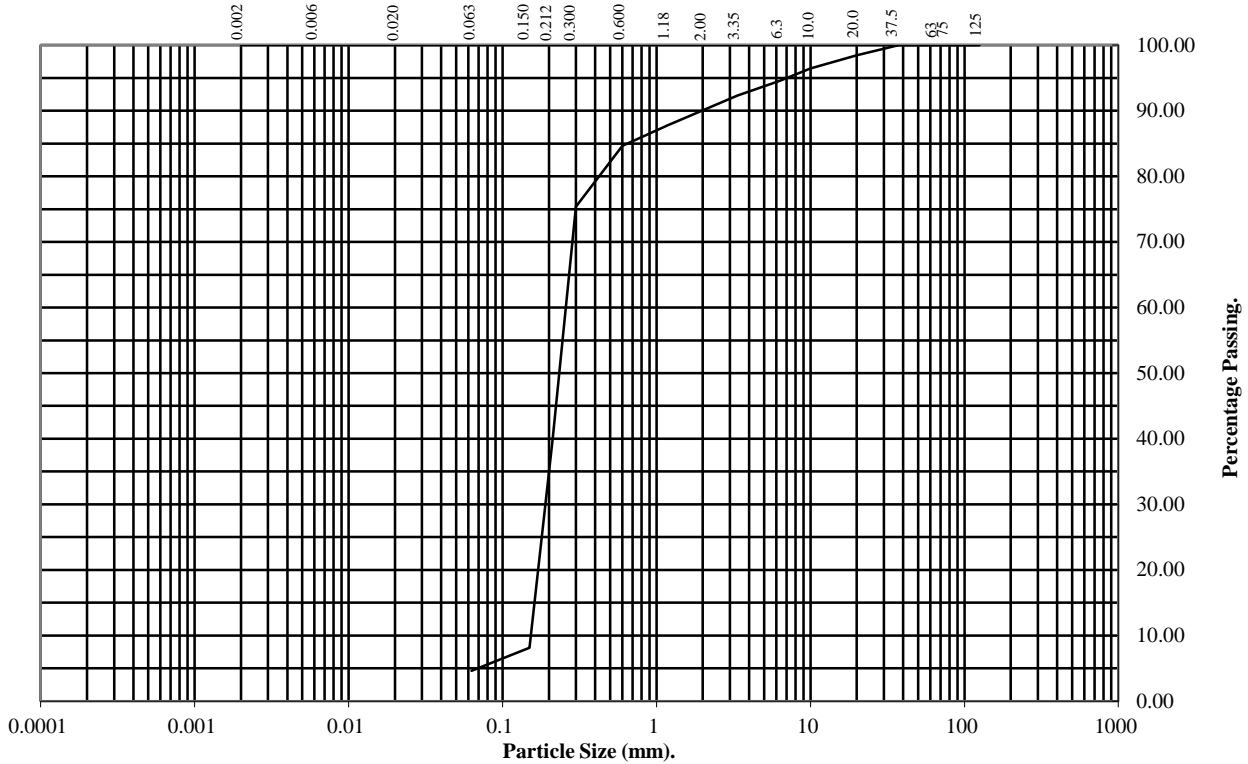
BS1377 : Part 2 : 1990

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



Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

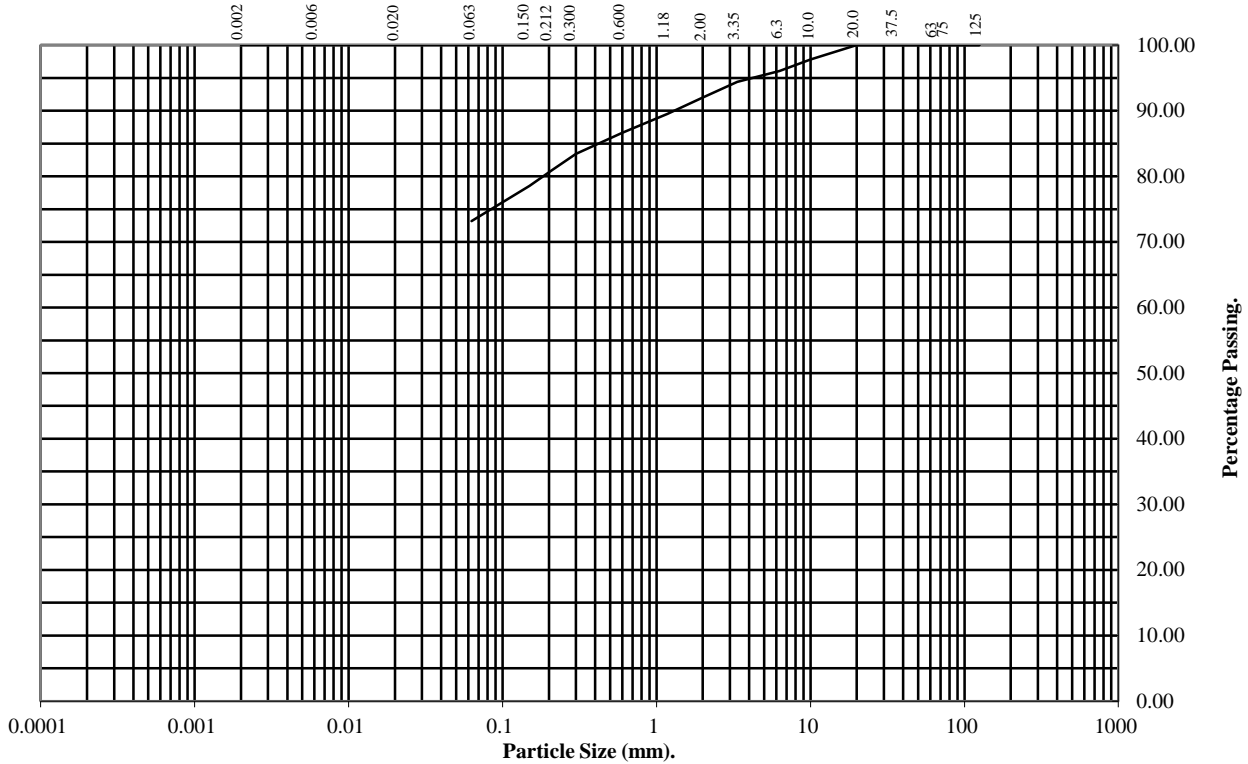
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

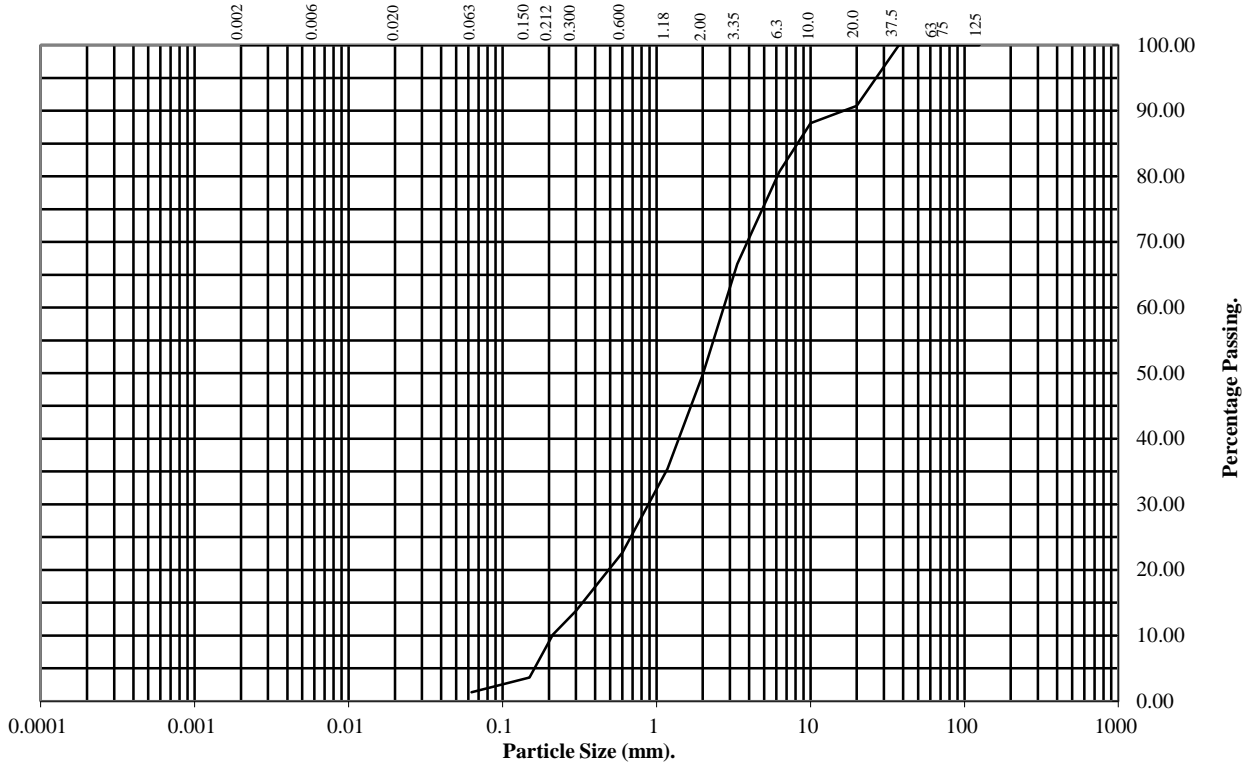
BS1377 : Part 2 : 1990

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

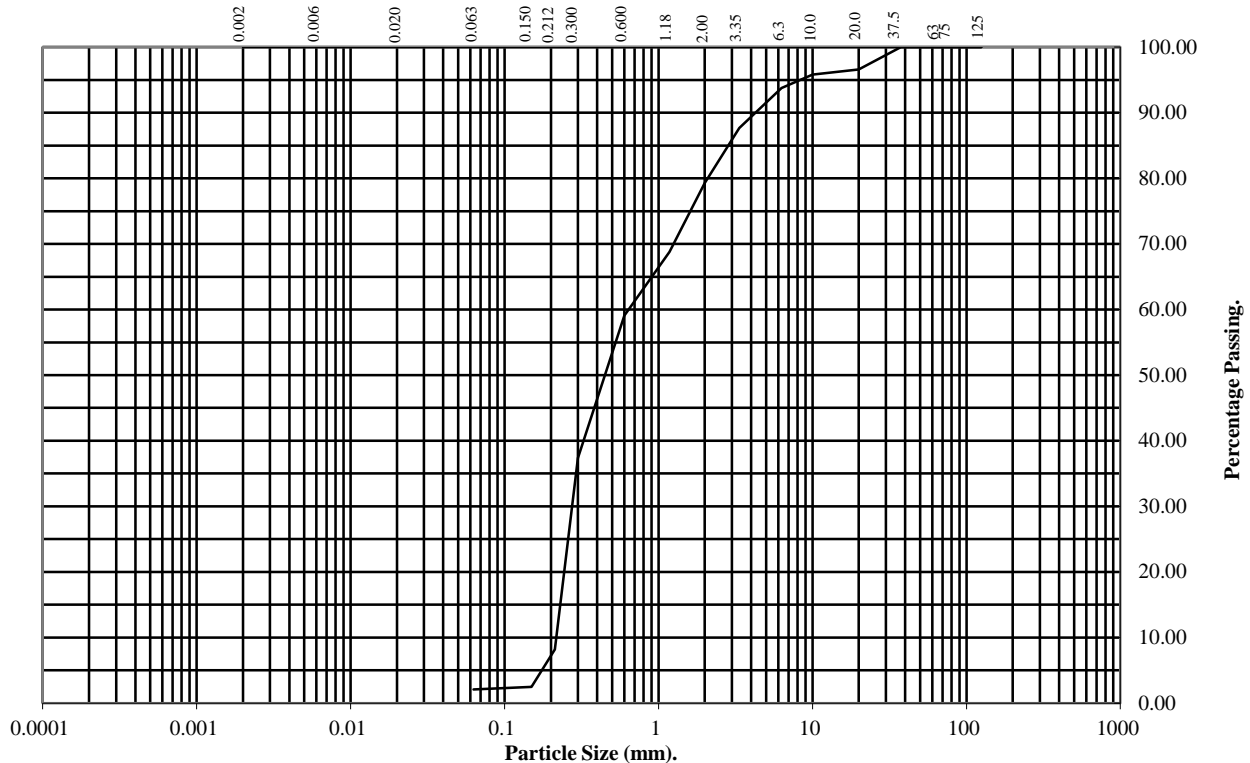
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>



# PARTICLE SIZE DISTRIBUTION TEST

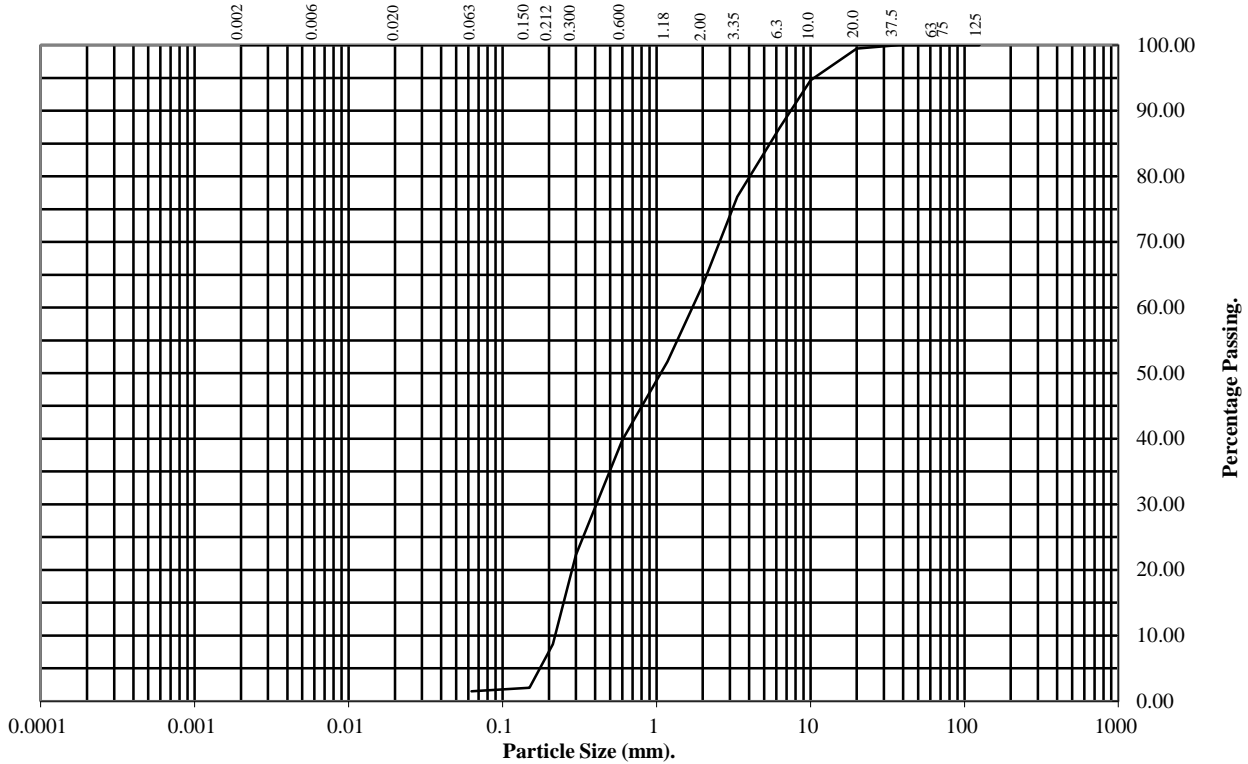
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

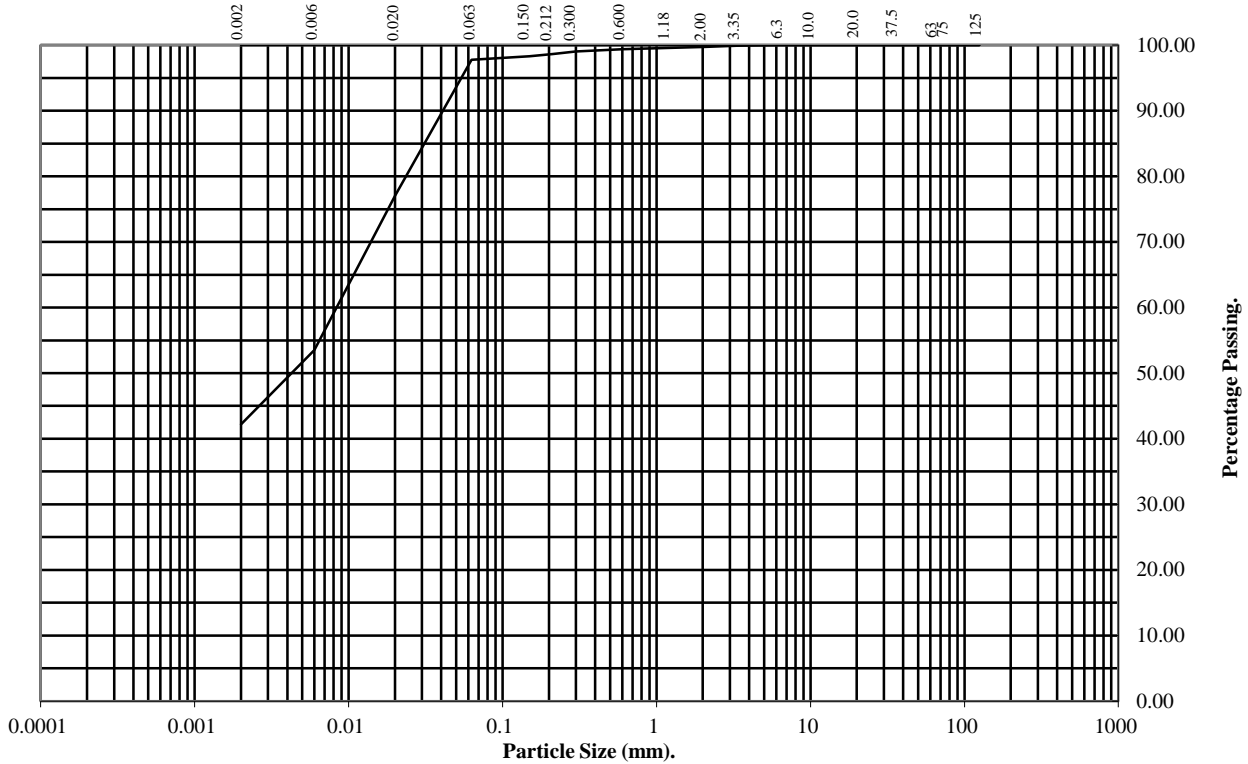
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

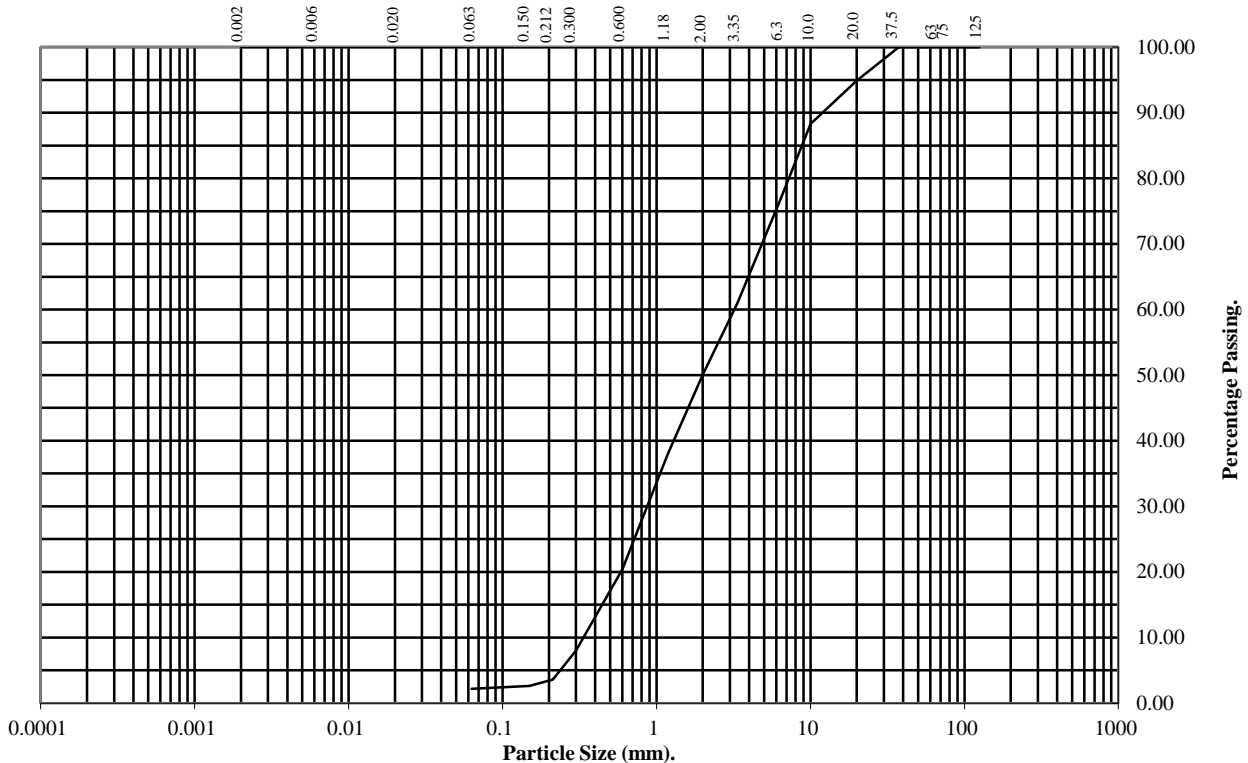
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

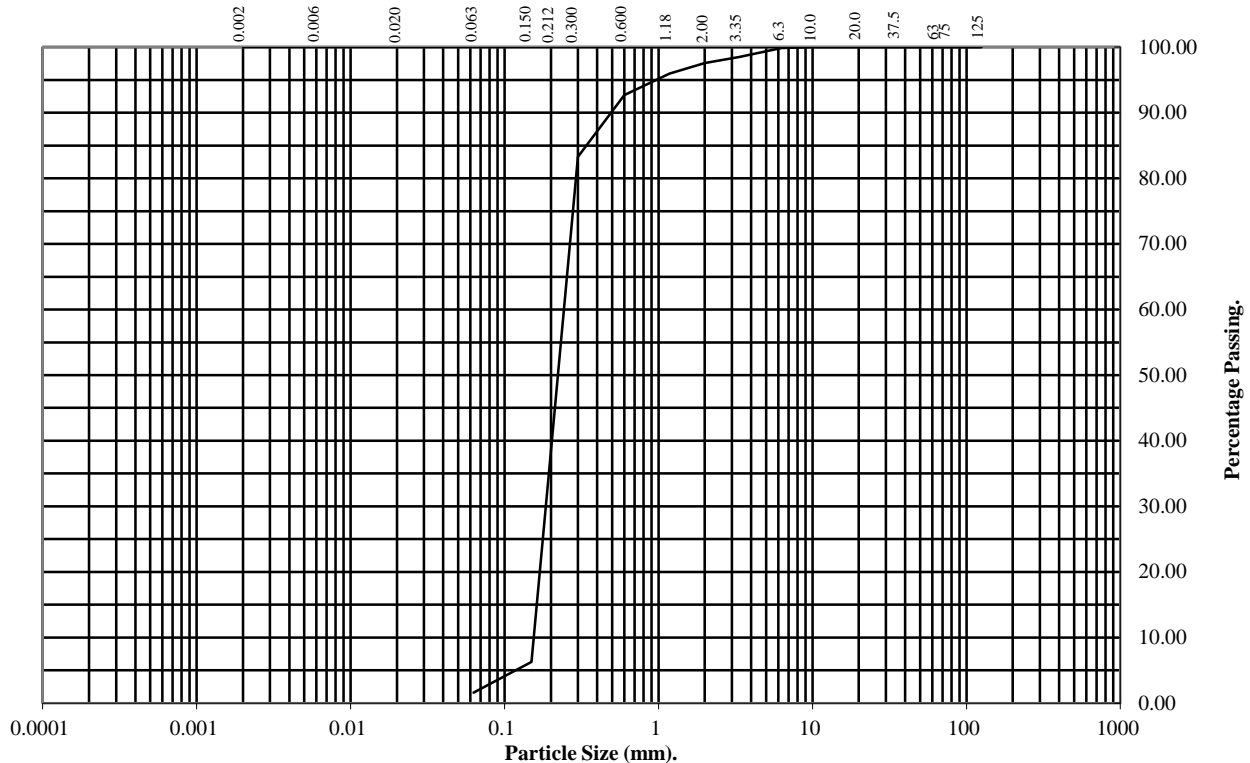
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

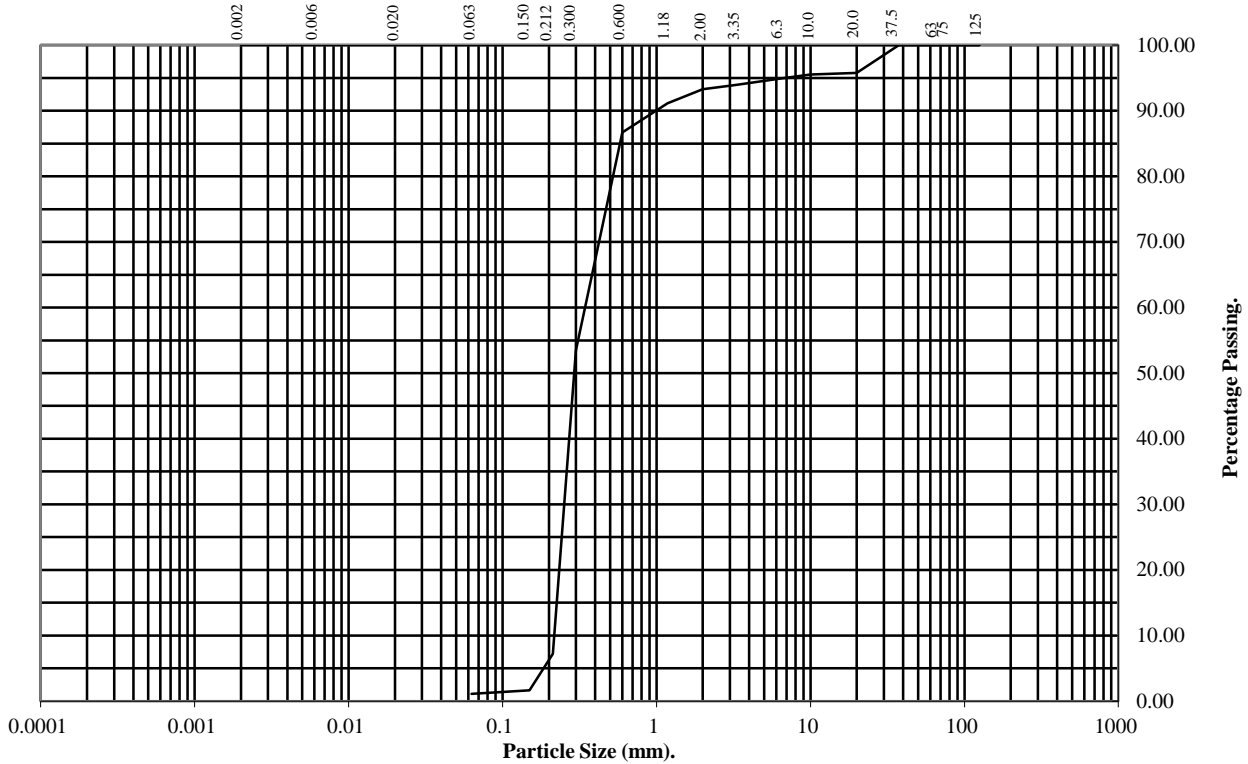
BS1377 : Part 2 : 1990

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



Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

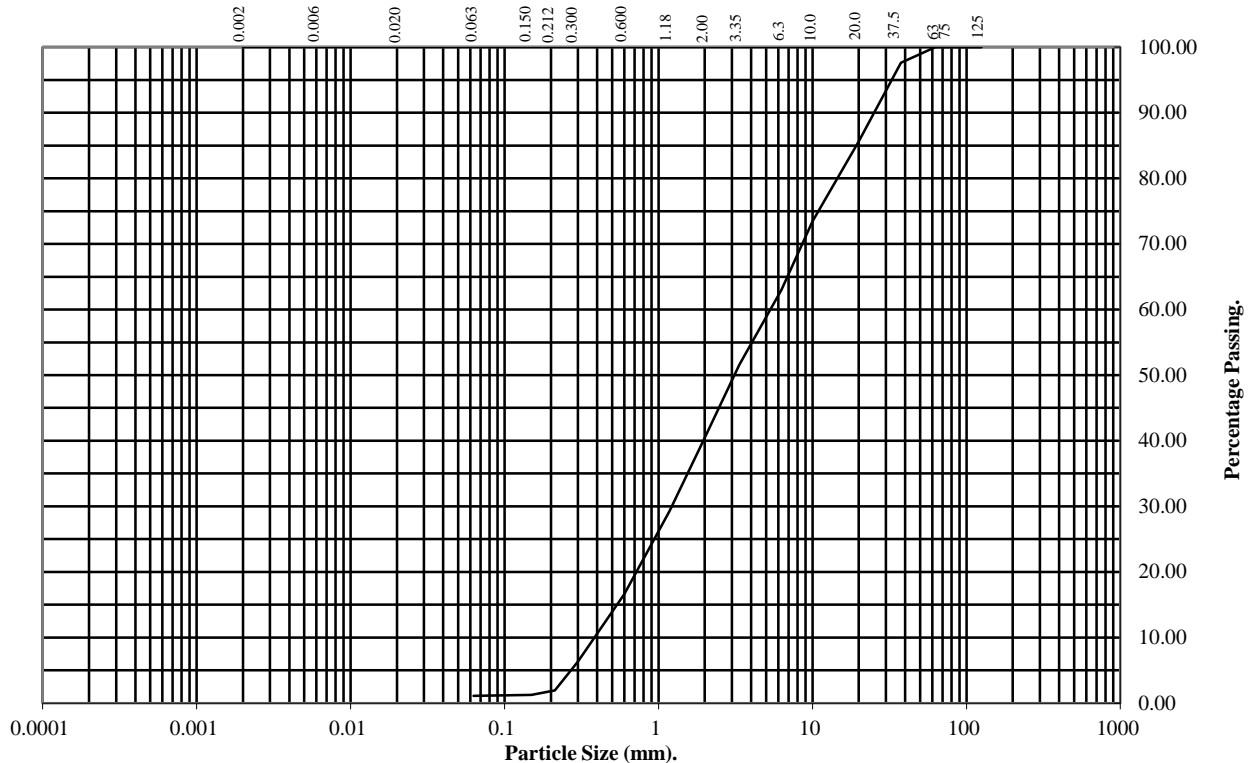
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

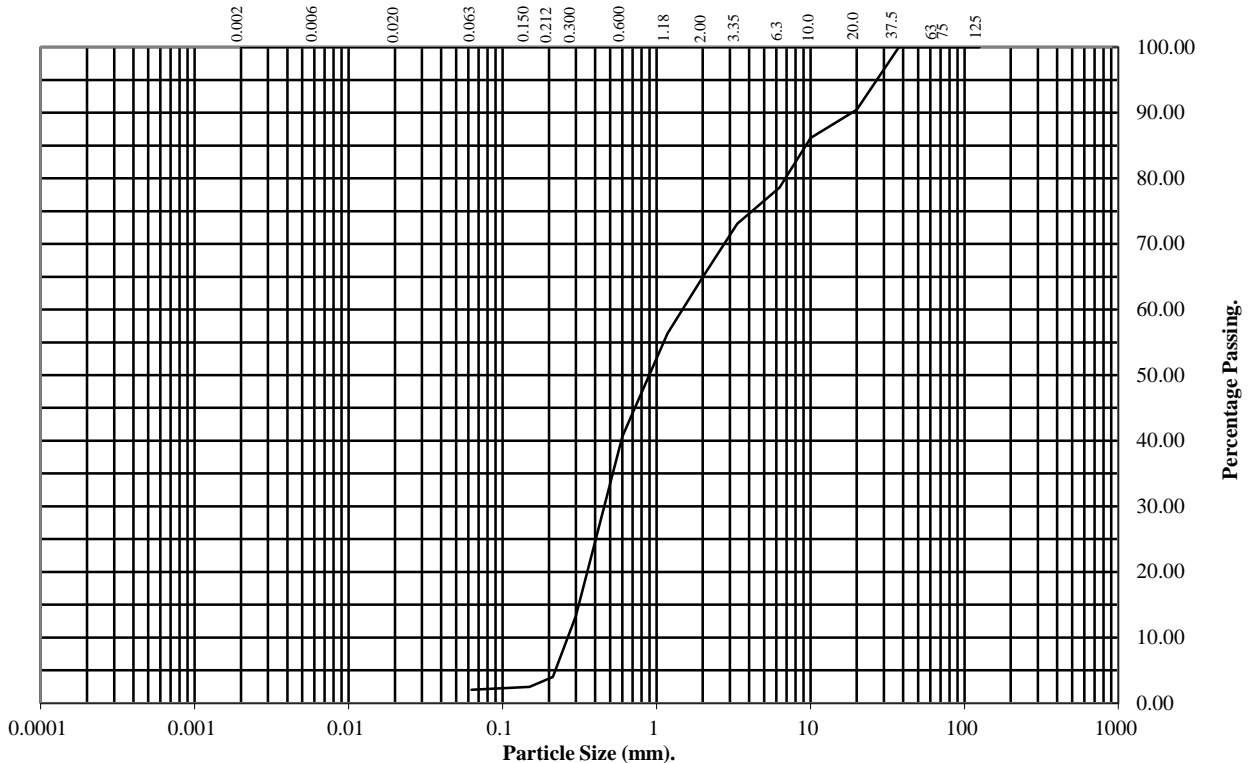
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# PARTICLE SIZE DISTRIBUTION TEST

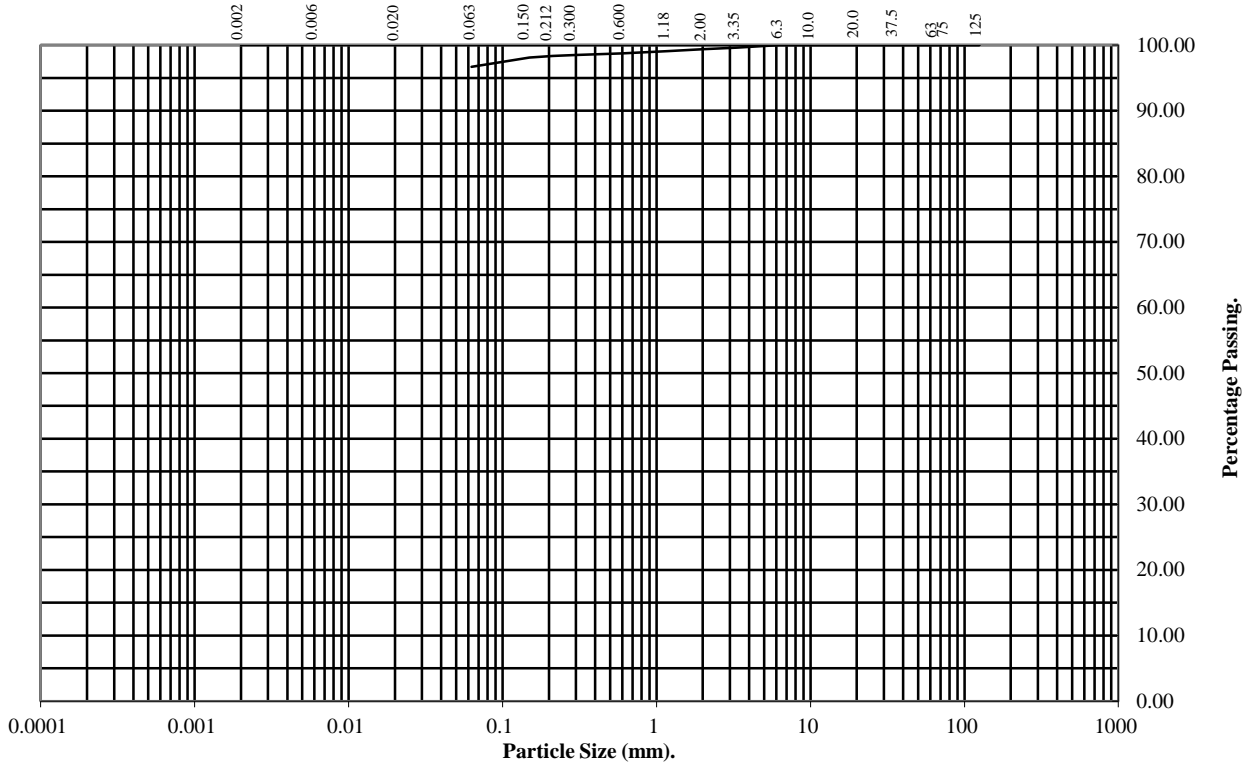
**BS1377 : Part 2 : 1990**

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



**Arklow WWTP Land GI**

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>



# UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

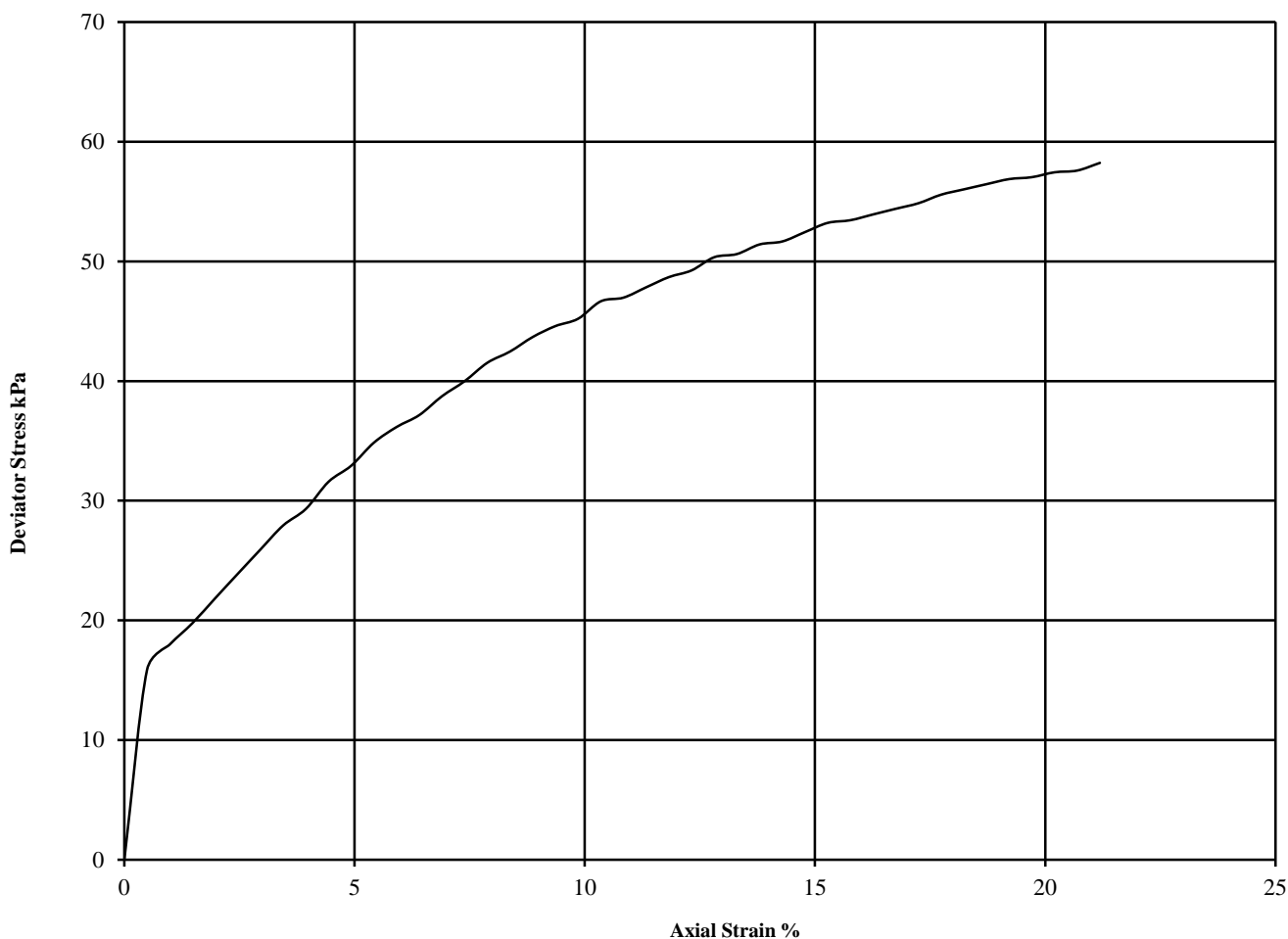
## WITHOUT MEASUREMENT OF PORE PRESSURE

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/m <sup>3</sup> )	Dry Density (Mg/m <sup>3</sup> )	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33 See summary of soil descriptions
1	27	2.10	1.66	$\theta_3$ 290	$(\theta_1 - \theta_3)_f$ 58	$\frac{1}{2}(\theta_1 - \theta_3)_f$ 29	21.2	Plastic	



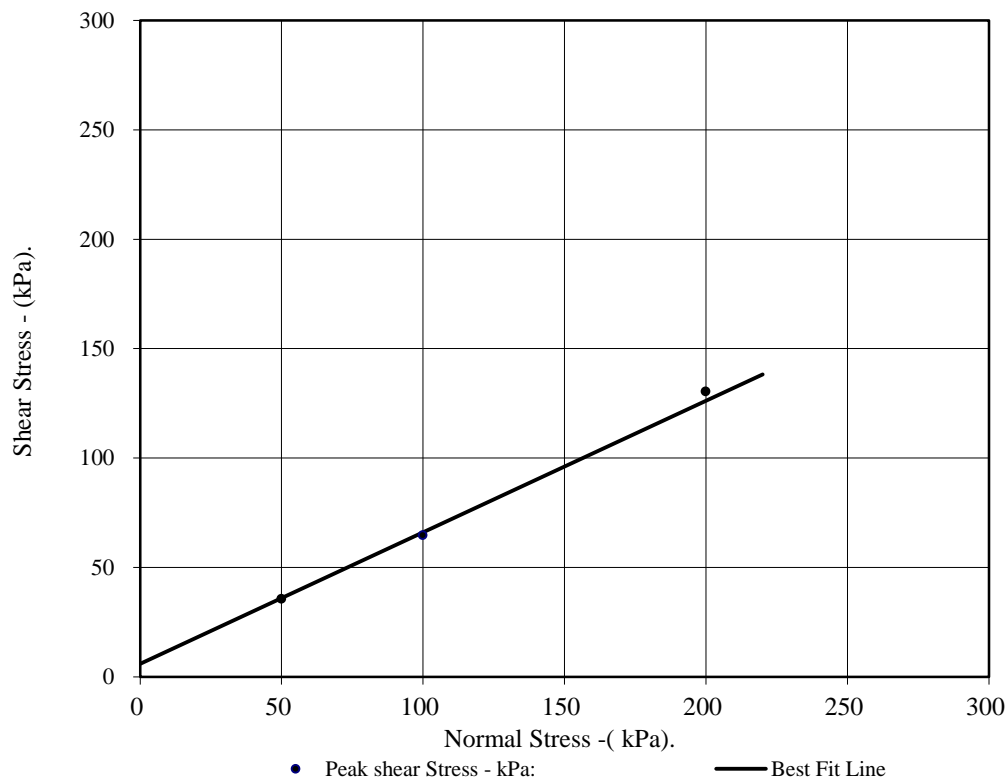
Arklow WWTP Land GI

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:	7.00		
Sample Number:	15		Base Depth:			
Sample Conditions:	Submerged		Sample Type	B		
Particle Density - Mg/m <sup>3</sup> :	2.65	Assumed	Remarks:			
Sample Preparation:	Remoulded using 2.5kg effort. Material tested passing 2mm sieve					
Sample Description:	See summary of soil descriptions.					
<b>STAGE</b>			<b>1</b>	<b>2</b>	<b>3</b>	
<b>Initial Conditions</b>						
Height - mm:			19.54	19.54	19.54	
Length - mm:			60.03	60.03	60.03	
Moisture Content - %:			15	15	15	
Bulk Density - Mg/m <sup>3</sup> :			1.81	1.81	1.81	
Dry Density - Mg/m <sup>3</sup> :			1.57	1.56	1.57	
Voids Ratio:			0.692	0.694	0.688	
Normal Pressure- kPa			50	100	200	
<b>Consolidation Stage</b>						
Consolidated Height - mm:			18.76	18.71	18.28	
<b>Shearing Stage</b>						
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	
<b>Final Consolidated Conditions</b>						
Moisture Content - %:			21	21	21	
Bulk Density - Mg/m <sup>3</sup> :			1.88	1.89	1.94	
Dry Density - Mg/m <sup>3</sup> :			1.56	1.56	1.60	
<b>Peak</b>						
Angle of Shearing Resistance:( $\theta$ )			<b>31</b>			
Effective Cohesion - kPa:			<b>6</b>			



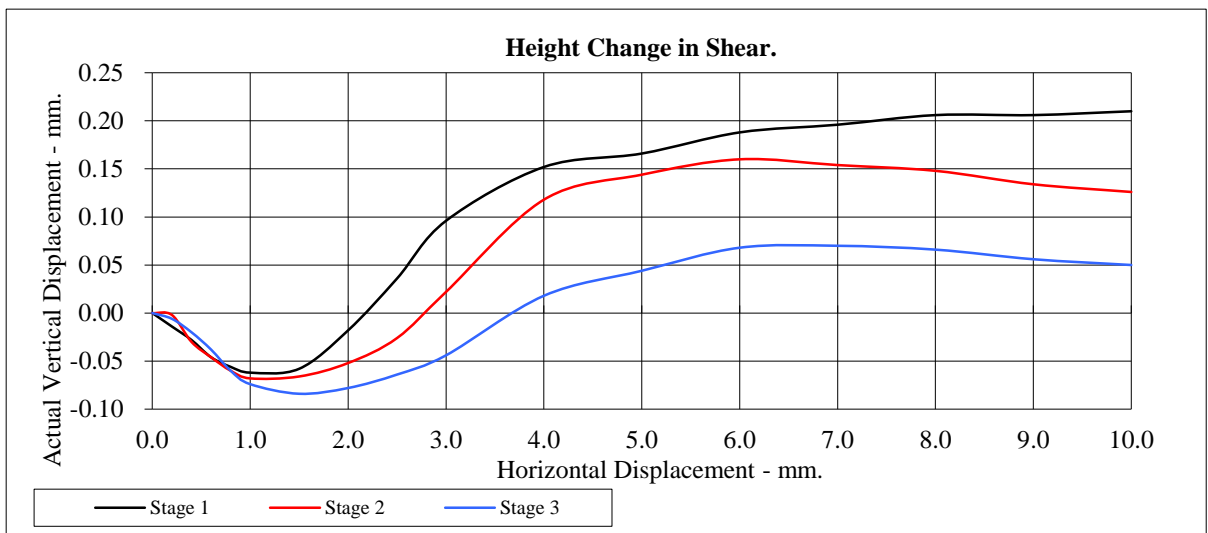
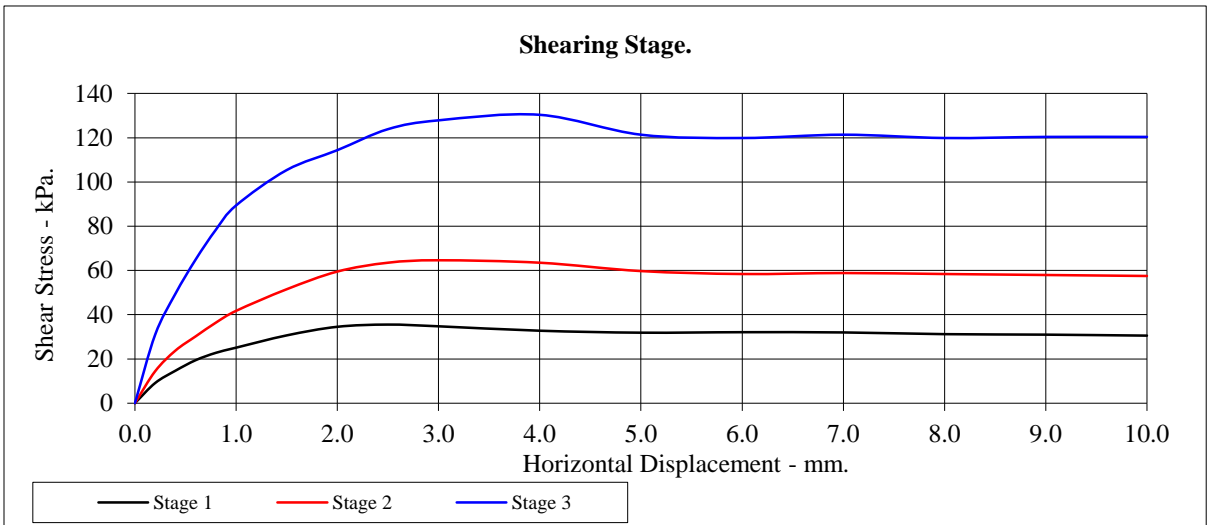
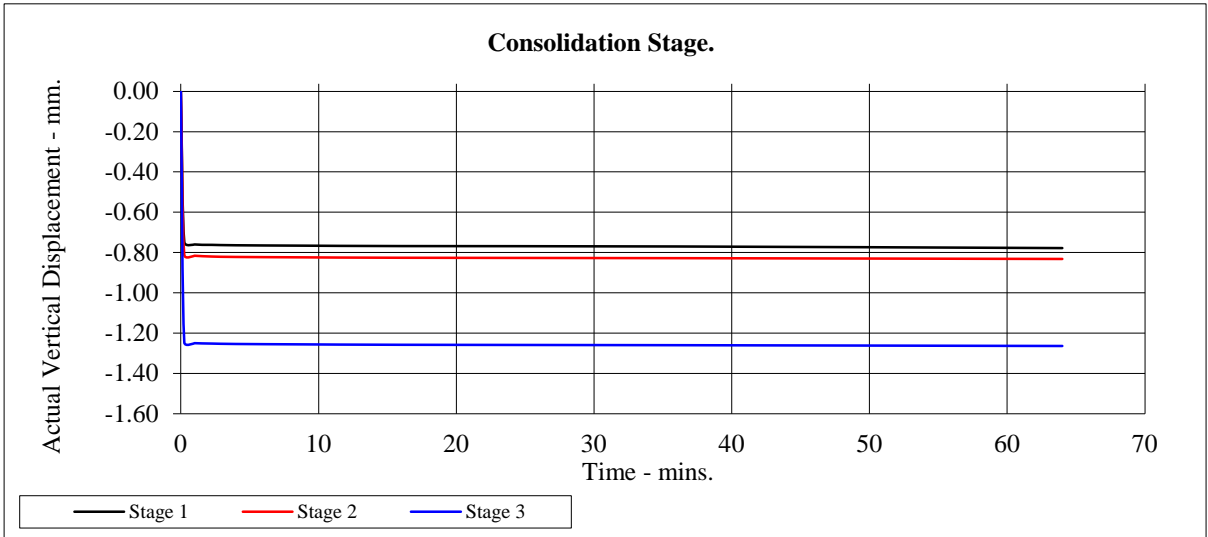
Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4.5.4

Hole Number:	BH02C	Top Depth:	7.00
Sample Number:	15	Base Depth:	



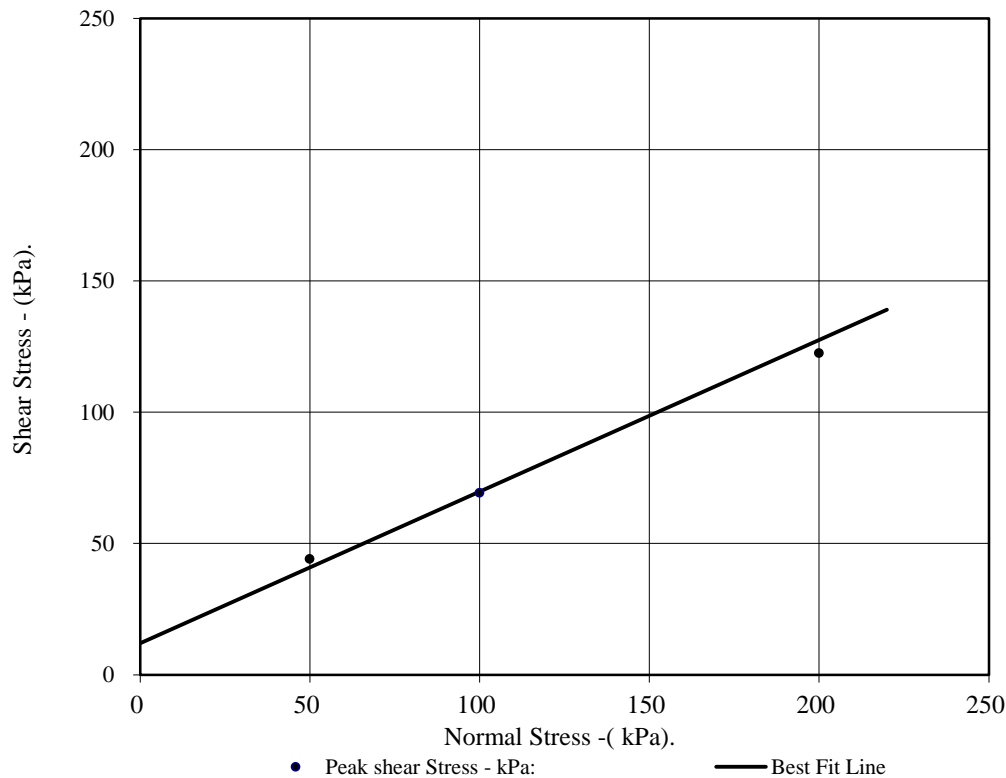
Arklow WWTP Land GI

<b>Contract No:</b>	PSL18/1055
<b>Client Ref:</b>	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/m <sup>3</sup> :	2.65	Assumed	Remarks:		
Sample Preparation:	Remoulded using 2.5kg effort. Material tested passing 2mm sieve				
Sample Description:	See summary of soil descriptions.				
<b>STAGE</b>			<b>1</b>	<b>2</b>	<b>3</b>
<b>Initial Conditions</b>					
Height - mm:			19.54	19.54	19.54
Length - mm:			60.03	60.03	60.03
Moisture Content - %:			19	19	19
Bulk Density - Mg/m <sup>3</sup> :			1.81	1.81	1.81
Dry Density - Mg/m <sup>3</sup> :			1.52	1.52	1.53
Voids Ratio:			0.738	0.741	0.734
Normal Pressure- kPa			50	100	200
<b>Consolidation Stage</b>					
Consolidated Height - mm:			19.11	18.69	18.48
<b>Shearing Stage</b>					
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
<b>Final Consolidated Conditions</b>					
Moisture Content - %:			23	25	25
Bulk Density - Mg/m <sup>3</sup> :			1.85	1.89	1.92
Dry Density - Mg/m <sup>3</sup> :			1.50	1.52	1.54
<b>Peak</b>					
Angle of Shearing Resistance:( $\theta$ )			<b>30</b>		
Effective Cohesion - kPa:			<b>12</b>		



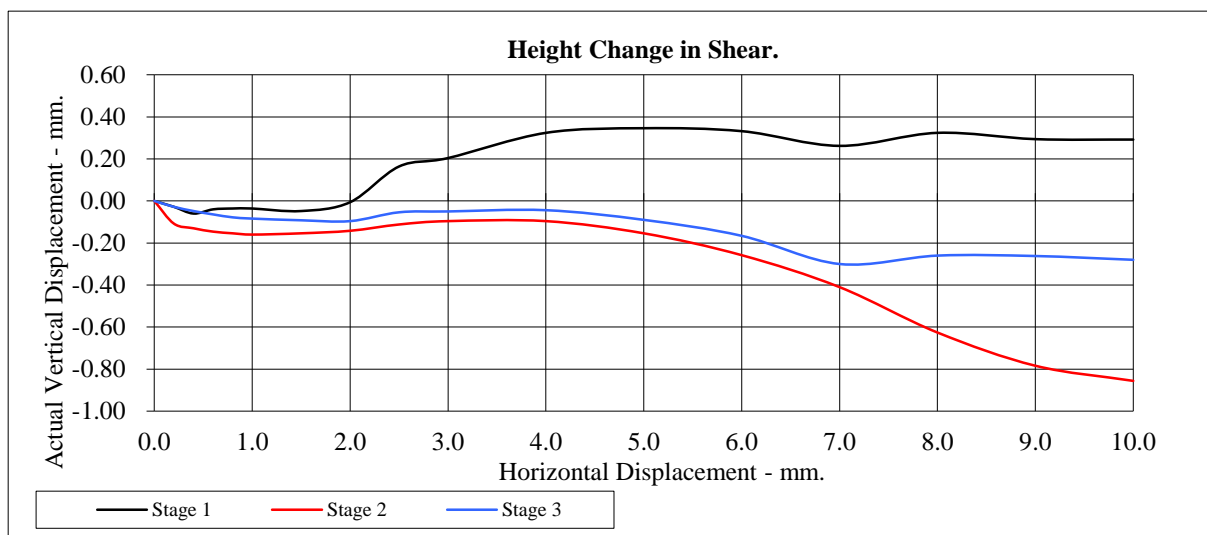
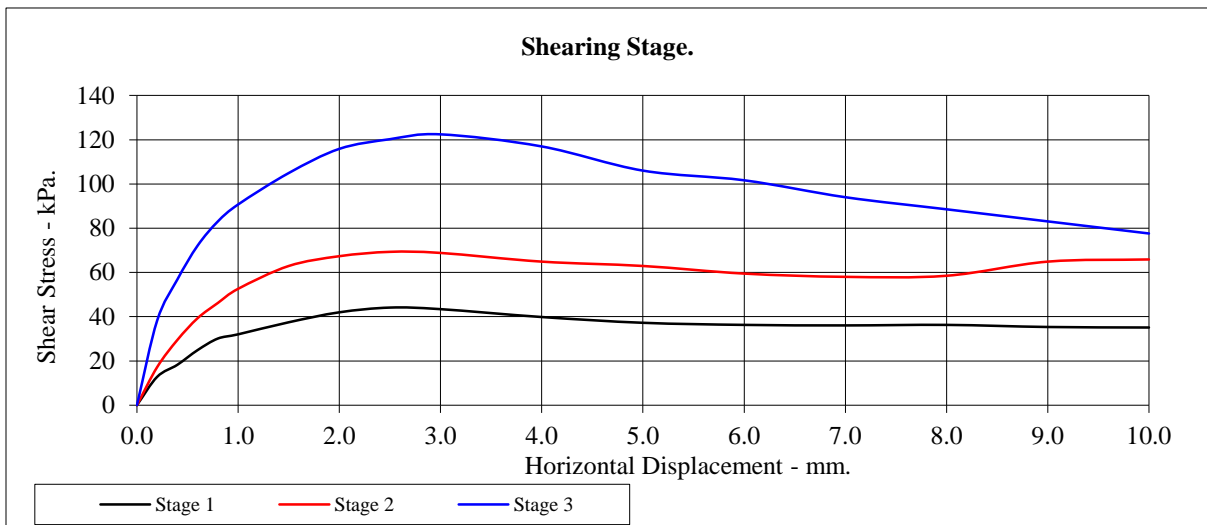
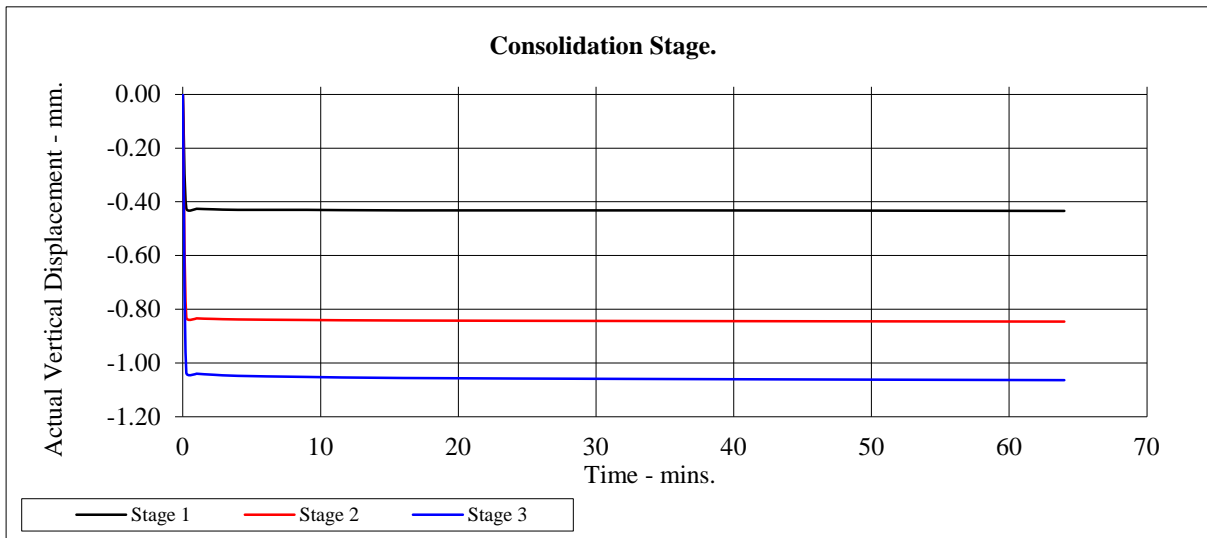
Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4.5.4

Hole Number:	BH02C	Top Depth:	9.00
Sample Number:	17	Base Depth:	



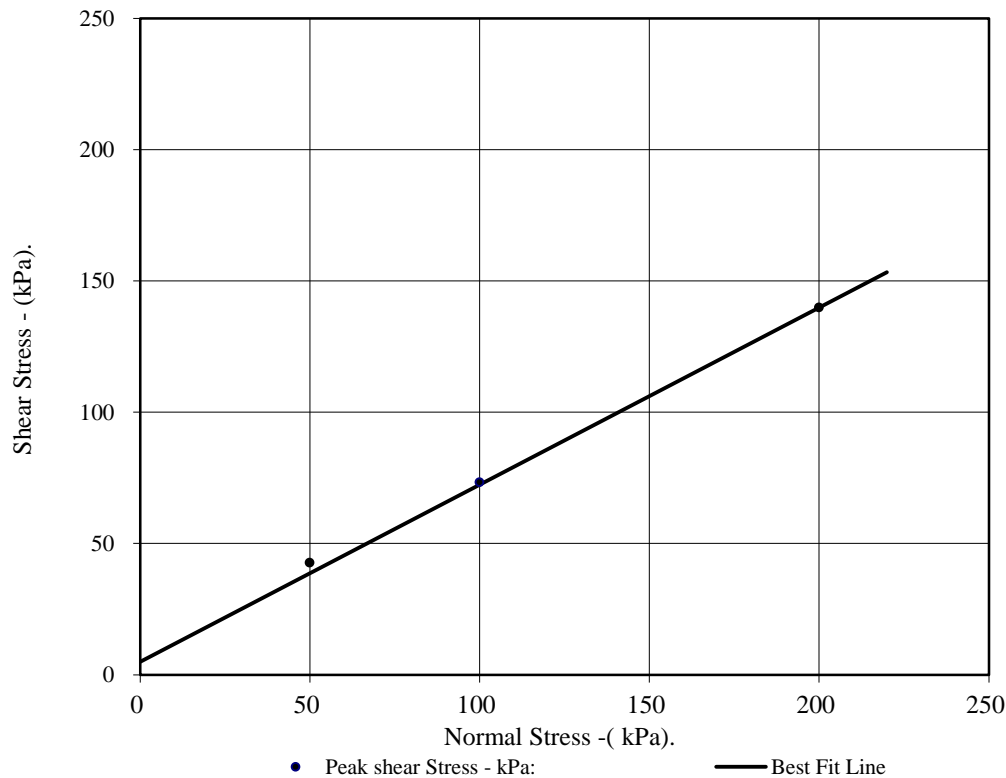
Arklow WWTP Land GI

<b>Contract No:</b>	PSL18/1055
<b>Client Ref:</b>	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/m <sup>3</sup> :	2.65	Assumed	Remarks:		
Sample Preparation:	Remoulded using 2.5kg effort. Material tested passing 2mm sieve				
Sample Description:	See summary of soil descriptions.				
<b>STAGE</b>			<b>1</b>	<b>2</b>	<b>3</b>
<b>Initial Conditions</b>					
Height - mm:			19.54	19.54	19.54
Length - mm:			60.03	60.03	60.03
Moisture Content - %:			15	15	15
Bulk Density - Mg/m <sup>3</sup> :			2.01	2.00	2.01
Dry Density - Mg/m <sup>3</sup> :			1.75	1.75	1.75
Voids Ratio:			0.514	0.518	0.515
Normal Pressure- kPa			50	100	200
<b>Consolidation Stage</b>					
Consolidated Height - mm:			19.20	19.02	18.62
<b>Shearing Stage</b>					
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
<b>Final Consolidated Conditions</b>					
Moisture Content - %:			18	19	18
Bulk Density - Mg/m <sup>3</sup> :			2.04	2.06	2.10
Dry Density - Mg/m <sup>3</sup> :			1.72	1.72	1.78
<b>Peak</b>					
Angle of Shearing Resistance:( $\theta$ )			<b>34</b>		
Effective Cohesion - kPa:			<b>5</b>		



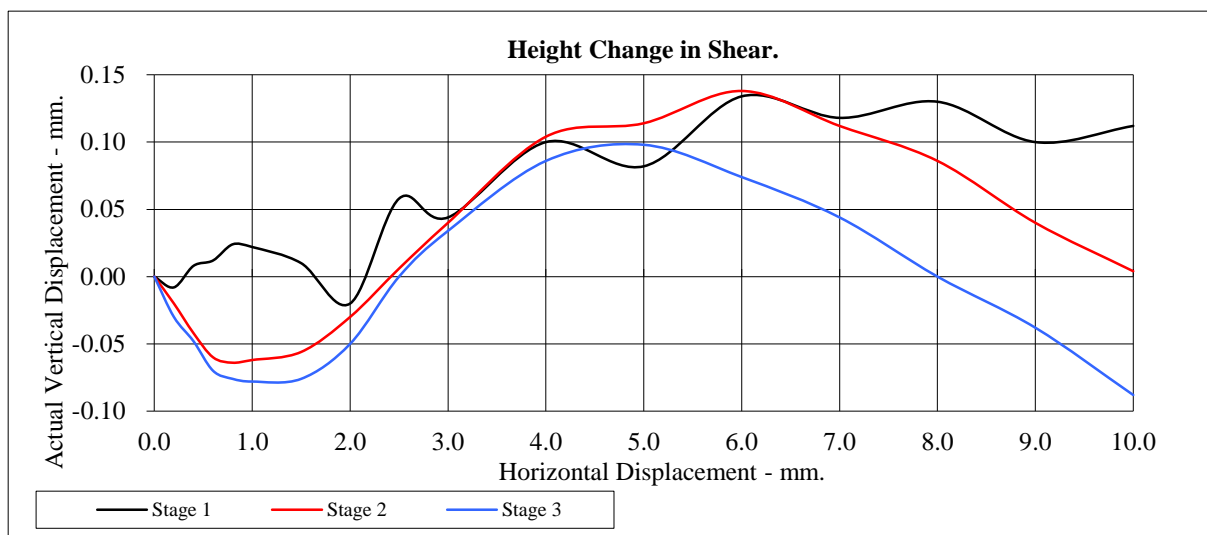
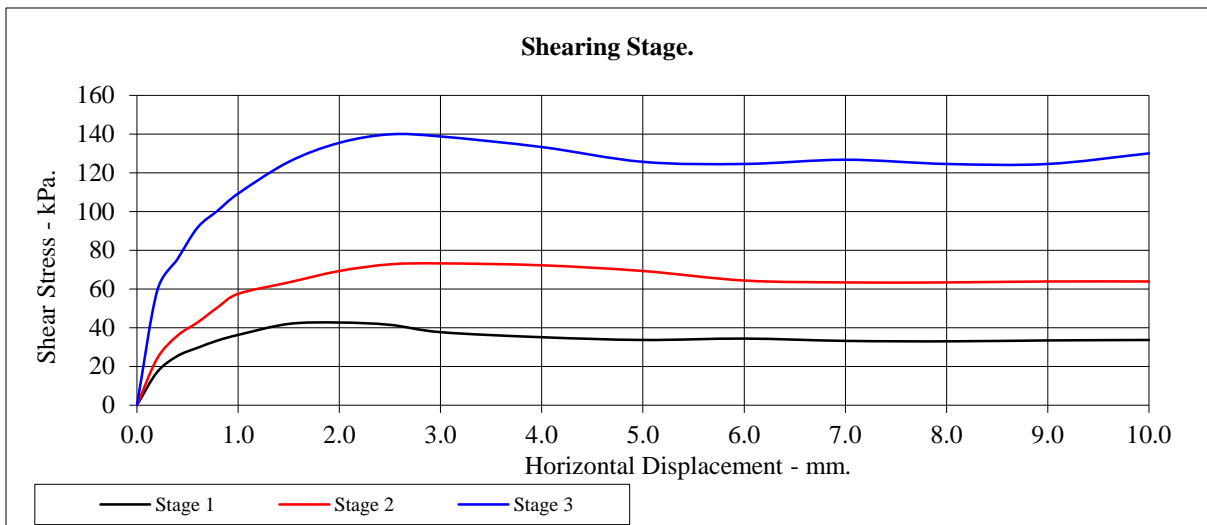
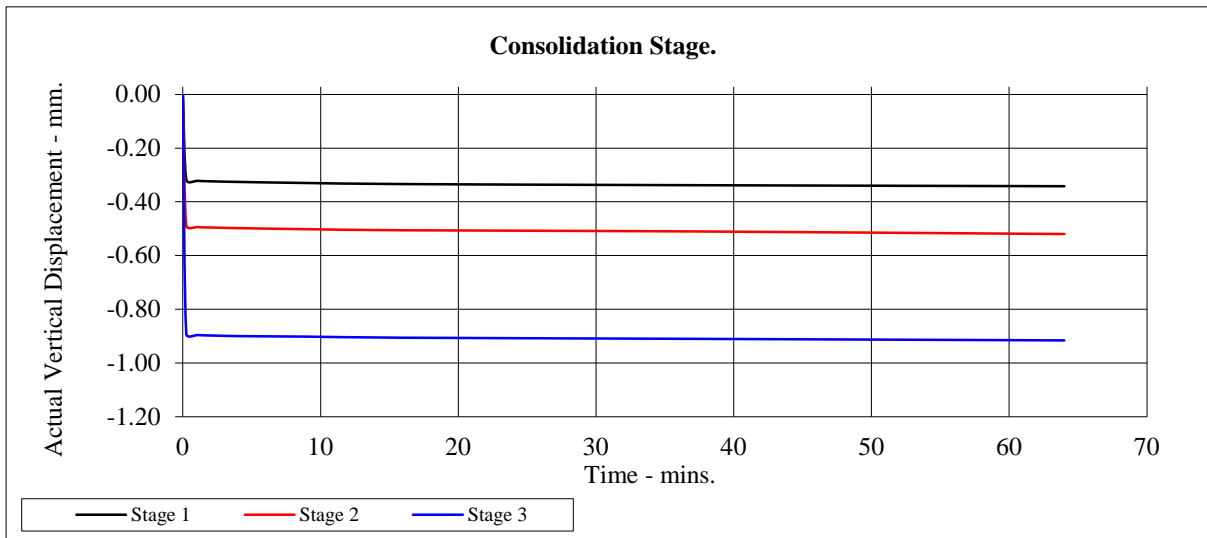
Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>

# CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4.5.4

Hole Number:	BH03	Top Depth:	7.50
Sample Number:	10	Base Depth:	



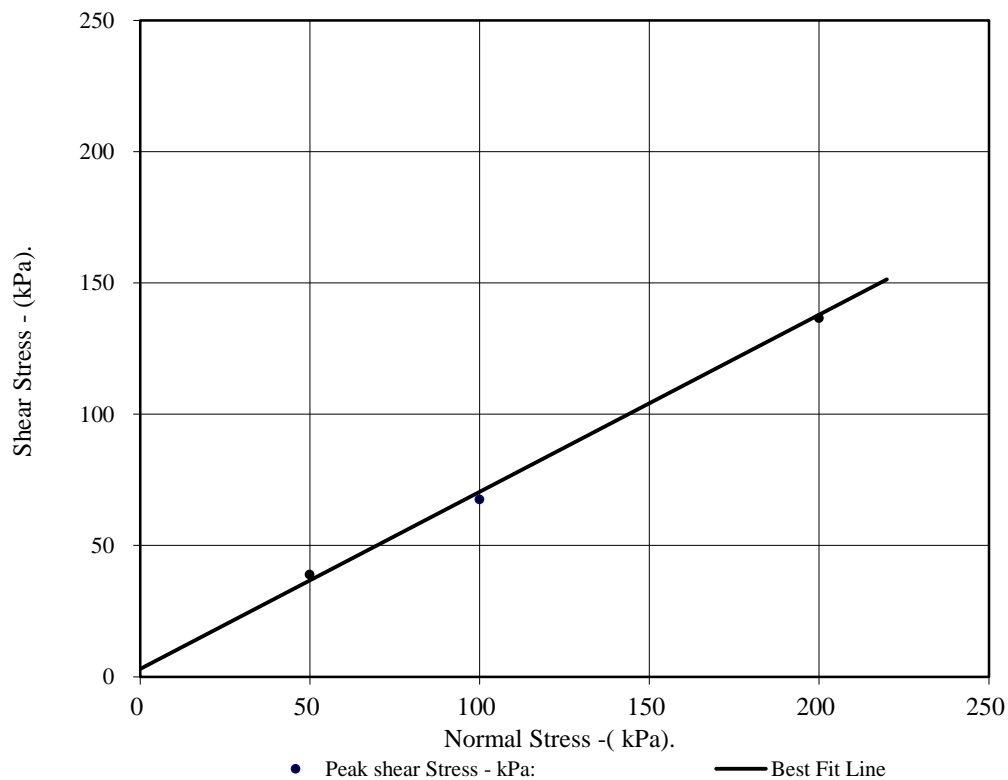
Arklow WWTP Land GI

<b>Contract No:</b>	PSL18/1055
<b>Client Ref:</b>	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/m <sup>3</sup> :	2.65	Assumed	Remarks:		
Sample Preparation:	Remoulded using 2.5kg effort. Material tested passing 2mm sieve				
Sample Description:	See summary of soil descriptions.				
<b>STAGE</b>			<b>1</b>	<b>2</b>	<b>3</b>
<b>Initial Conditions</b>					
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/m <sup>3</sup> :			1.87	1.87	1.87
Dry Density - Mg/m <sup>3</sup> :			1.72	1.72	1.72
Voids Ratio:			0.539	0.545	0.539
Normal Pressure- kPa			50	100	200
<b>Consolidation Stage</b>					
Consolidated Height - mm:			19.12	18.19	17.71
<b>Shearing Stage</b>					
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
<b>Final Consolidated Conditions</b>					
Moisture Content - %:			19	18	19
Bulk Density - Mg/m <sup>3</sup> :			1.91	2.00	2.07
Dry Density - Mg/m <sup>3</sup> :			1.60	1.70	1.74
<b>Peak</b>					
Angle of Shearing Resistance:( $\theta$ )			<b>34</b>		
Effective Cohesion - kPa:			<b>3</b>		



Arklow WWTP Land GI

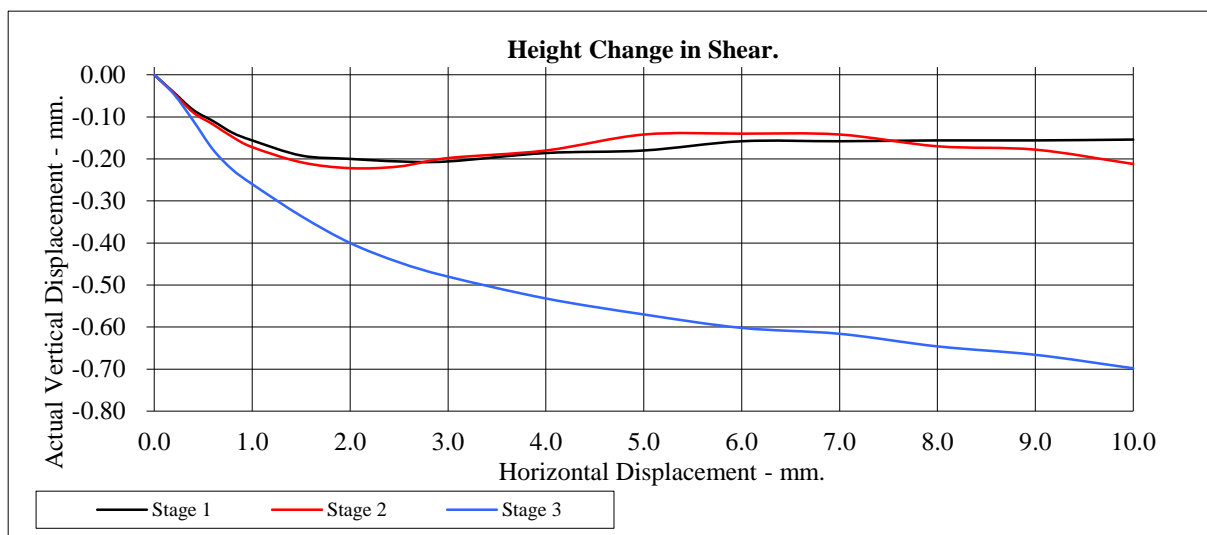
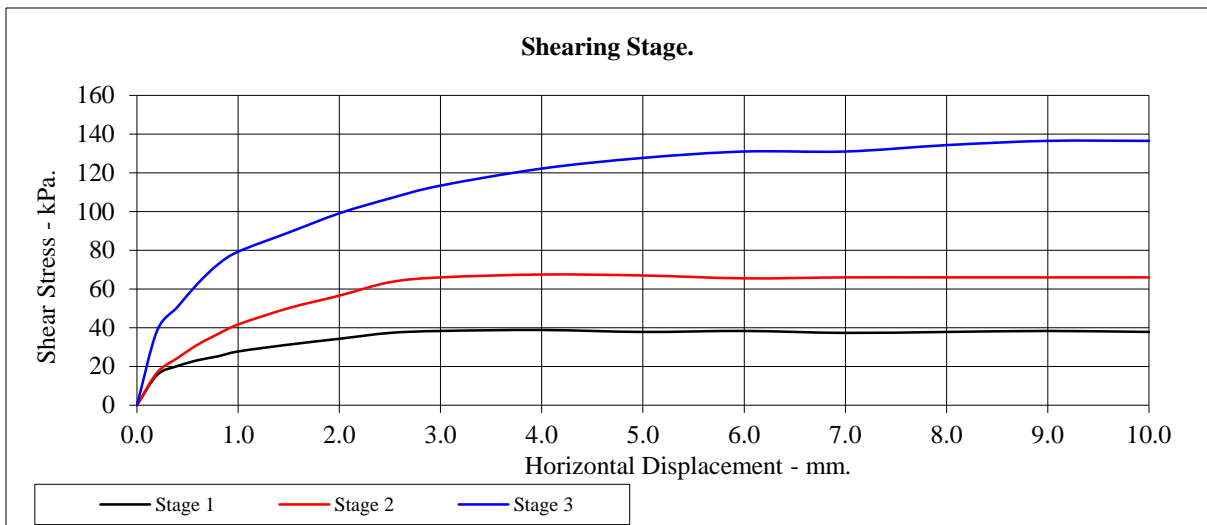
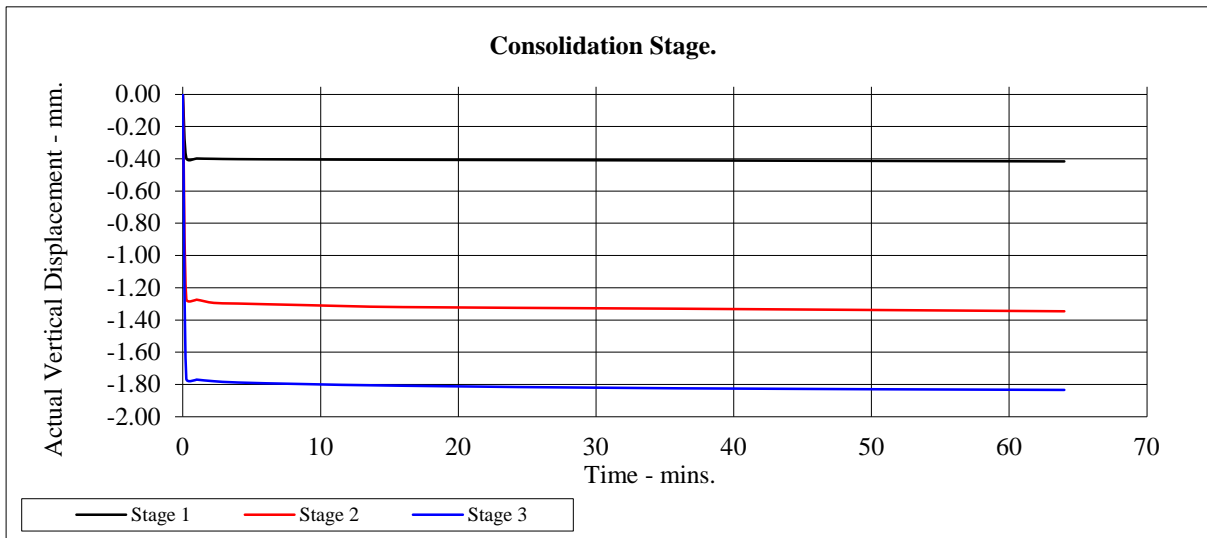
<b>Contract No:</b>
<b>PSL18/1055</b>
<b>Client Ref:</b>
<b>17-1455</b>



# CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4.5.4

Hole Number:	BH05	Top Depth:	6.00
Sample Number:	11	Base Depth:	



Arklow WWTP Land GI

<b>Contract No:</b>	PSL18/1055
<b>Client Ref:</b>	17-1455



**Anthony Watkins**

PSL  
5/7 Hexthorpe Road  
Doncaster  
South Yorkshire  
DN4 0AR

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 0844 8156641

**e:** ChemResults@prosoils.co.uk

**t:** 01923 225404

**f:** 01923 237404

**e:** reception@i2analytical.com

## **Analytical Report Number : 18-78505**

<b>Project / Site name:</b>	Arklow WWTP Land GI	<b>Samples received on:</b>	08/03/2018
<b>Your job number:</b>	PSL18-1055	<b>Samples instructed on:</b>	08/03/2018
<b>Your order number:</b>		<b>Analysis completed by:</b>	15/03/2018
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	15/03/2018
<b>Samples Analysed:</b>	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.



Analytical Report Number: 18-78505

Project / Site name: Arklow WWTP Land GI

<b>Lab Sample Number</b>				922218	922219			
<b>Sample Reference</b>				BH04	BH04			
<b>Sample Number</b>				5	23			
<b>Depth (m)</b>				3.00	15.00			
<b>Date Sampled</b>				Deviating	Deviating			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
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 <sub>4</sub>	%	0.005	MCERTS	0.389	0.054			
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.21	0.14			
Water Soluble SO <sub>4</sub> 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			



**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.



**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 Wastewater & 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.**

**SOIL AND ROCK SAMPLE ANALYSIS  
LABORATORY TEST REPORT**

<b>Client:</b>	<b>Irish Water</b>
<b>Engineer:</b>	<b>Byrne Looby ARUP JV</b>
<b>From:</b>	<b>Stephen Watson Laboratory Manager Causeway Geotech Ltd</b>
<b>Tel:</b>	<b>+44(0)2827666640</b>
<b>E-mail:</b>	<b>stephen.watson@causewaygeotech.com</b>
<b>Date:</b>	<b>20/04/18</b>
<b>Ref:</b>	<b>17-1455 - Soils Schedule 4 &amp; 5</b>

---

**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



**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:

<b>Material tested</b>	<b>Type of test/Properties measured/Range of measurement</b>	<b>Standard specifications</b>	<b>Number of test results included in the report</b>
SOIL	Moisture Content of Soil	BS1377: Part 2: Clause 3.2: 1990	33
SOIL	Liquid and Plastic Limits of soil -1-point cone penetrometer method	BS1377: Part 2: Clauses 4.4, 5.3 & 5.4 1990	7
SOIL	Particle size distribution - wet sieving	BS1377: Part 2: Clause 9.2: 1990	28
SOIL	Particle size distribution -sedimentation 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. 17-1455	Project Name Arklow WWTP Land GI
------------------------	-------------------------------------

Hole No.	Sample				Soil Description	Density		w	Passing 425µm	LL	PL	PI	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
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

<b>Key</b> Density test Linear measurement unless : wd - water displacement wi - immersion in water Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test Particle density sp - small pyknometer gj - gas jar	<b>Date Printed</b>  20/04/2018	<b>Approved By</b>  Stephen.Watson	<b>Table</b>  sheet 1 sheet 1
---	---------------------------------------	--	--





## Summary of Classification Test Results

Project No. 17-1455	Project Name Arklow WWTP Land GI
------------------------	-------------------------------------

Hole No.	Sample				Soil Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk Mg/m3	dry							
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		Cl
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

<b>Key</b> Density test Linear measurement unless : wd - water displacement wi - immersion in water	Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test	Particle density sp - small pyknometer gj - gas jar	Date Printed 20/04/2018	Approved By Stephen.Watson	Table 1 sheet 2
---	---	---	----------------------------	-------------------------------	--------------------------



## Summary of Classification Test Results

Project No. 17-1455	Project Name Arklow WWTP Land GI
------------------------	-------------------------------------

Hole No.	Sample				Soil Description	Density		w	Passing 425µm	LL	PL	PI	Particle density	Casagrande Classification							
	Ref	Top	Base	Type		bulk	dry														
														Mg/m3	%	%	%	%	%	Mg/m3	
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

<b>Key</b> Density test Linear measurement unless : wd - water displacement wi - immersion in water Liquid Limit 4pt cone unless : cas - Casagrande method 1pt - single point test Particle density sp - small pyknometer gj - gas jar	<b>Date Printed</b>  20/04/2018	<b>Approved By</b>  Stephen.Watson	<b>Table</b>  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.**

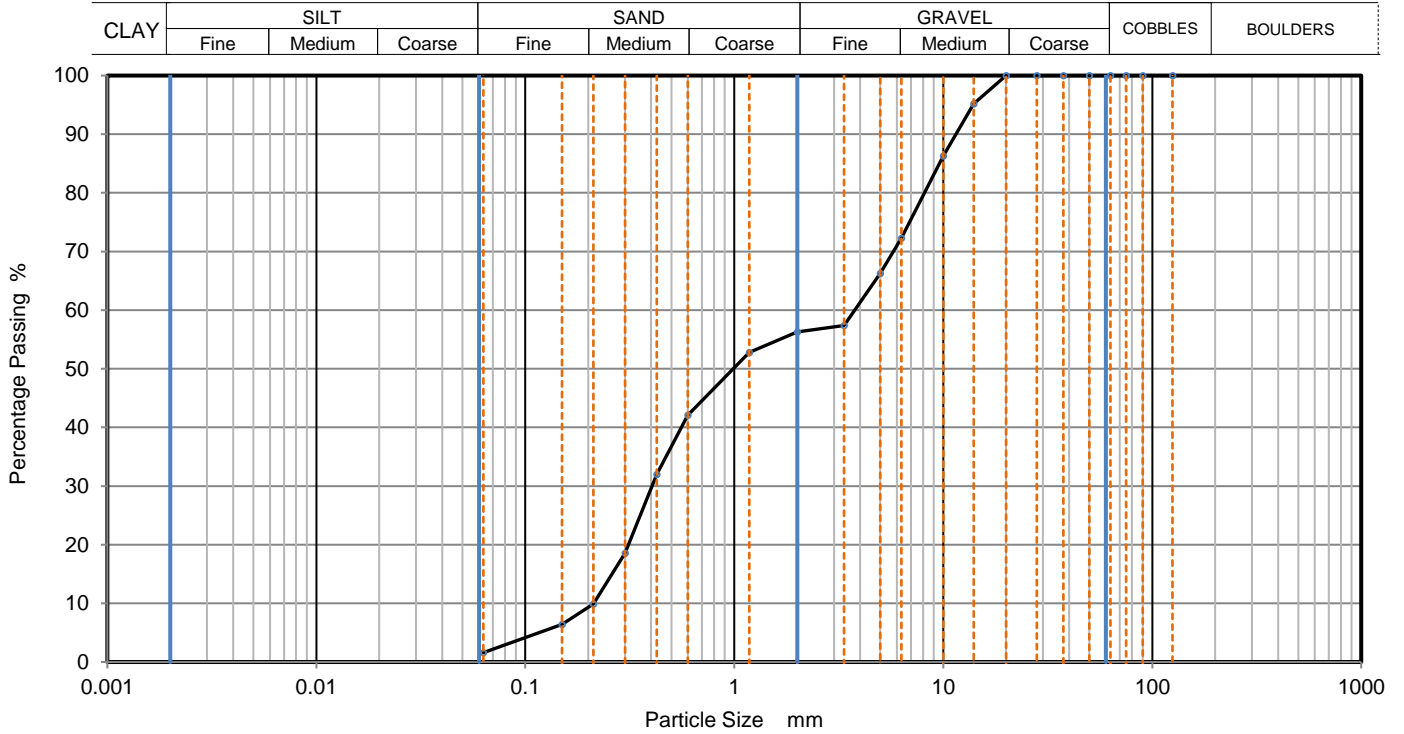
Depth, m **4.00**

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



## 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.**

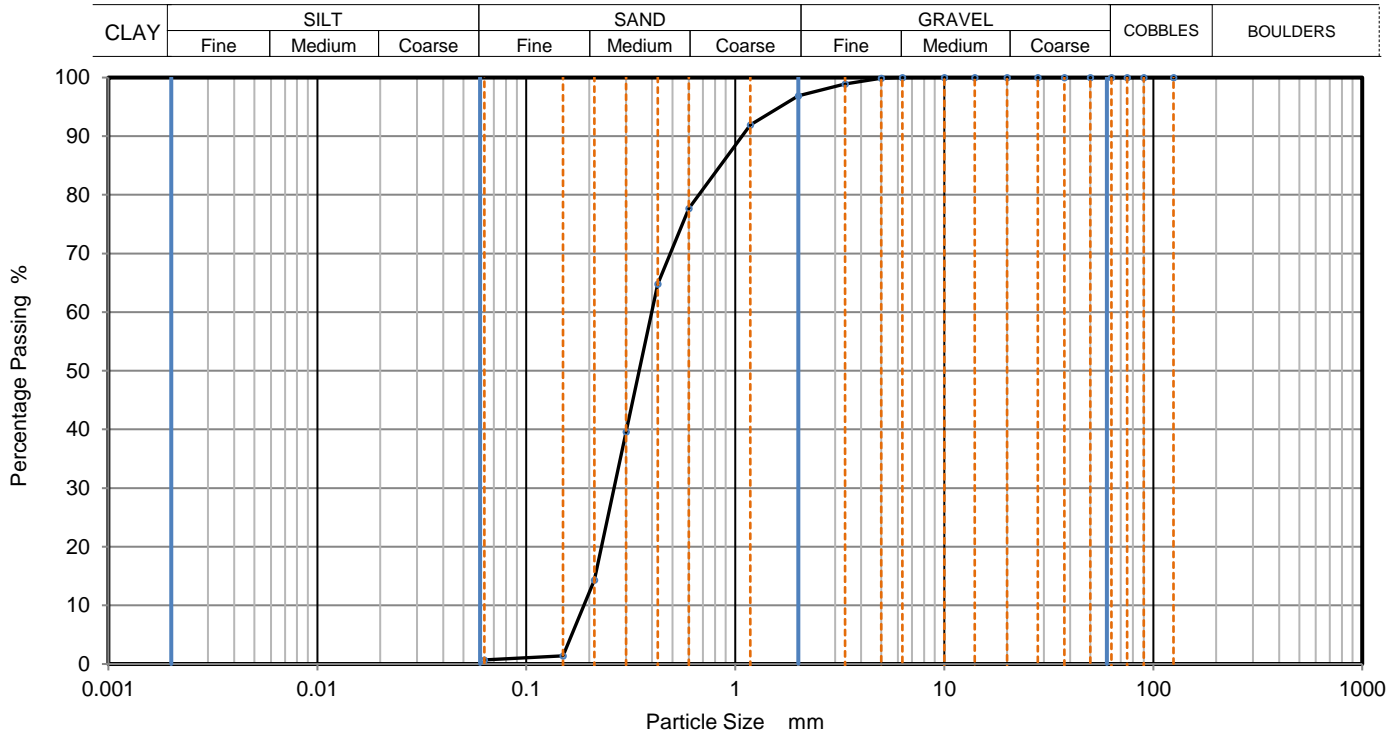
Depth, m **7.50**

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

Stephen.Watson

Sheet printed

20/04/2018 10:25

Fig **1**

Sheet



# 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.**

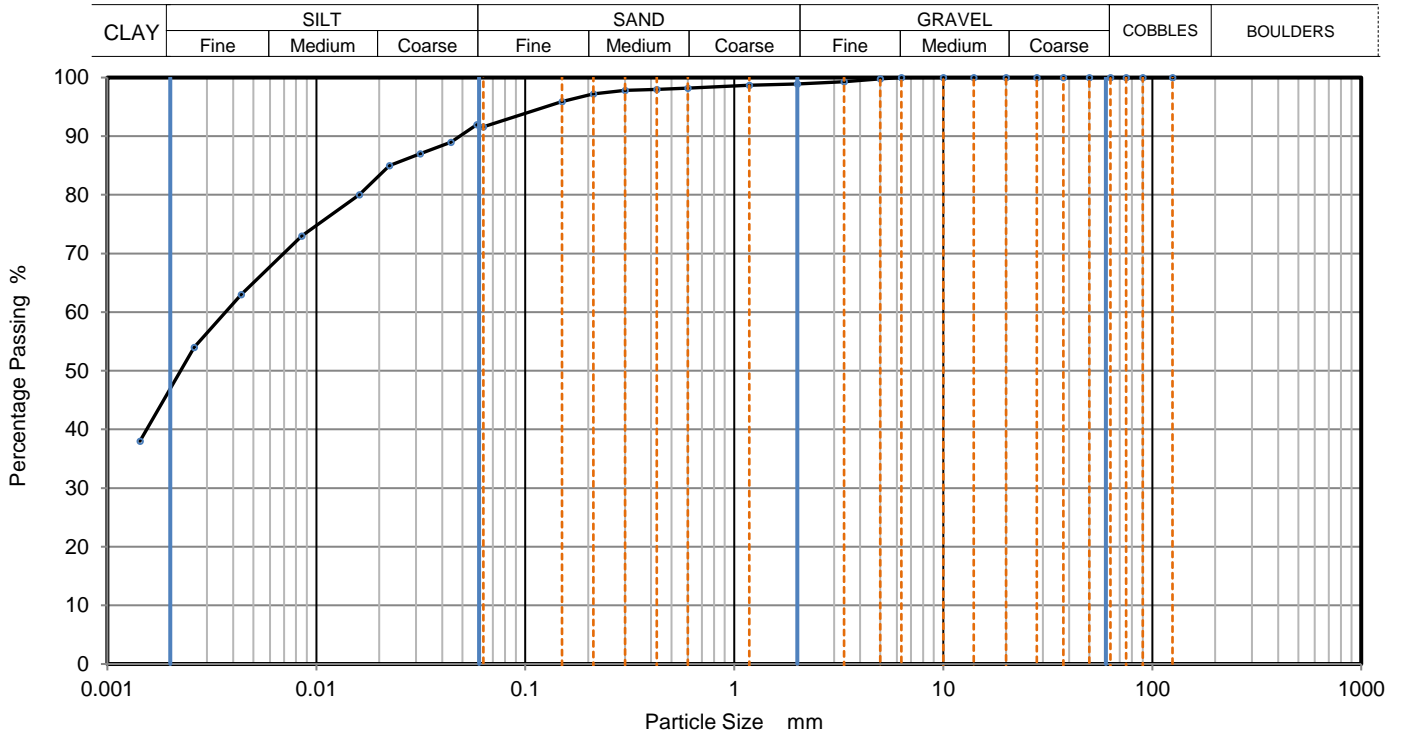
Depth, m **14.40**

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

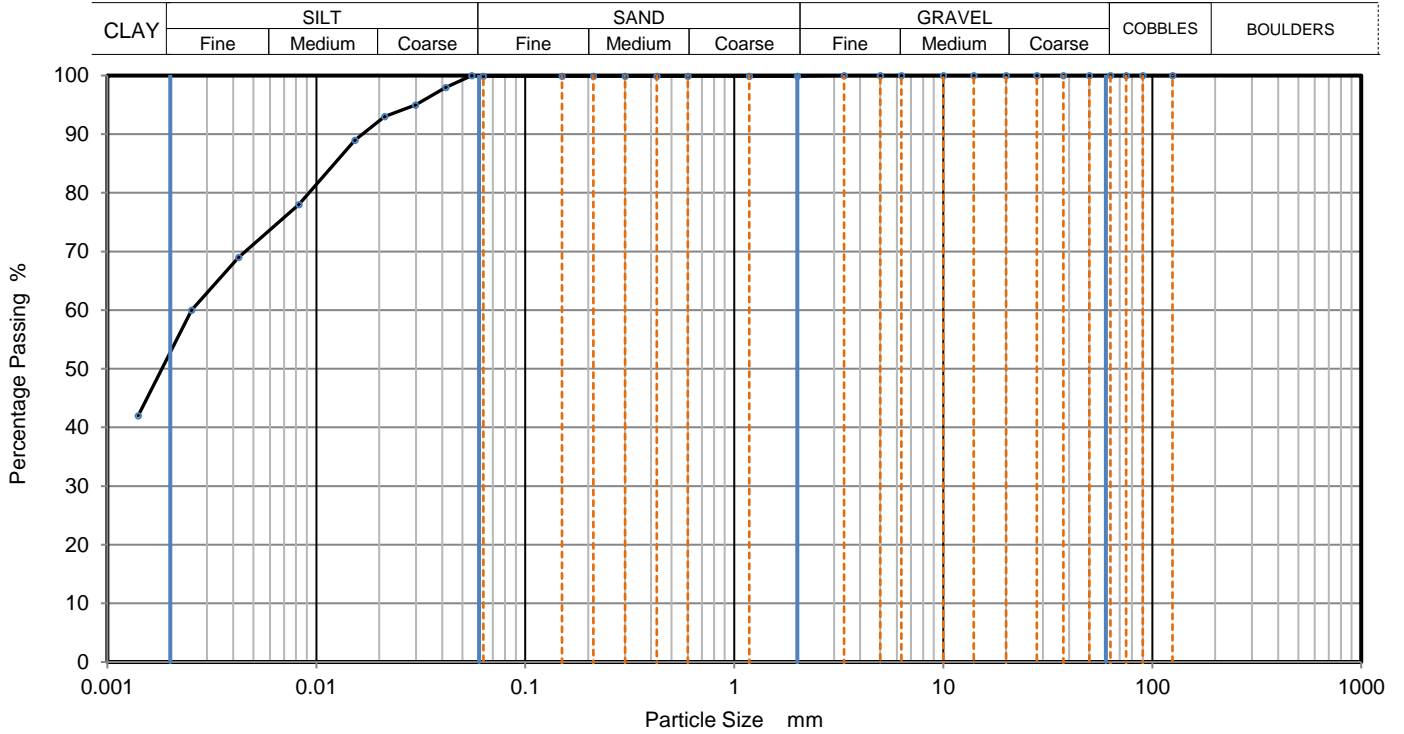
Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377 unless noted below



# 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 <sub>100</sub>	mm
D <sub>60</sub>	mm
D <sub>30</sub>	mm
D <sub>10</sub>	mm
Uniformity Coefficient	
Curvature Coefficient	

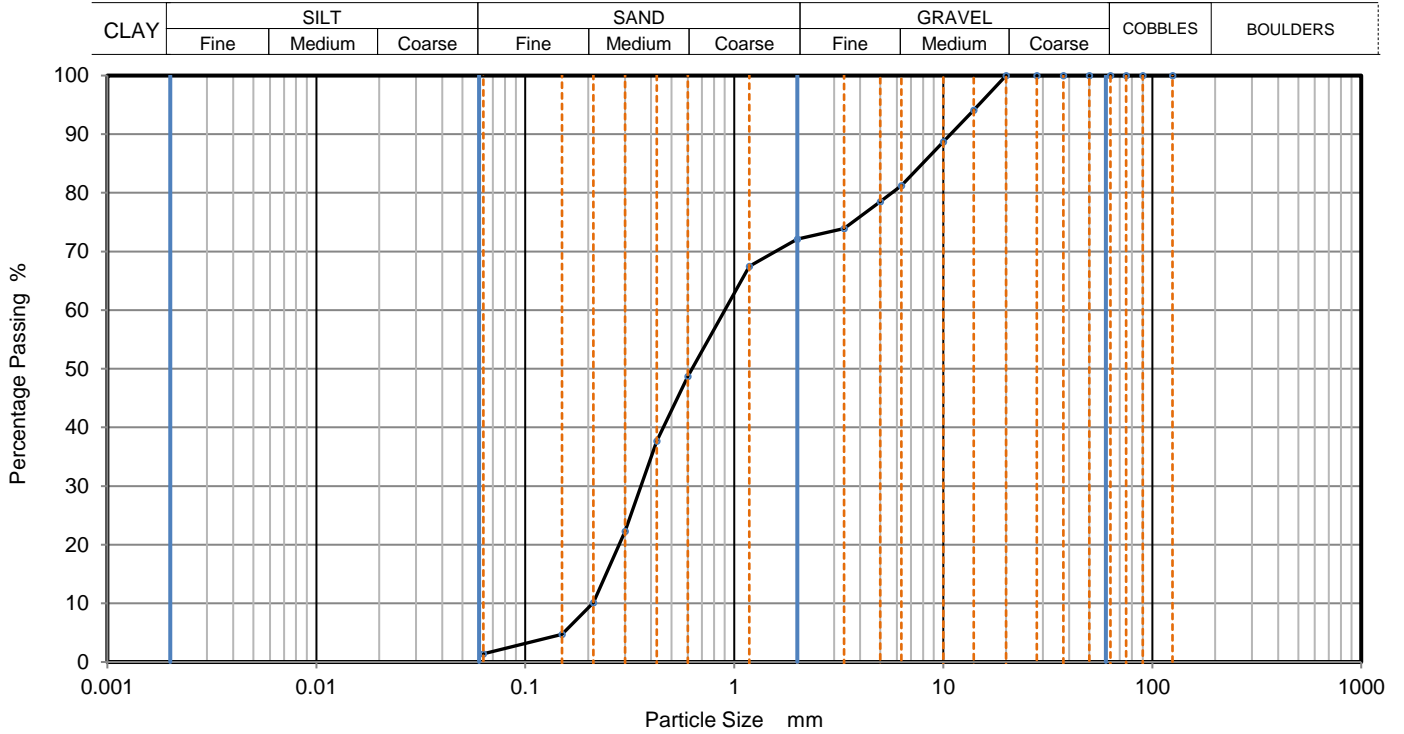
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH08
Sample No.	16
Depth, m	5.00
Sample Type	B
KeyLAB ID	Caus2018032414

Site Name	Arklow WWTP Land GI	
Soil Description	Greyish brown gravelly fine to coarse SAND.	
Specimen Reference	2	Specimen Depth m
Test Method	BS1377:Part 2:1990, clause 9.2	



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

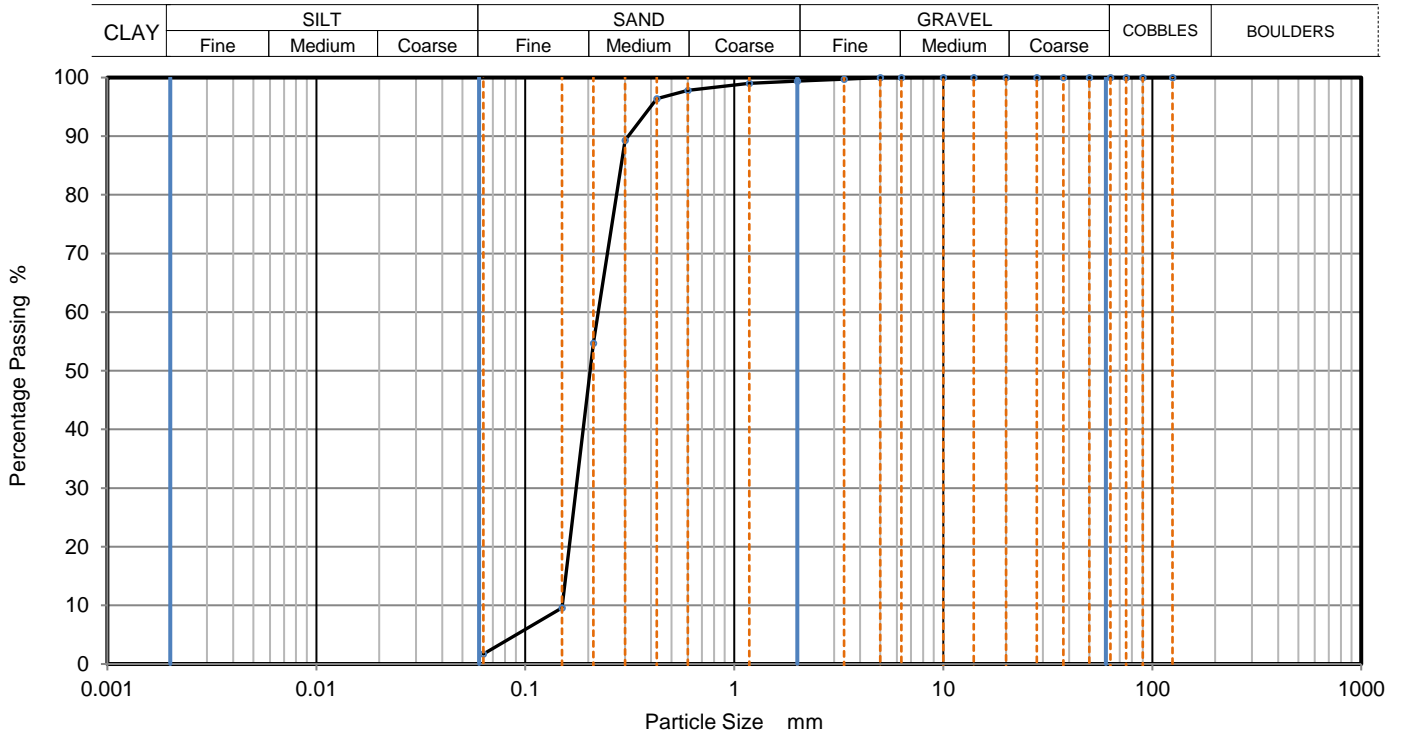
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



# PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH08
Sample No.	25
Depth, m	10.50
Sample Type	B
KeyLAB ID	Caus2018032416

Site Name	Arklow WWTP Land GI	
Soil Description	Brown fine to medium SAND.	
Specimen Reference	2	m
Test Method	BS1377:Part 2:1990, clause 9.2	



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

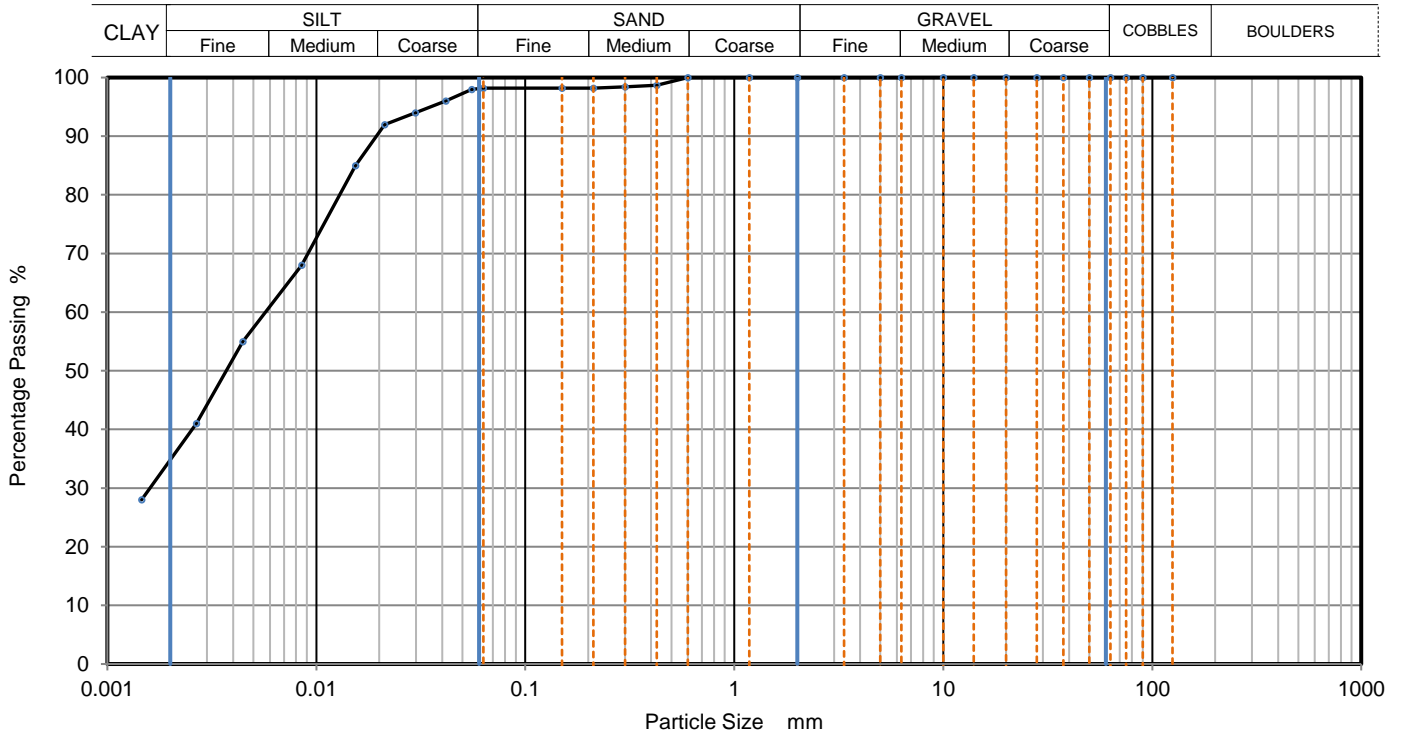




# PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH08
Sample No.	29
Depth, m	12.00
Sample Type	U
KeyLAB ID	Caus2018032418

Site Name	Arklow WWTP Land GI	
Soil Description	Grey silty CLAY.	
Specimen Reference	5	Specimen Depth m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	



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



## 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.**

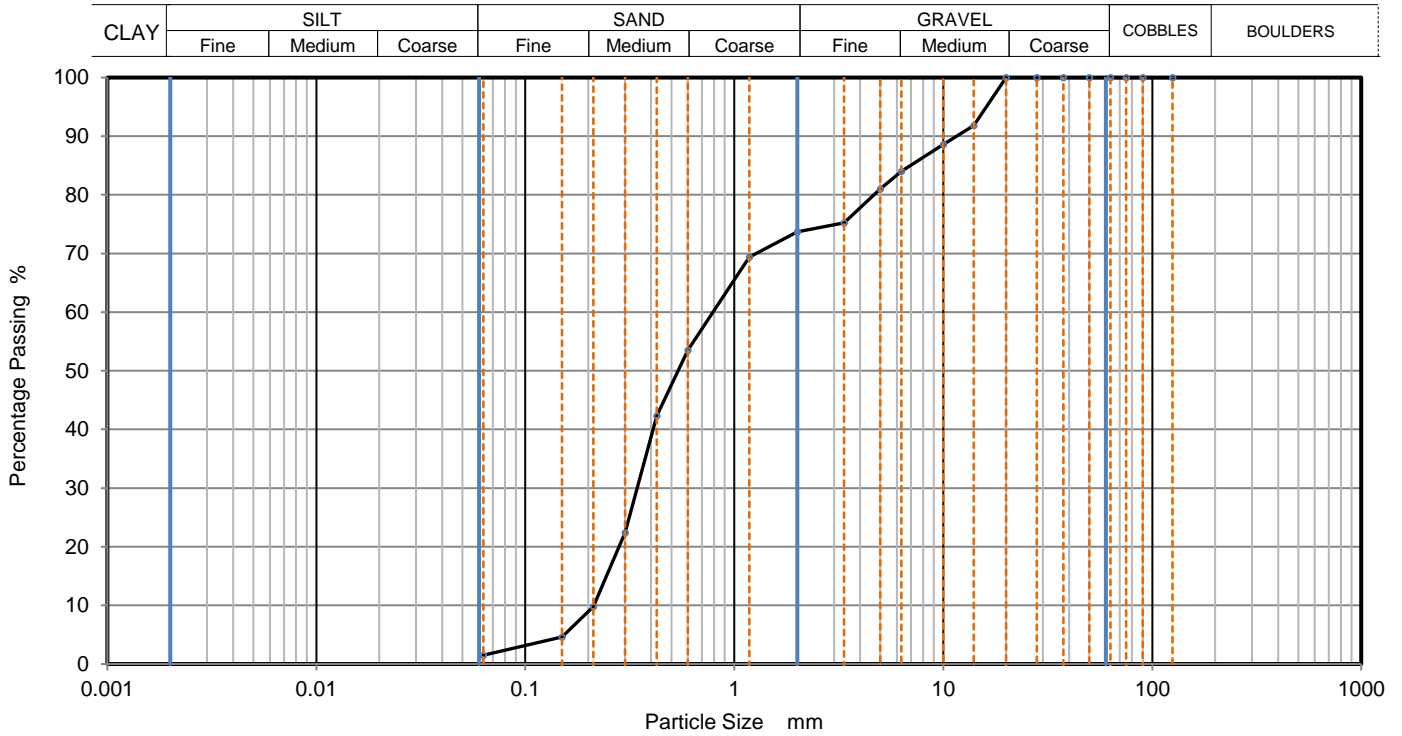
Depth, m **5.00**

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

Stephen.Watson

Sheet printed

20/04/2018 10:25

Fig **1**

Sheet



## 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.**

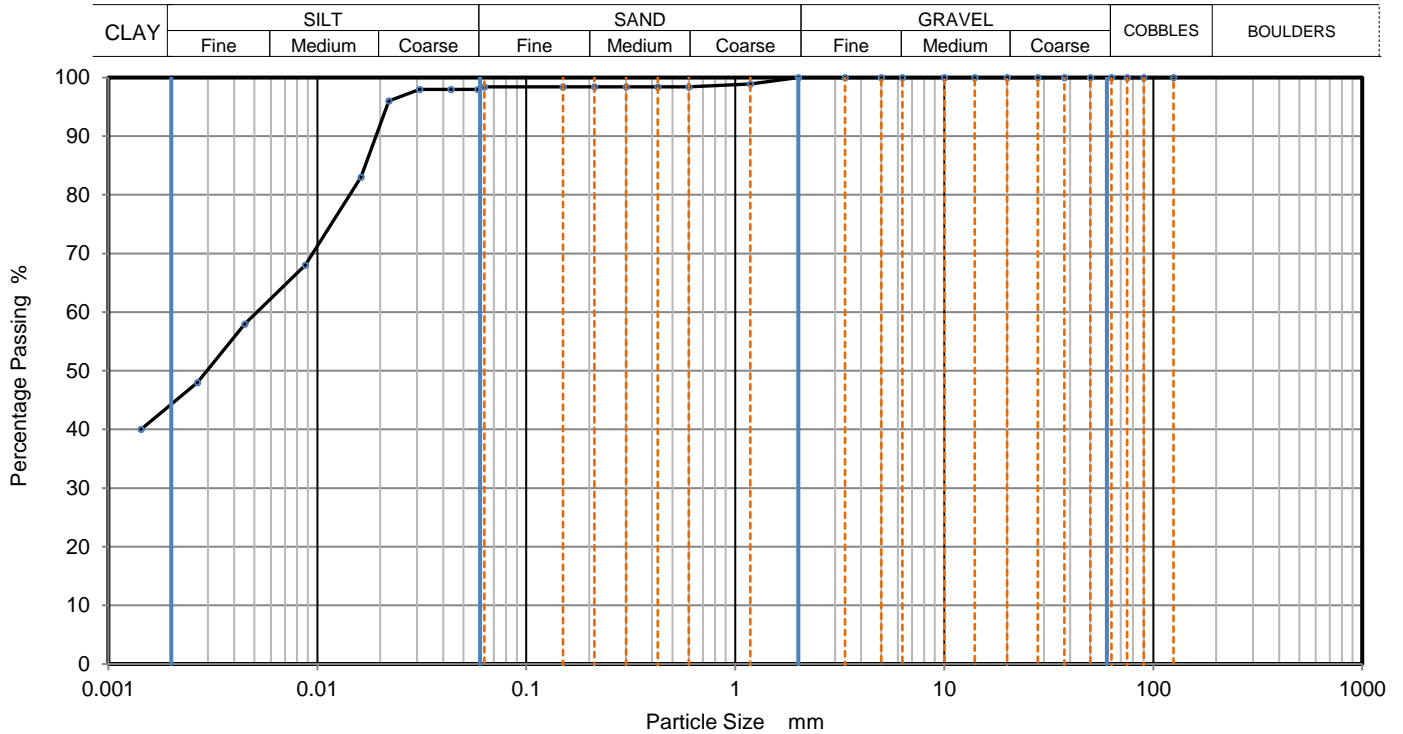
Depth, m **12.00**

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

Stephen.Watson

Sheet printed

20/04/2018 10:25

Fig **1**

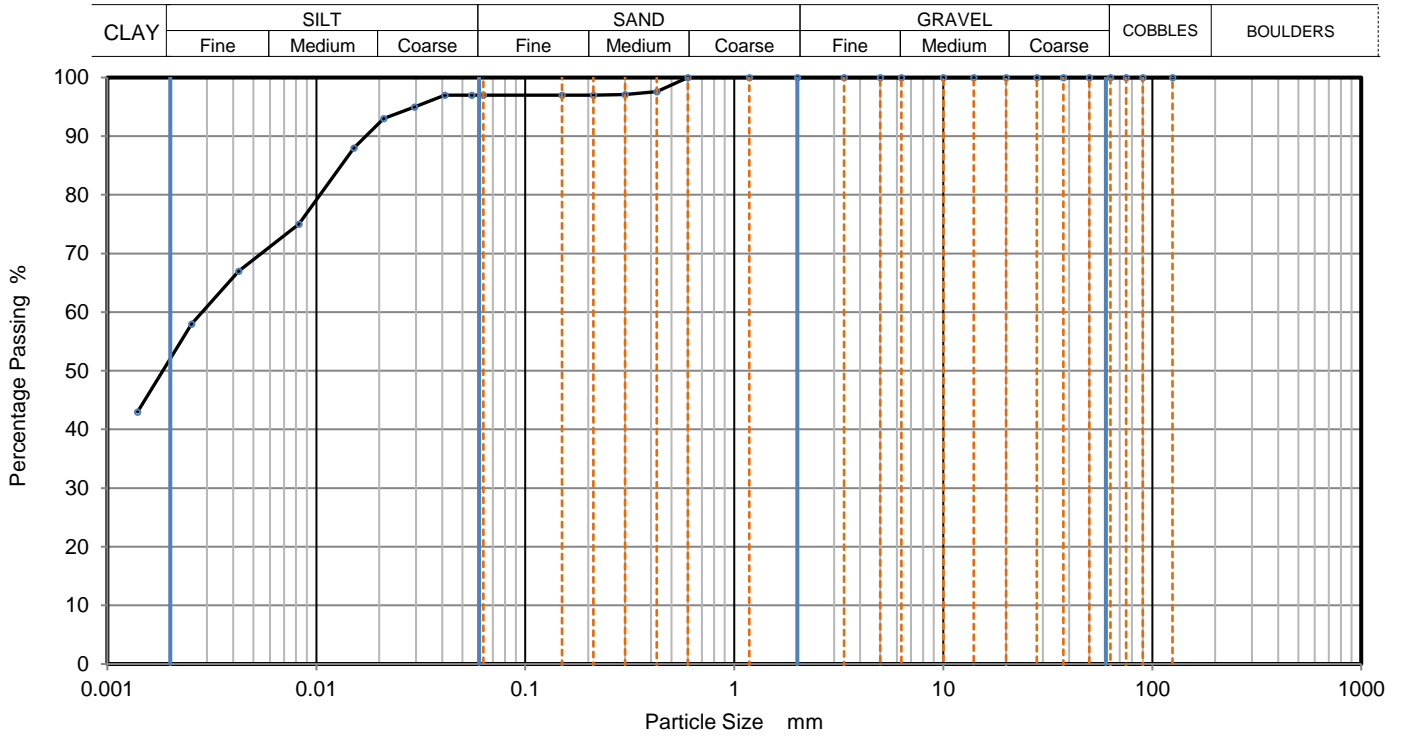
Sheet



# PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH09
Sample No.	36
Depth, m	15.30
Sample Type	U
KeyLAB ID	Caus2018032423

Site Name	Arklow WWTP Land GI	
Soil Description	Brown silty CLAY.	
Specimen Reference	2	Specimen Depth m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	



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

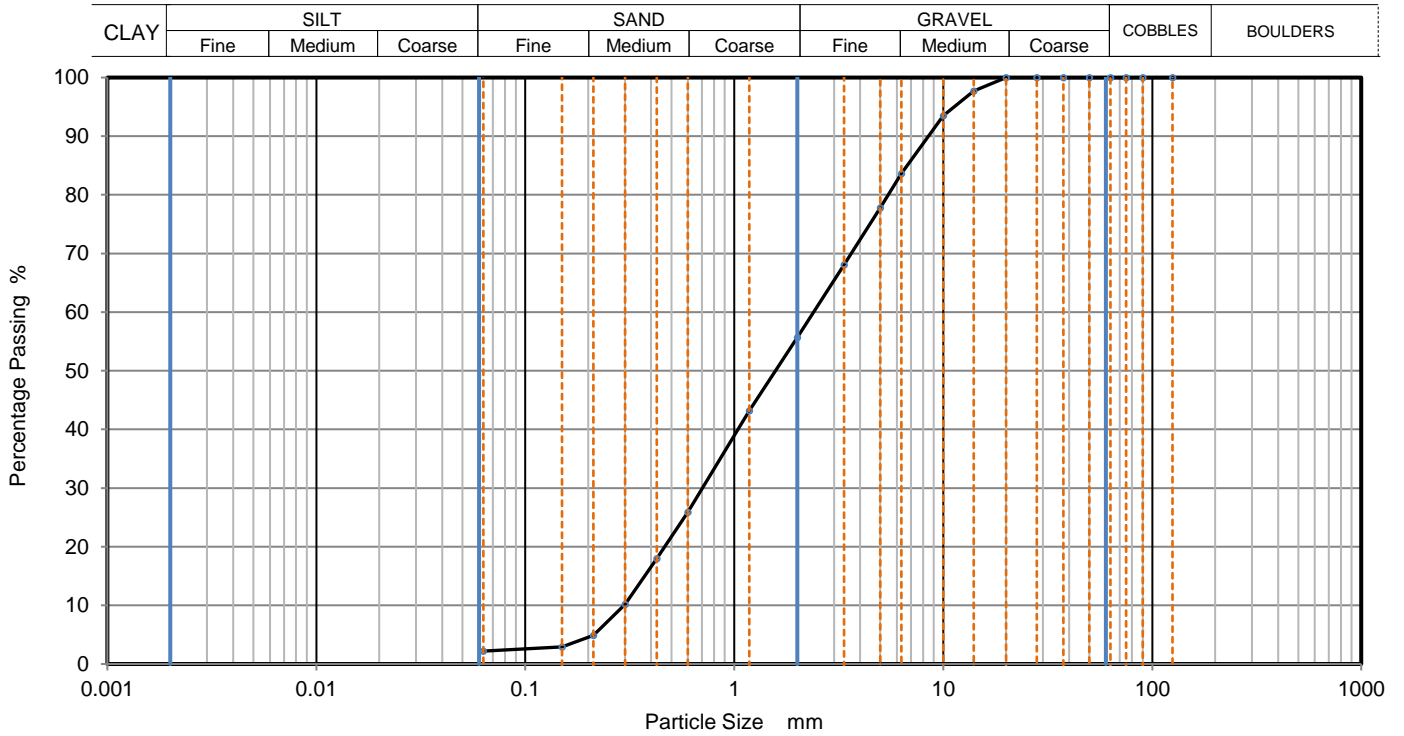
Grading Analysis		
D100	mm	
D60	mm	0.00282
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## 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

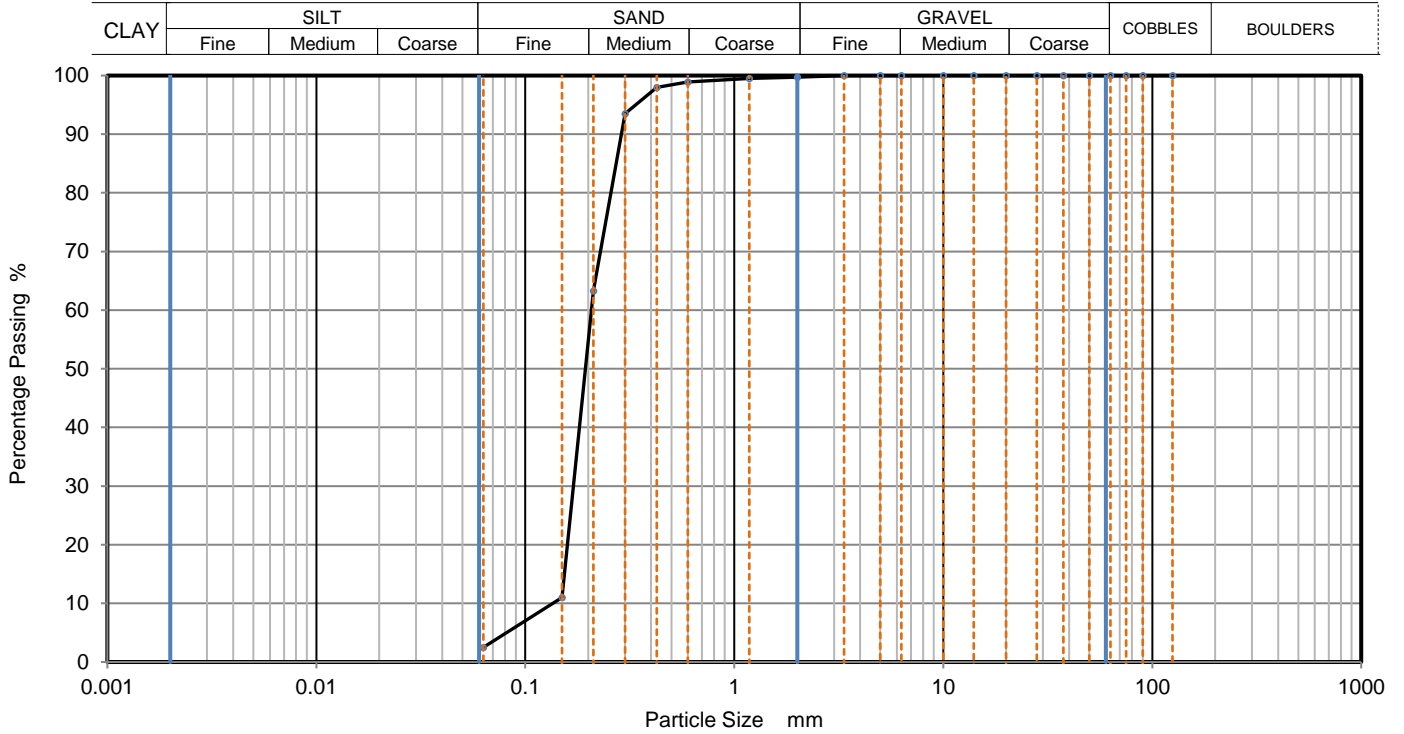
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



# PARTICLE SIZE DISTRIBUTION

Job Ref	<b>17-1455</b>
Borehole/Pit No.	BH10B
Sample No.	19
Depth, m	10.50
Sample Type	B
KeyLAB ID	Caus2018032427

Site Name	Arklow WWTP Land GI
Soil Description	Brown fine to medium SAND.
Specimen Reference	2
Specimen Depth	m
Test Method	BS1377:Part 2:1990, clause 9.2



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

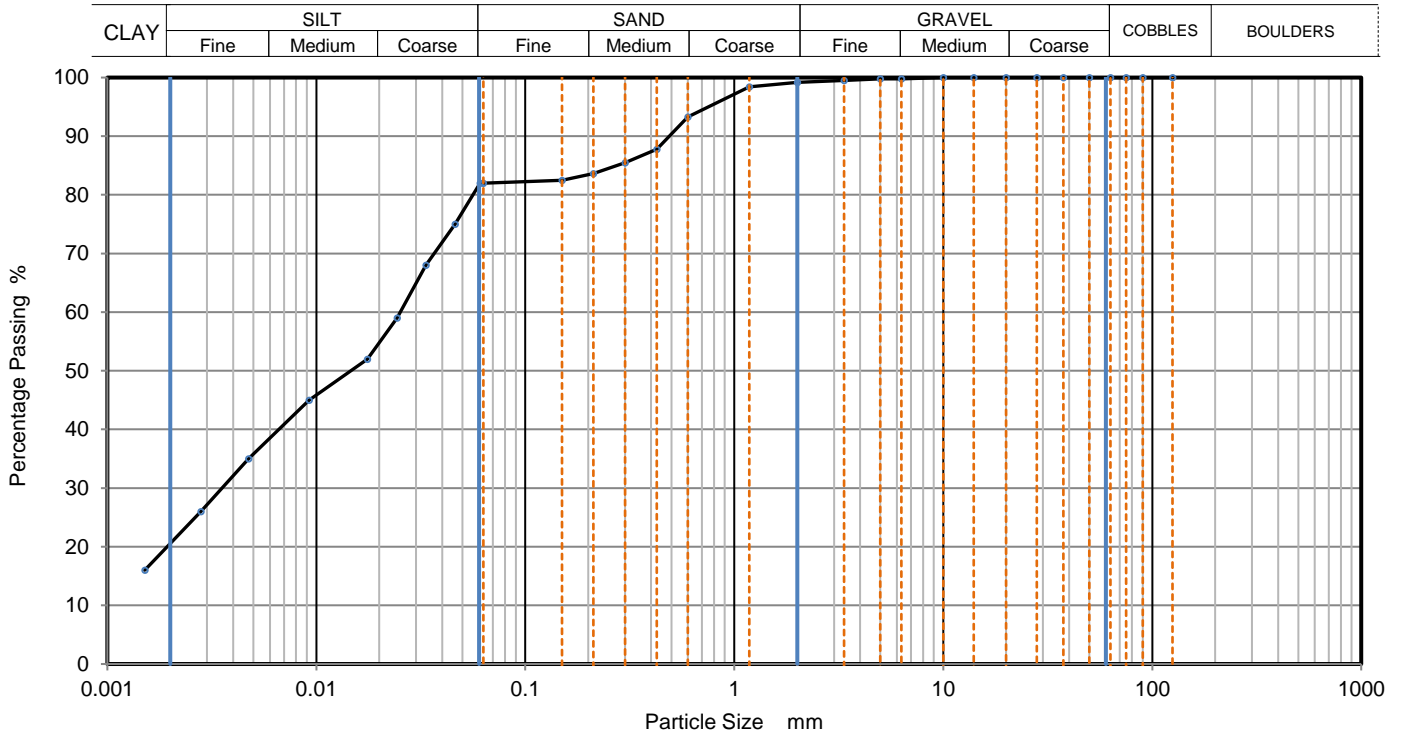
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



# PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH10B
Sample No.	22
Depth, m	15.00
Sample Type	B
KeyLAB ID	Caus2018032429

Site Name	Arklow WWTP Land GI	
Soil Description	Brown slightly sandy silty CLAY.	
Specimen Reference	5	Specimen Depth
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	



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		
0.425	88	Particle density (assumed) 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 <sub>100</sub>	mm
D <sub>60</sub>	mm      0.0255
D <sub>30</sub>	mm      0.00355
D <sub>10</sub>	mm
Uniformity Coefficient	
Curvature Coefficient	

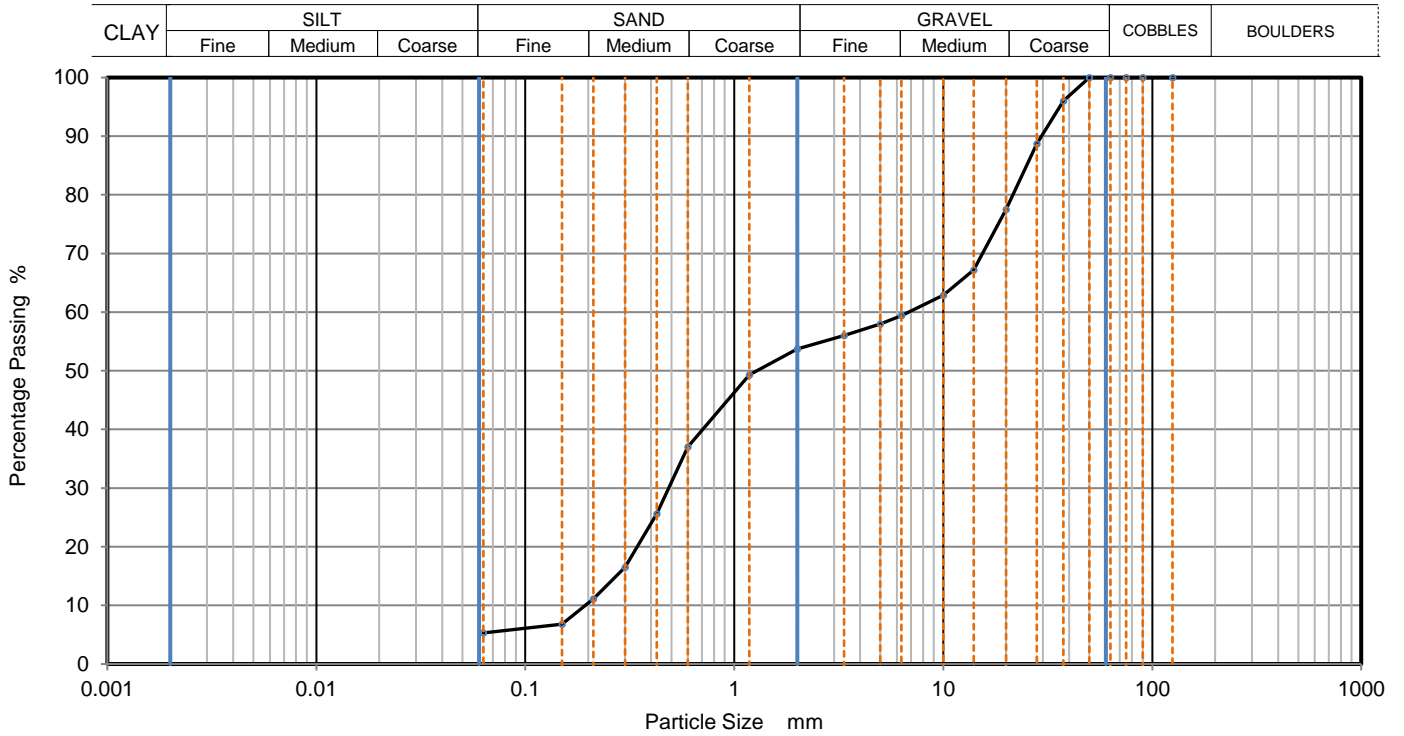
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



# PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH11
Sample No.	6
Depth, m	1.00
Sample Type	B
KeyLAB ID	Caus2018032430

Site Name	Arklow WWTP Land GI	
Soil Description	MADE GROUND: Brown gravelly fine to coarse SAND.	
Specimen Reference	2	Specimen Depth m
Test Method	BS1377:Part 2:1990, clause 9.2	



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





## 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.**

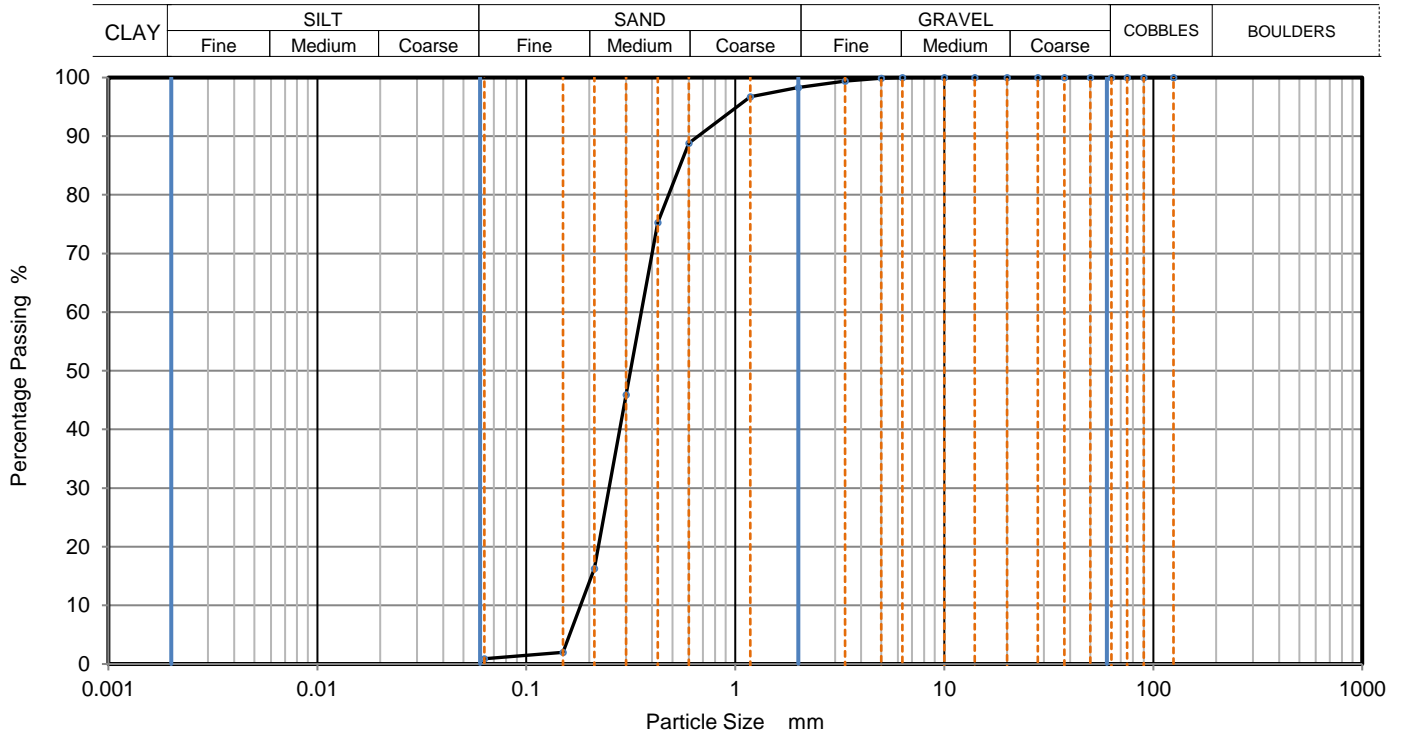
Depth, m **7.50**

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

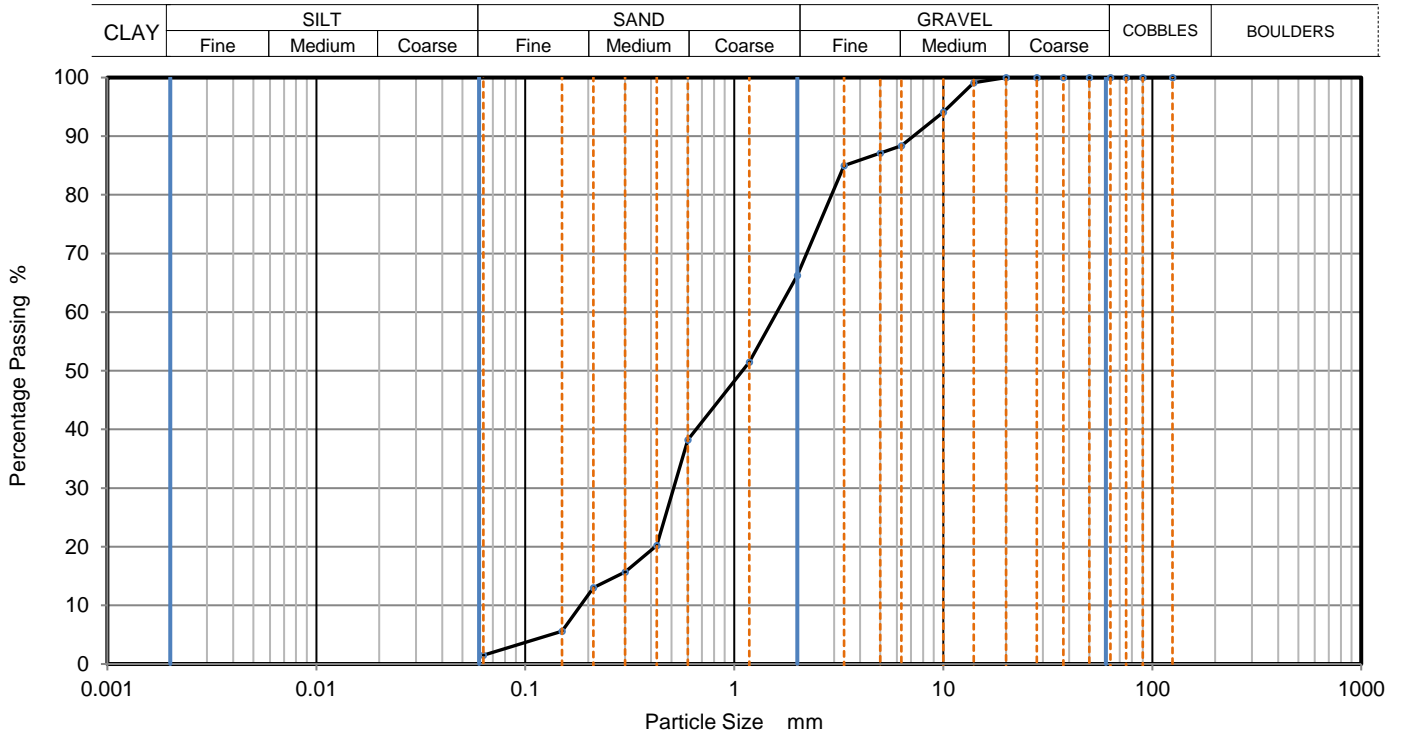
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH17
Sample No.	8
Depth, m	4.00
Sample Type	B
KeyLAB ID	Caus2018032436

Site Name	Arklow WWTP Land GI	
Soil Description	Brown gravelly fine to coarse SAND.	
Specimen Reference	2	m
Test Method	BS1377:Part 2:1990, clause 9.2	



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



## 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

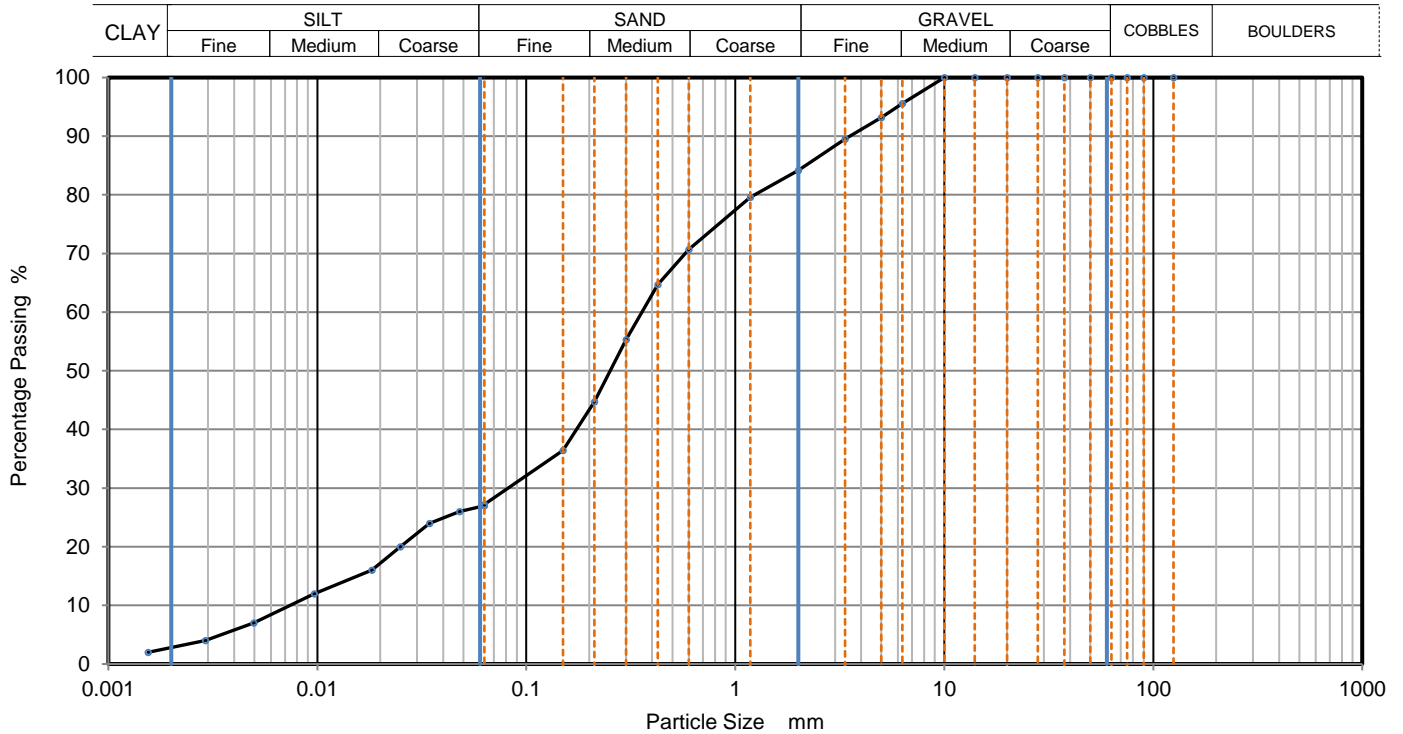
**m**

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		
0.425	65	Particle density (assumed)	
0.3	55	2.65 Mg/m3	
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

Stephen.Watson

Sheet printed

20/04/2018 10:26

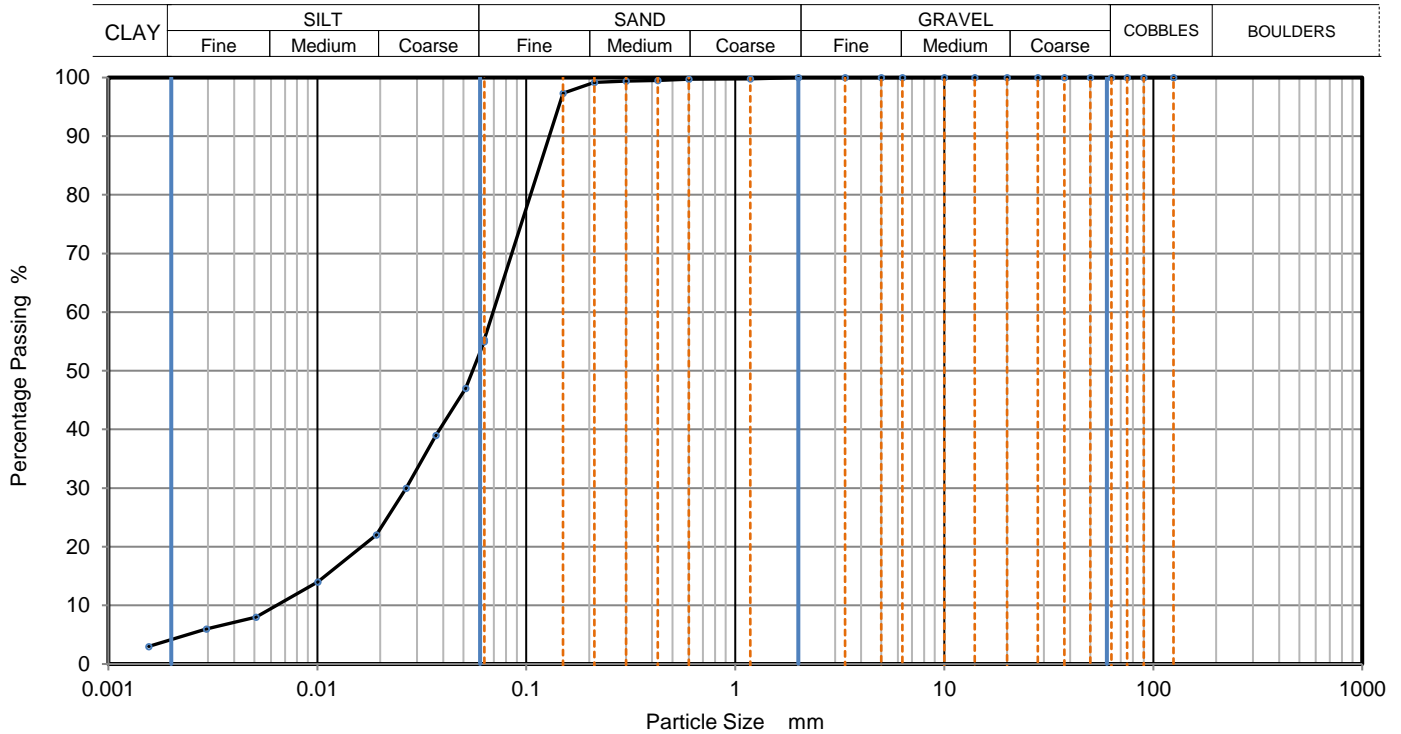
**Fig 1**

Sheet



## 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

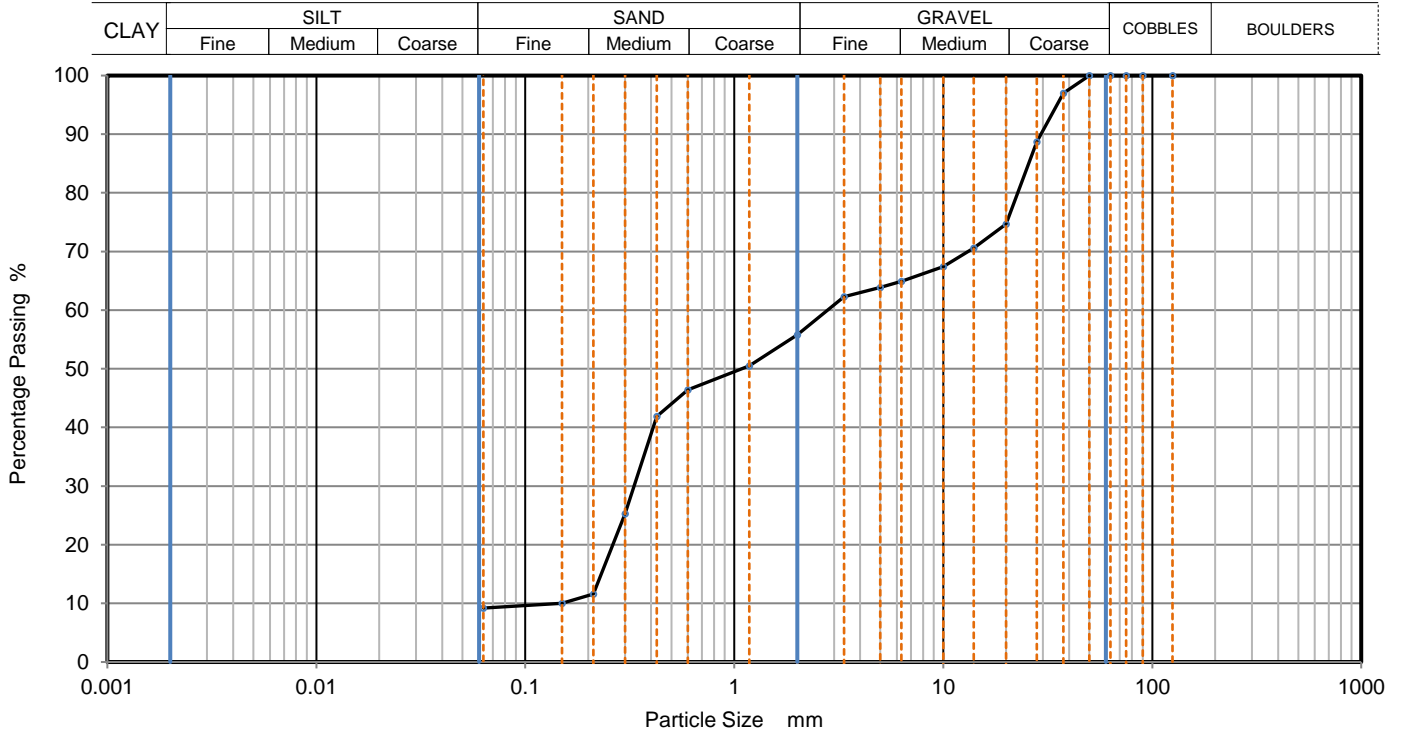
Grading Analysis		
D100	mm	
D60	mm	0.0695
D30	mm	0.0262
D10	mm	0.00627
Uniformity Coefficient		11
Curvature Coefficient		1.6

Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## 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

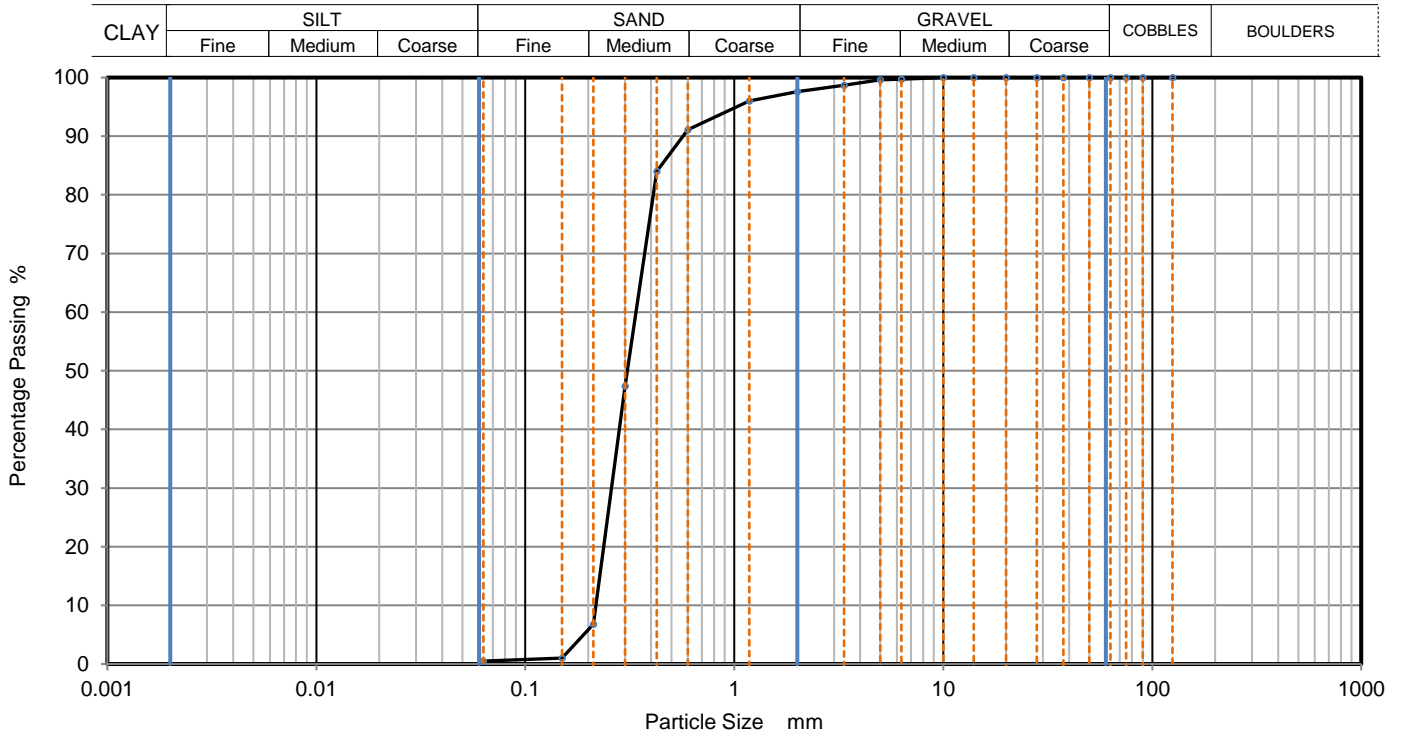
Grading Analysis	
D100	mm
D60	mm 2.79
D30	mm 0.331
D10	mm 0.151
Uniformity Coefficient	18
Curvature Coefficient	0.26

Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## 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

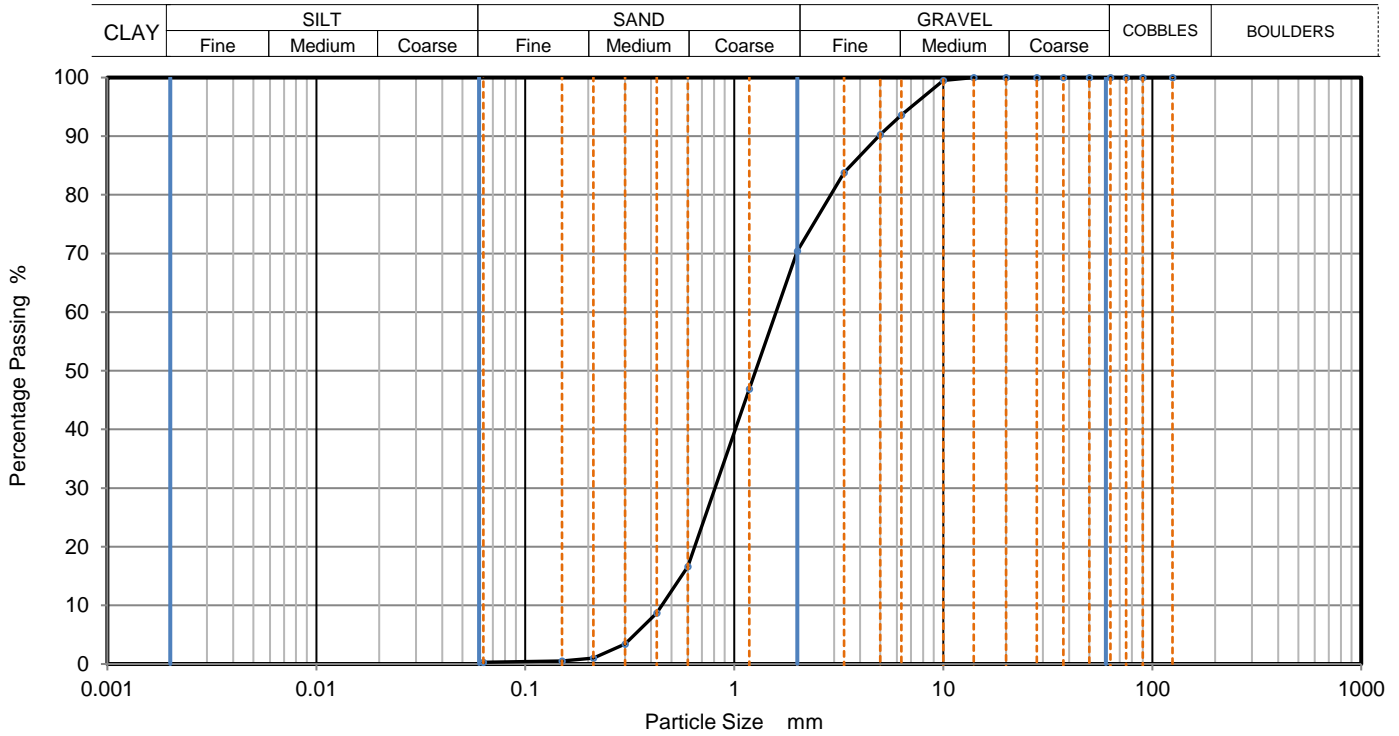
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH18
Sample No.	28
Depth, m	5.00
Sample Type	B
KeyLAB ID	Caus2018032444

Site Name	Arklow WWTP Land GI	
Soil Description	Reddish brown gravelly fine to coarse SAND.	
Specimen Reference	4	Specimen Depth m
Test Method	BS1377:Part 2:1990, clause 9.2	



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



## 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

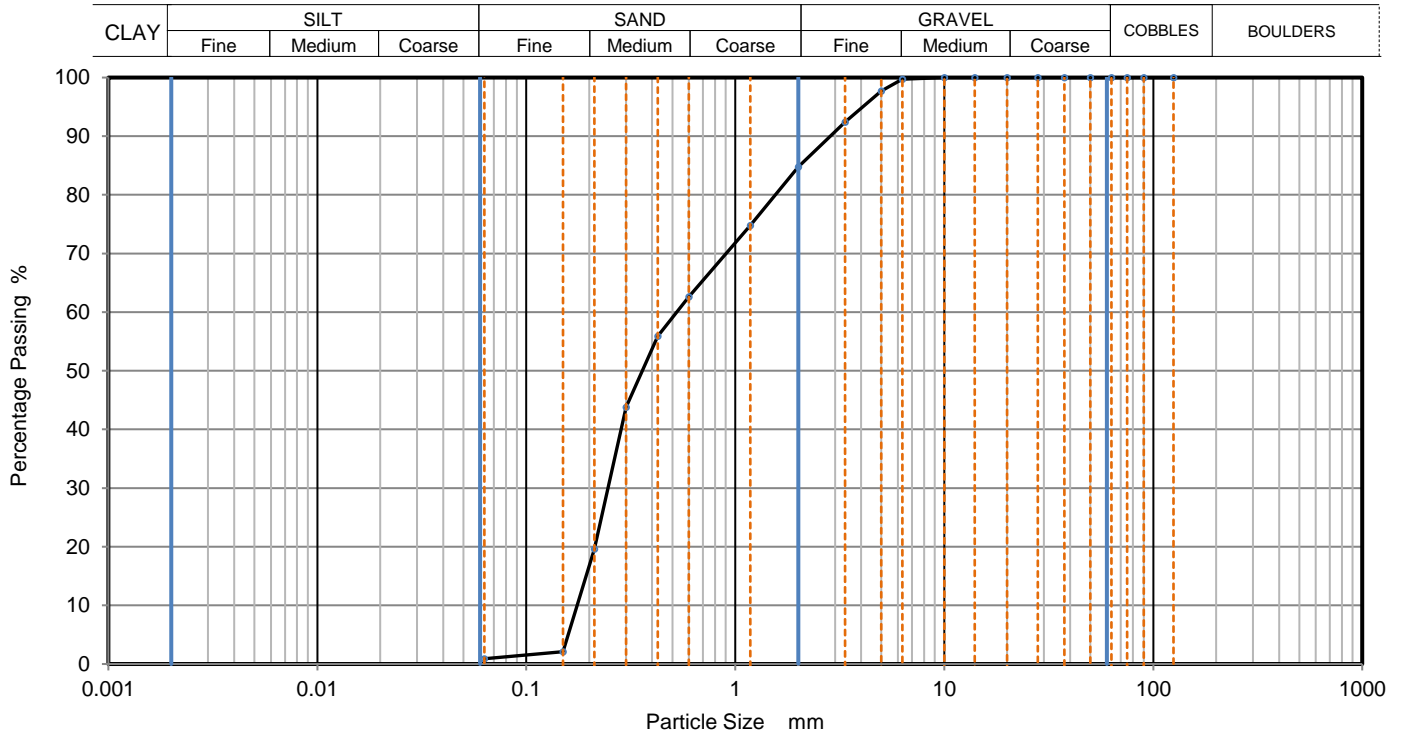
**B**

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

Stephen.Watson

Sheet printed

20/04/2018 10:26

**Fig 1**

Sheet

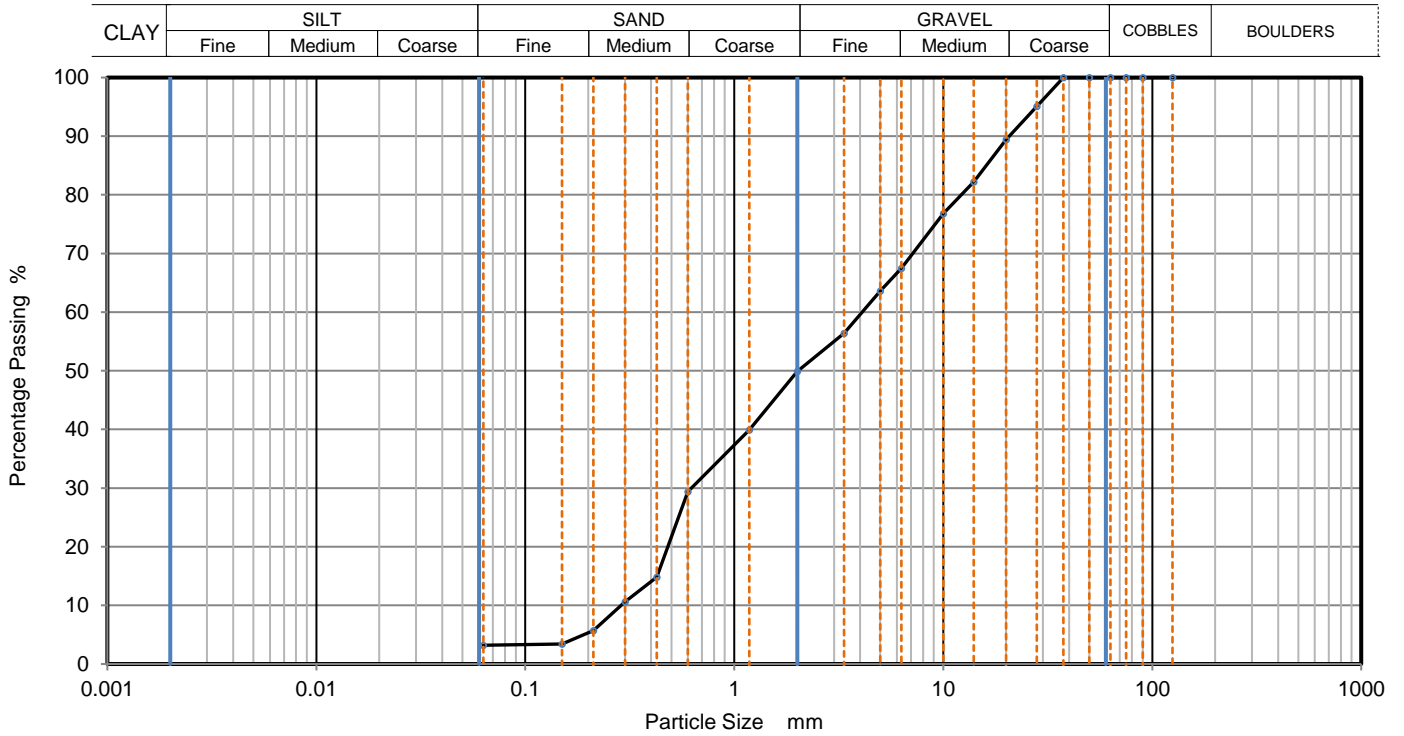




## PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH18
Sample No.	5
Depth, m	13.50
Sample Type	B
KeyLAB ID	Caus2018032448

Site Name	Arklow WWTP Land GI	
Soil Description	Brown sandy subangular fine to coarse GRAVEL.	
Specimen Reference	2	Specimen Depth m
Test Method	BS1377:Part 2:1990, clause 9.2	



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

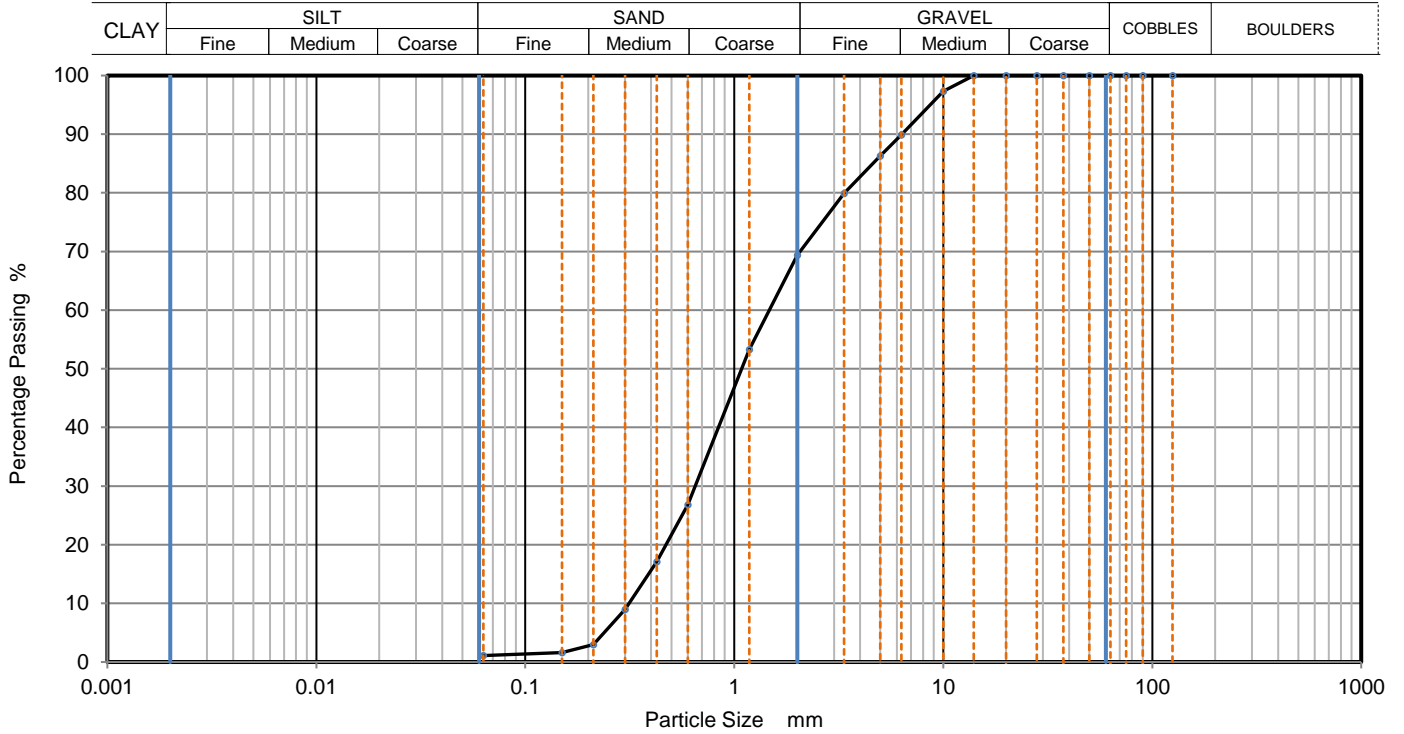
Grading Analysis	
D100	mm
D60	mm 4.1
D30	mm 0.624
D10	mm 0.288
Uniformity Coefficient	14
Curvature Coefficient	0.33

Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## PARTICLE SIZE DISTRIBUTION

Job Ref	<b>17-1455</b>
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
D30	mm
D10	mm
Uniformity Coefficient	4.7
Curvature Coefficient	0.92

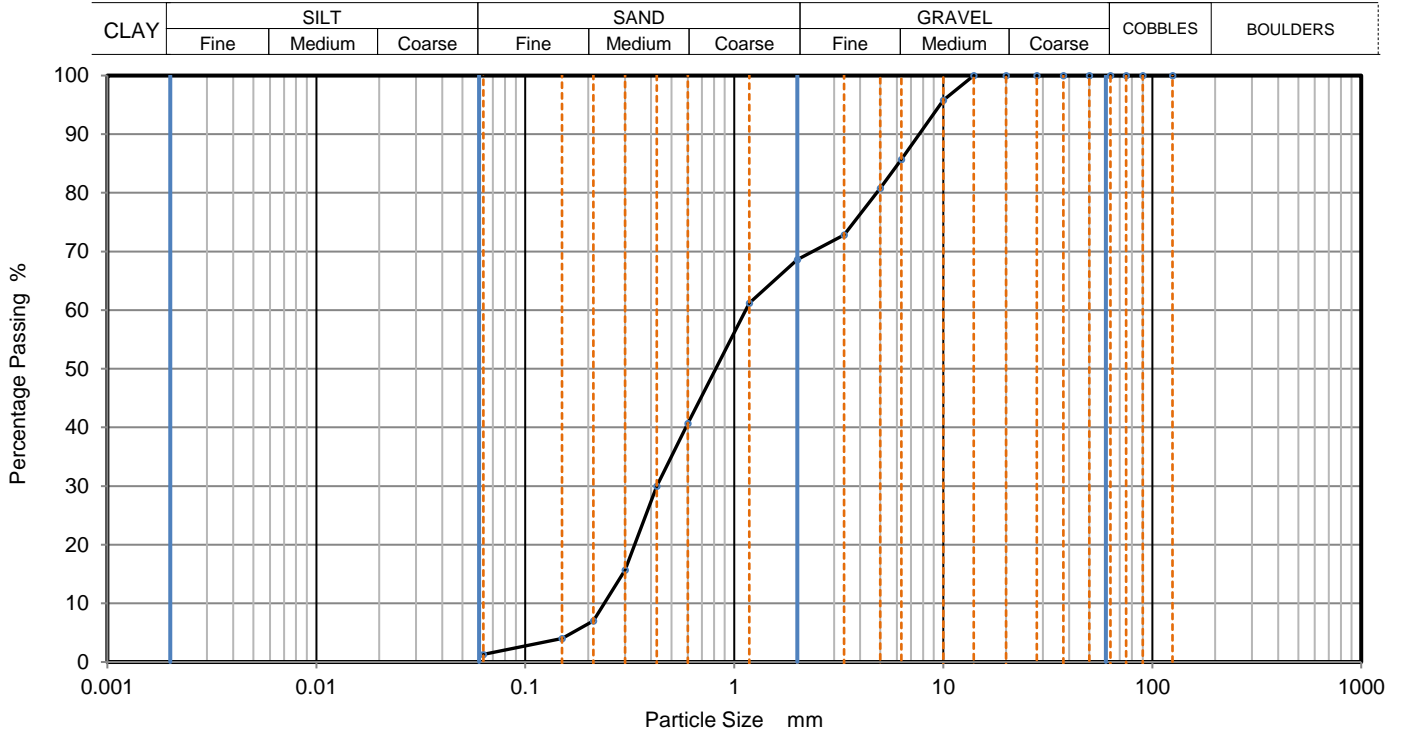
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH20
Sample No.	8
Depth, m	7.50
Sample Type	B
KeyLAB ID	Caus2018032453

Site Name	Arklow WWTP Land GI	
Soil Description	Brown gravelly fine to coarse SAND.	
Specimen Reference	2	Specimen Depth m
Test Method	BS1377:Part 2:1990, clause 9.2	



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

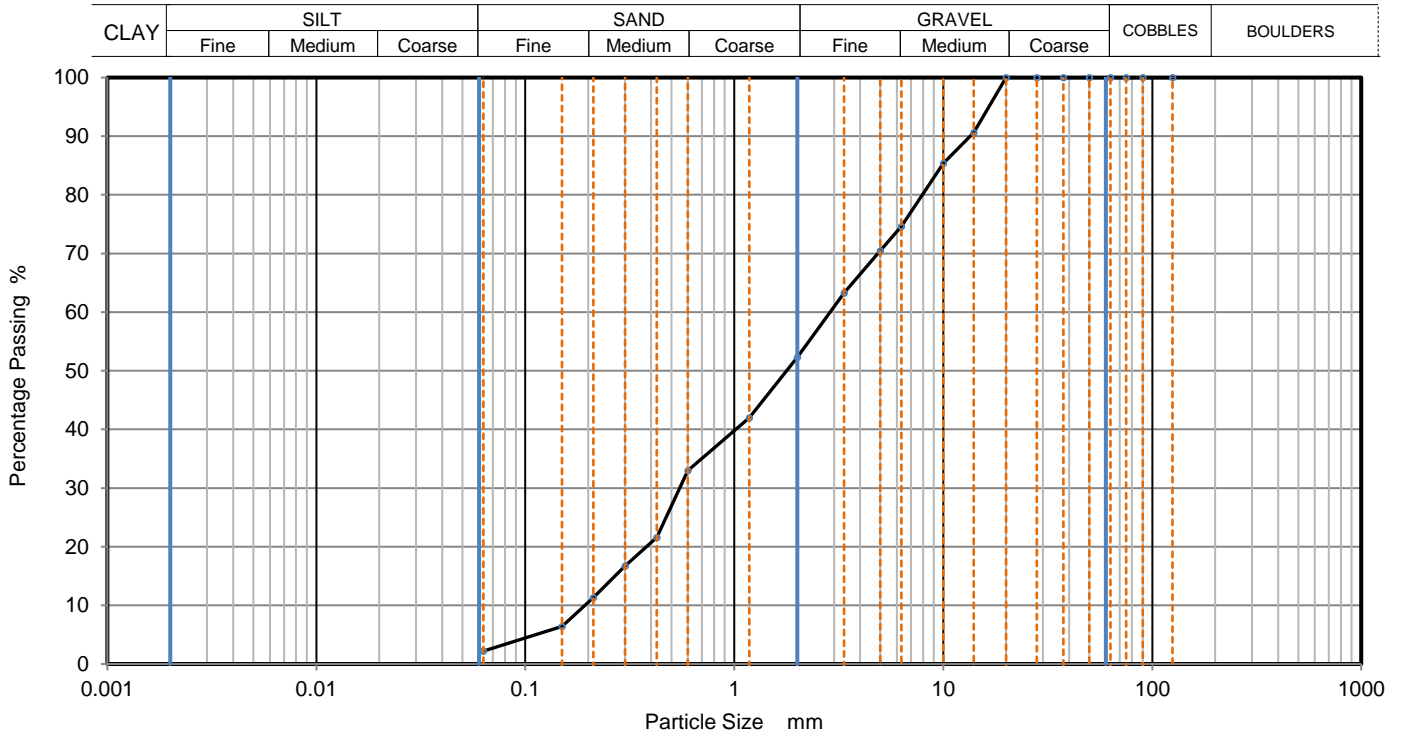
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



## PARTICLE SIZE DISTRIBUTION

Job Ref	<b>17-1455</b>
Borehole/Pit No.	BH20
Sample No.	24
Depth, m	13.50
Sample Type	B
KeyLAB ID	Caus2018032456

Site Name	Arklow WWTP Land GI	
Soil Description	Brown gravelly fine to coarse SAND.	
Specimen Reference	2	Specimen Depth m
Test Method	BS1377:Part 2:1990, clause 9.2	



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

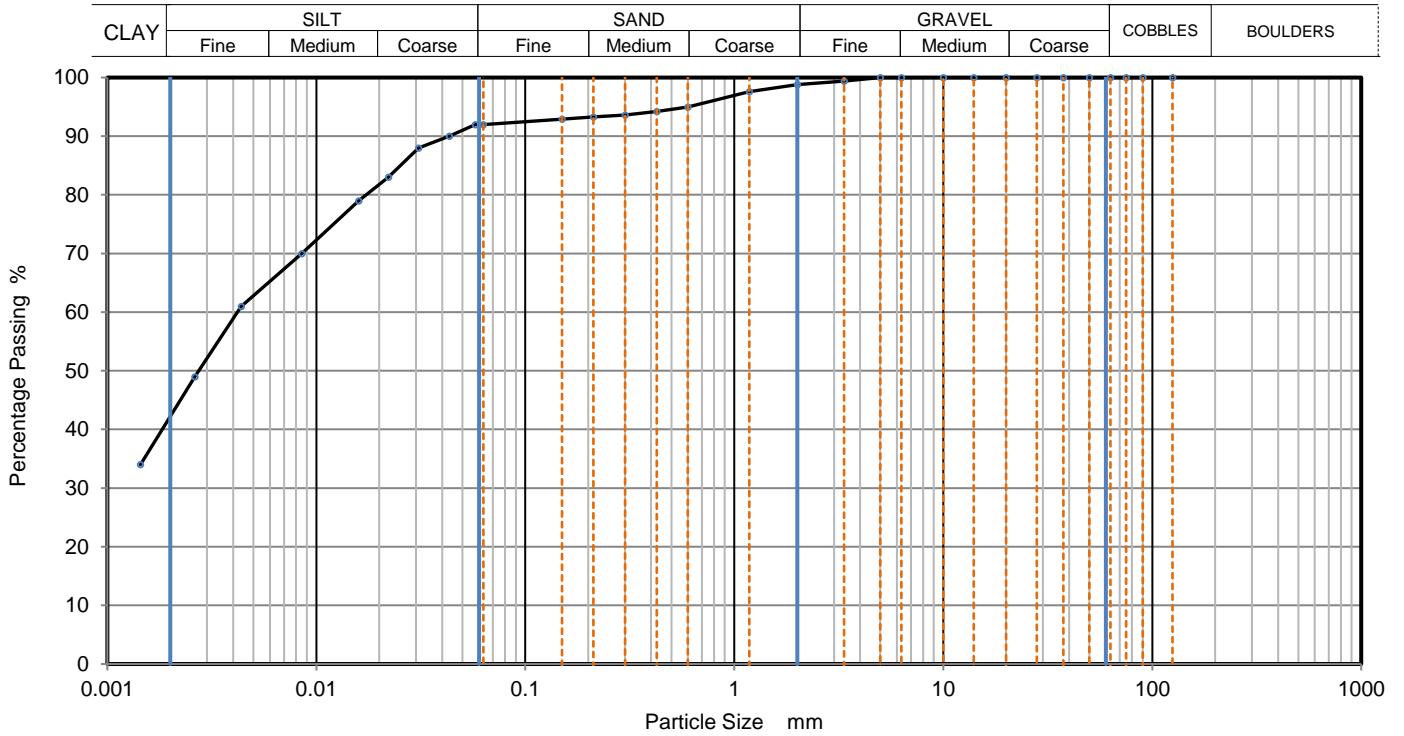
Remarks  
Preparation and testing in accordance with BS1377 unless noted below



# PARTICLE SIZE DISTRIBUTION

Job Ref	17-1455
Borehole/Pit No.	BH20
Sample No.	25
Depth, m	15.20
Sample Type	B
KeyLAB ID	Caus2018032458

Site Name	Arklow WWTP Land GI	
Soil Description	Brownish grey silty CLAY.	
Specimen Reference	2	m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5	



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) 2.65 Mg/m3	
0.425	94		
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
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377 unless noted below



# 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  
(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](mailto:rgunson@prosoils.co.uk)  
[awatkins@prosoils.co.uk](mailto:awatkins@prosoils.co.uk)

Page 1 of

# 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.

		<p>Arklow WWTP Land GI</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;"><b>Contract No:</b></td></tr> <tr><td style="text-align: center;"><b>PSL18/1448</b></td></tr> <tr><td style="text-align: center;"><b>Client Ref:</b></td></tr> <tr><td style="text-align: center;"><b>17-1455</b></td></tr> </table>	<b>Contract No:</b>	<b>PSL18/1448</b>	<b>Client Ref:</b>	<b>17-1455</b>
<b>Contract No:</b>							
<b>PSL18/1448</b>							
<b>Client Ref:</b>							
<b>17-1455</b>							

# PARTICLE SIZE DISTRIBUTION TEST

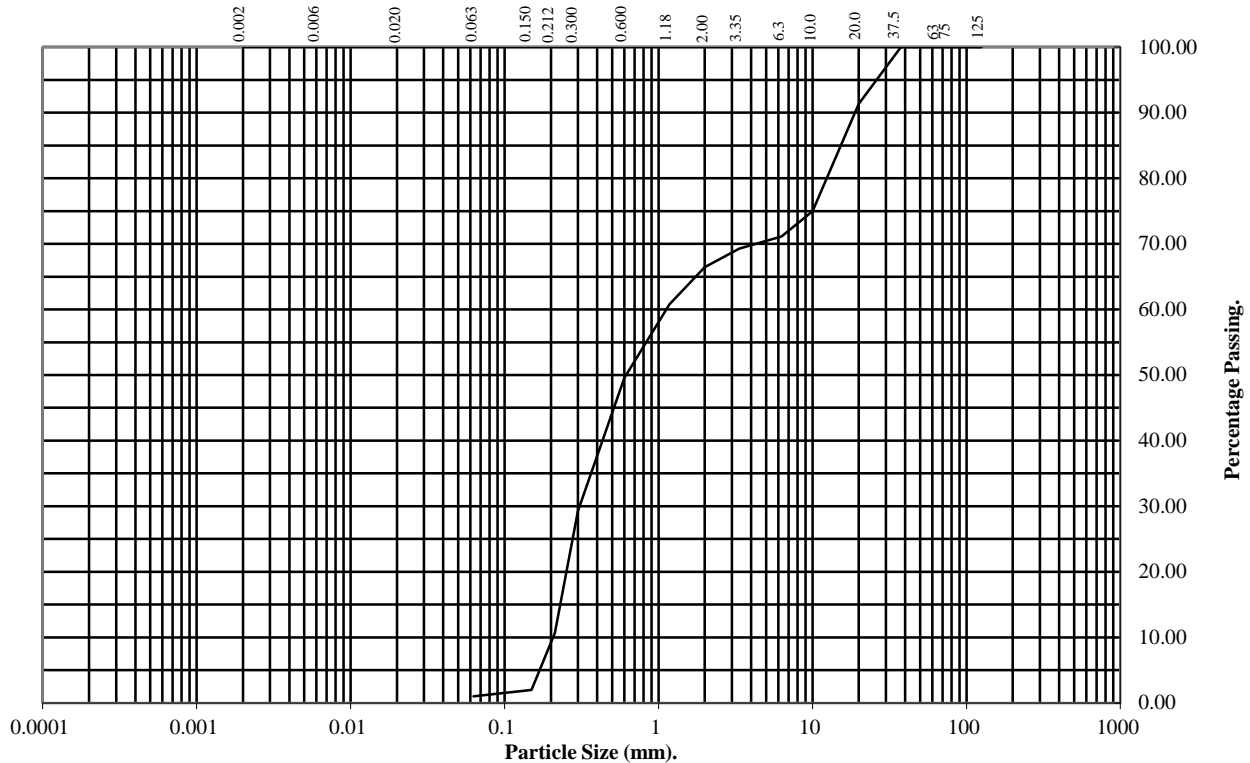
**BS1377 : Part 2 : 1990**

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:**



**Arklow WWTP Land GI**

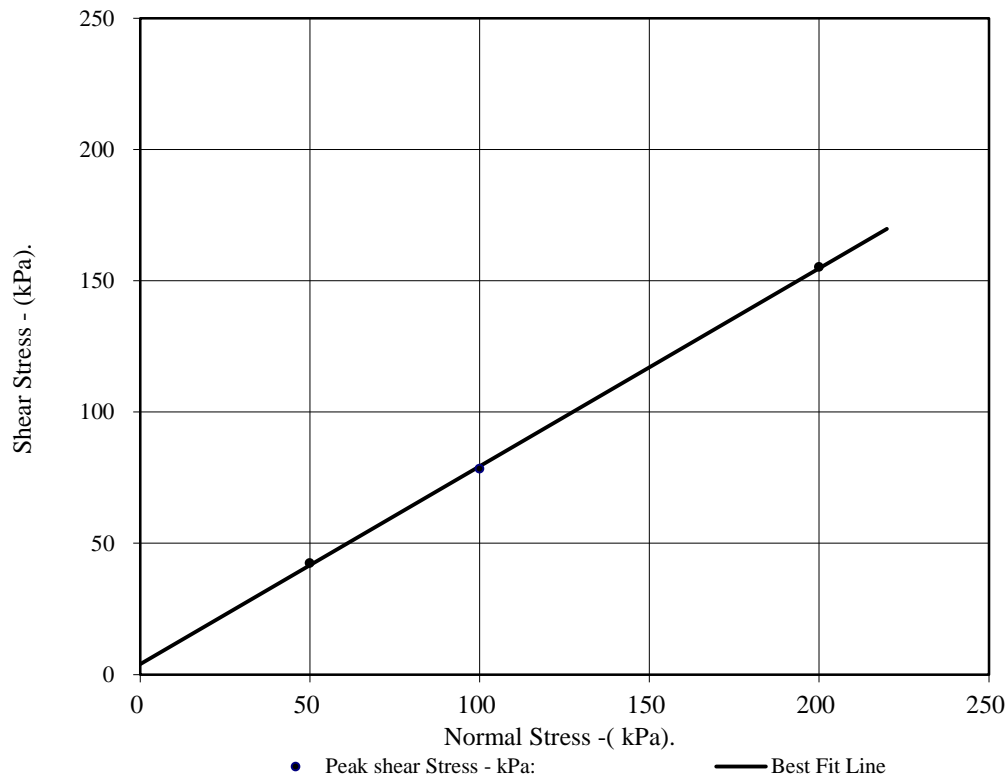
<b>Contract No:</b>
<b>PSL18/1448</b>
<b>Client Ref:</b>
<b>17-1455</b>



# 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/m <sup>3</sup> :	2.65	Assumed	<b>Remarks:</b>		
Sample Preparation:	Remoulded using hand tamped effort. Material tested passing 2mm sieve				
Sample Description:	See summary of soil descriptions.				
<b>STAGE</b>			<b>1</b>	<b>2</b>	<b>3</b>
<b>Initial Conditions</b>					
Height - mm:			19.54	19.54	19.54
Length - mm:			60.03	60.03	60.03
Moisture Content - %:			12	12	12
Bulk Density - Mg/m <sup>3</sup> :			1.88	1.87	1.90
Dry Density - Mg/m <sup>3</sup> :			1.68	1.67	1.70
Voids Ratio:			0.575	0.584	0.563
Normal Pressure- kPa			50	100	200
<b>Consolidation Stage</b>					
Consolidated Height - mm:			19.02	18.61	18.55
<b>Shearing Stage</b>					
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
<b>Final Consolidated Conditions</b>					
Moisture Content - %:			21	20	20
Bulk Density - Mg/m <sup>3</sup> :			1.93	1.96	2.00
Dry Density - Mg/m <sup>3</sup> :			1.60	1.63	1.67
<b>Peak</b>					
Angle of Shearing Resistance:( $\theta$ )			37		
Effective Cohesion - kPa:			4		



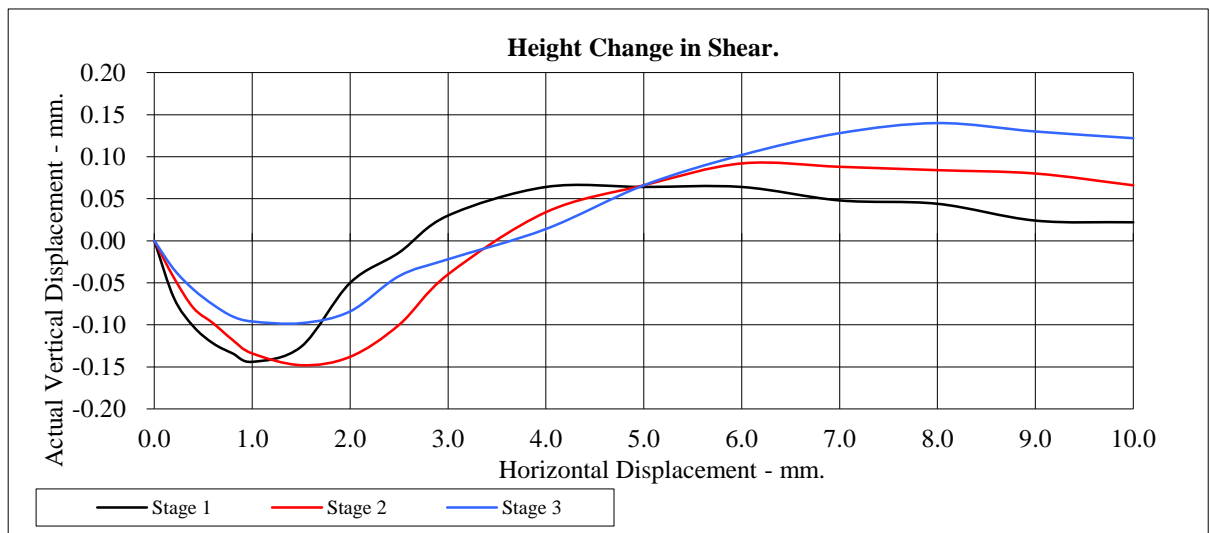
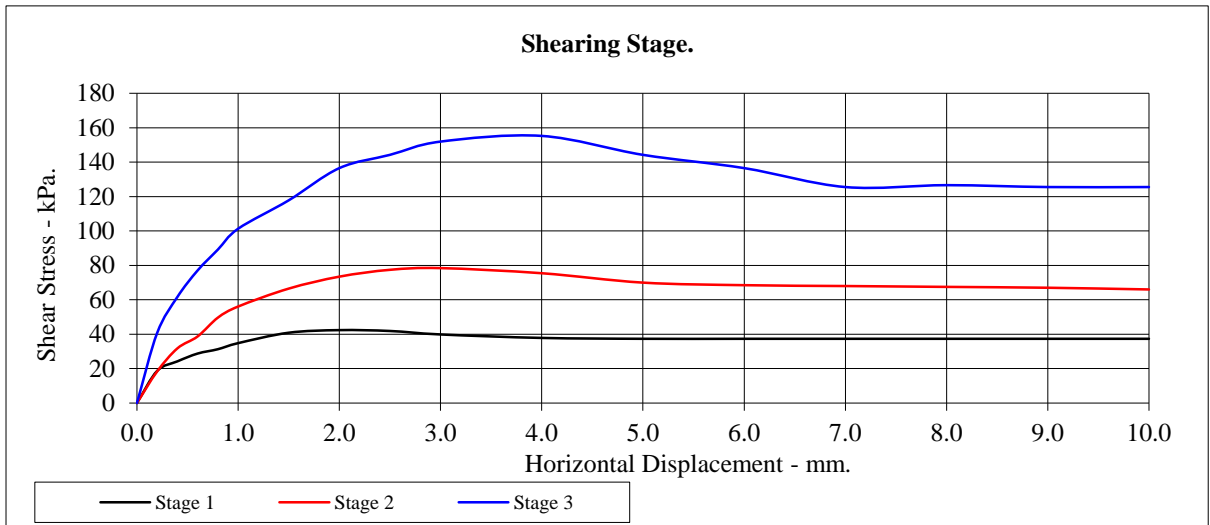
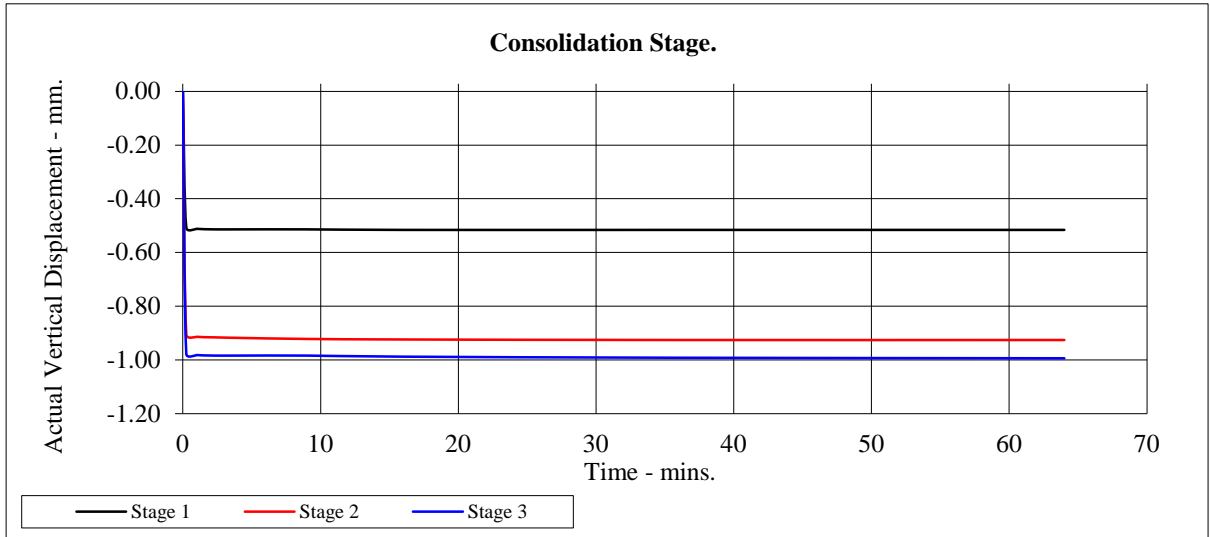
Arklow WWTP Land GI

<b>Contract No:</b>
<b>PSL18/1448</b>
<b>Client Ref:</b>
<b>17-1455</b>

# CONSOLIDATED DRAINED SHEARBOX TEST

BS1377:Part 7:1990 Clause 4.5.4

Hole Number:	BH07B	Top Depth:	7.50
Sample Number:	14	Base Depth:	



Arklow WWTP Land GI

<b>Contract No:</b>	PSL18/1448
<b>Client Ref:</b>	17-1455



## LABORATORY TEST CERTIFICATE

10 Queenslie Point  
Queenslie Industrial Estate  
120 Stepps Road  
Glasgow  
G33 3NQ

**Certificate No :** 18/336 - 01  
**To :** Stephen Watson  
**Client :** Causeway Geotech Limited  
8 Drumahiskey Road  
Ballymoney  
Co. Antrim  
BT53 7QL

Tel: 0141 774 4032  
Fax: 0141 774 3552

email: info@mattest.org  
Website: www.mattest.org

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



BOREHOLE		<b>BH04</b>	
SAMPLE		<b>CS7</b>	
DEPTH	m	<b>24.20-24.50</b>	
SAMPLE DIAMETER	mm	<b>101.80</b>	
SAMPLE HEIGHT	mm	<b>217.27</b>	
TEST CONDITION		<b>As Received</b>	
RATE OF LOADING	kN/s	<b>0.7</b>	
TEST DURATION	min.sec	<b>3.45</b>	
DATE OF TESTING		<b>31/03/2018</b>	
LOAD FRAME USED		<b>2000kN</b>	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		<b>Unknown</b>	
FAILURE LOAD	kN	<b>153.1</b>	
UNCONFINED COMPRESSIVE STRENGTH	MPa	<b>18.8</b>	
WATER CONTENT (ISRM Suggested Methods)	%	<b>0.6</b>	
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.70</b>	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.69</b>	

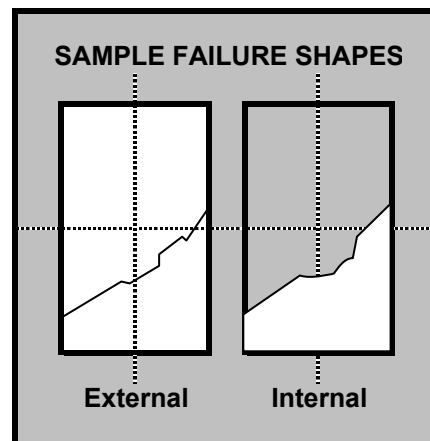
BOREHOLE			
SAMPLE			
DEPTH	m		
SAMPLE DIAMETER	mm		
SAMPLE HEIGHT	mm		
TEST CONDITION			
RATE OF LOADING	kN/s		
TEST DURATION	min.sec		
DATE OF TESTING			
LOAD FRAME USED			
LOAD DIRECTION WITH RESPECT TO LITHOLOGY			
FAILURE LOAD	kN		
UNCONFINED COMPRESSIVE STRENGTH	MPa		
WATER CONTENT (ISRM Suggested Methods)	%		
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		

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 <sup>3</sup>		
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		

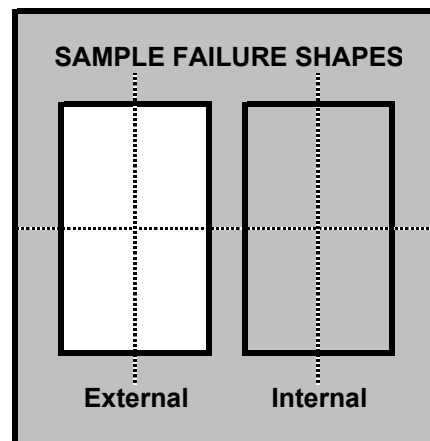
Tested in accordance with ASTM D7012 - 14

**SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH**

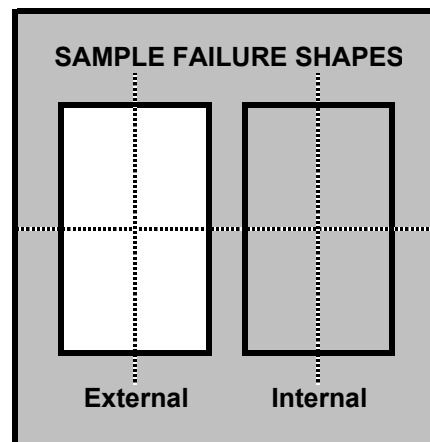
BOREHOLE		<b>BH05</b>
SAMPLE		<b>CS7</b>
DEPTH	m	<b>23.50-23.80</b>
SAMPLE DIAMETER	mm	<b>101.85</b>
SAMPLE HEIGHT	mm	<b>223.24</b>
TEST CONDITION		<b>As Received</b>
RATE OF LOADING	kN/s	<b>0.7</b>
TEST DURATION	min.sec	<b>2.25</b>
DATE OF TESTING		<b>31/03/2018</b>
LOAD FRAME USED		<b>2000kN</b>
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		<b>Unknown</b>
FAILURE LOAD	kN	<b>92.1</b>
UNCONFINED COMPRESSIVE STRENGTH	MPa	<b>11.3</b>
WATER CONTENT (ISRM Suggested Methods)	%	<b>0.3</b>
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.94</b>
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.93</b>



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 <sup>3</sup>	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	



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 <sup>3</sup>	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	



Tested in accordance with ASTM D7012 - 14

**SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH**

BOREHOLE		<b>BH11</b>	<p><b>SAMPLE FAILURE SHAPES</b></p> <p>External Internal</p>
SAMPLE		<b>CS2</b>	
DEPTH	m	<b>25.50-25.95</b>	
SAMPLE DIAMETER	mm	<b>101.72</b>	
SAMPLE HEIGHT	mm	<b>215.90</b>	
TEST CONDITION		<b>As Received</b>	
RATE OF LOADING	kN/s	<b>0.7</b>	
TEST DURATION	min.sec	<b>9.16</b>	
DATE OF TESTING		<b>31/03/2018</b>	
LOAD FRAME USED		<b>2000kN</b>	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		<b>Unknown</b>	
FAILURE LOAD	kN	<b>369.4</b>	
UNCONFINED COMPRESSIVE STRENGTH	MPa	<b>45.5</b>	
WATER CONTENT (ISRM Suggested Methods)	%	<b>0.2</b>	
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.91</b>	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.90</b>	

BOREHOLE		<b>BH11</b>	<p><b>SAMPLE FAILURE SHAPES</b></p> <p>External Internal</p>
SAMPLE		<b>CS3</b>	
DEPTH	m	<b>25.95-26.30</b>	
SAMPLE DIAMETER	mm	<b>101.64</b>	
SAMPLE HEIGHT	mm	<b>215.49</b>	
TEST CONDITION		<b>As Received</b>	
RATE OF LOADING	kN/s	<b>0.9</b>	
TEST DURATION	min.sec	<b>11.03</b>	
DATE OF TESTING		<b>31/03/2018</b>	
LOAD FRAME USED		<b>2000kN</b>	
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		<b>Unknown</b>	
FAILURE LOAD	kN	<b>620.0</b>	
UNCONFINED COMPRESSIVE STRENGTH	MPa	<b>76.4</b>	
WATER CONTENT (ISRM Suggested Methods)	%	<b>0.1</b>	
BULK DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.92</b>	
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>	<b>2.92</b>	

BOREHOLE			<p><b>SAMPLE FAILURE SHAPES</b></p> <p>External Internal</p>
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 <sup>3</sup>		
DRY DENSITY (ISRM Suggested Methods)	Mg/m <sup>3</sup>		

Tested in accordance with ASTM D7012 - 14

**SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH**

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 = DIAMETRICAL TEST  
A = AXIAL TEST

Mean Is(50) - Axial tests	4.08
Mean Is(50) - Diametrical tests	2.40
la(50)	1.70

Tested in accordance with ISRM (2007)

### SUMMARY OF POINT LOAD TEST RESULTS

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 = DIAMETRICAL TEST  
A = AXIAL TEST

Mean Is(50) - Axial tests	3.64
Mean Is(50) - Diametrical tests	2.01
Is(50)	1.81

Tested in accordance with ISRM (2007)

### SUMMARY OF POINT LOAD TEST RESULTS



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 = DIAMETRICAL TEST  
A = AXIAL TEST

Mean Is(50) - Axial tests	4.53
Mean Is(50) - Diametrical tests	3.21
la(50)	1.41

Tested in accordance with ISRM (2007)

### SUMMARY OF POINT LOAD TEST RESULTS



**CAUSEWAY**  
— GEOTECH

**APPENDIX K**

**Environmental Laboratory Test Results**





## 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  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Aisling O'Kane  
Colm Hurley  
Darren O'Mahony  
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.:** 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

**Site Address:**

**Date Sampled:** 09-Jan-2018

**Date Received:** 12-Jan-2018

**Your Ref.:**

**Project:** 17-1455 - Arklow  
WWTW Land GI

**Job Number:** 18-00911

**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)

**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	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

**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	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								

**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
Phenol	N	2790	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.24	< 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	0.18	< 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	0.75	< 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

**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



## 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	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

**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

**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	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

**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	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								

**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	

**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	
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		

**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	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		

## 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	
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		



**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	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

**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	

**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

**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

**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
2,4-dinitrotoluene	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 200.00

**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
Ethylene Glycol Dinitrate (EGDN)	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 1000.00
Cyclotetramethylenetetranitramine(HMX)	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 200.00
Hexanitrostilbene (HNS)	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 100.00
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	< 1000.00
Pentaerythritol tetranitrate (PETN)	SN		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 1000.00
Picrite	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 20.00
Cyclotrimethylenetrinitramine (RDX)	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 200.00
2,4,6-trinitrophenol	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 20.00
N-methyl-N,2,4,6-tetranitroaniline	S		mg/kg	5.00			< 5.0	< 5.0	< 5.0	< 5.0	< 200.00

**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
Quotation No.: Q17-11626	Chemtest Sample ID.:		563011	563012	563013	563015	563017	563018	563018
Order No.:	Client Sample Ref.:		TP10	TP17	TP17	TP22	TP23	TP23	TP23
	Client Sample ID.:		ES2	ES1	ES2	ES2	ES2	ES3	ES3
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		1.50	0.50	1.50	1.50	1.50	2.50	2.50
	Date Sampled:		10-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	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	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
Gamma Spectrometry (Subcon)	S			N/A					
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	1.6	1.5	0.87	1.3	1.2
Arsenic	U	2450	mg/kg	1.0	12	98	89	15	18
Barium	U	2450	mg/kg	10	< 10	11	35	< 10	< 10
Cadmium	U	2450	mg/kg	0.10	3.0	0.19	1.8	< 0.10	< 0.10
Molybdenum	U	2450	mg/kg	2.0	< 2.0	5.7	2.5	< 2.0	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	3.6	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	22	51	120	10	19
Mercury	U	2450	mg/kg	0.10	0.11	0.31	0.65	0.10	0.40
Nickel	U	2450	mg/kg	0.50	4.8	1.7	3.7	1.5	0.90
Lead	U	2450	mg/kg	0.50	26	64	270	77	11000
Selenium	U	2450	mg/kg	0.20	< 0.20	0.82	1.2	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	22	17	19	16	14
Zinc	U	2450	mg/kg	0.50	730	95	380	17	14
Chromium (Trivalent)	N	2490	mg/kg	1.0	6.3	2.7	4.9	2.7	2.1
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	18	< 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	18	< 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

**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						



**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

**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

**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
Acenaphthylene	N	2800	mg/kg	0.010	< 0.010	< 0.010	0.40	< 0.010	< 0.010
Acenaphthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	0.060	< 0.010	< 0.010
Fluorene	N	2800	mg/kg	0.010	< 0.010	< 0.010	0.29	< 0.010	< 0.010
Phenanthrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	5.1	< 0.010	0.16
Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	0.81	< 0.010	0.010
Fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	5.5	< 0.010	0.14
Pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	4.3	< 0.010	0.11
Benzo[a]anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	2.1	< 0.010	< 0.010
Chrysene	N	2800	mg/kg	0.010	< 0.010	< 0.010	2.4	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	2.6	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	0.99	< 0.010	< 0.010
Benzo[a]pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	1.5	< 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
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	0.23	< 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
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	29	< 0.20	0.42
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	< 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

## 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

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562984					Limits		
Sample Ref: TP15					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 08-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562985					Limits		
Sample Ref: TP15					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.00							
Bottom Depth(m):							
Sampling Date: 08-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562986					Limits		
Sample Ref: TP15					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 08-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 562987					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP15							
Sample ID: ES4							
Top Depth(m): 2.00							
Bottom Depth(m):							
Sampling Date: 08-Jan-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 562988				Limits			
Sample Ref: TP01				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES1							
Top Depth(m): 0.50				7.5	3	5	6
Bottom Depth(m):							
Sampling Date: 09-Jan-2018				7.3	--	--	10
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 562989				Limits			
Sample Ref: TP01				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES2							
Top Depth(m): 1.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Bottom Depth(m):							
Sampling Date: 09-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	%	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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 562991					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP16							
Sample ID: ES1							
Top Depth(m): 0.40							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562992					Limits		
Sample Ref: TP16					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.00							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 562994					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP16							
Sample ID: ES4							
Top Depth(m): 1.70							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562995					Limits		
Sample Ref: TP24					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562996					Limits		
Sample Ref: TP24					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.40							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562997					Limits		
Sample Ref: TP25					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562998					Limits		
Sample Ref: TP25					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 562999					Limits		
Sample Ref: TP25					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.30							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 563000					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP26							
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563001					Limits		
Sample Ref: TP26					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563002					Limits		
Sample Ref: TP27					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.10							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563003					Limits		
Sample Ref: TP27					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.00							
Bottom Depth(m):							
Sampling Date: 09-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563004					Limits		
Sample Ref: TP04					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563006					Limits		
Sample Ref: TP05					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563007					Limits		
Sample Ref: TP05					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.00							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563008					Limits		
Sample Ref: TP05					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.00							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563010					Limits		
Sample Ref: TP10					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563011				Limits			
Sample Ref: TP10				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES2							
Top Depth(m): 1.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Bottom Depth(m):							
Sampling Date: 10-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	%	< 0.20	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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 563012					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP17							
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563013					Limits		
Sample Ref: TP17					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563015					Limits		
Sample Ref: TP22					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563017					Limits		
Sample Ref: TP23					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-00911				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563018				Limits			
Sample Ref: TP23					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.50							
Bottom Depth(m):							
Sampling Date: 10-Jan-2018							
Determinand	SOP	Accred.	Units				
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	Alkaline 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-diphenylcarbazine.
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–C44 Aromatics: >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.

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*; Diben[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](mailto:customerservices@chemtest.co.uk)

## Analysis of Soil Samples

Client: Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 0AL

Testing Facility: SOCOTEC UK  
Unit 12  
Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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: *Chunston*

Approver's name: Charlene Hunston

Job Title: Senior Analyst

Report Date: 05 February 2018

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." (<sup>226</sup>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.

### 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
562999 – 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	2.8 ± 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<sup>-1</sup> 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.

## 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	< 63	< 17	< 7.7
562997 - TP25 ES1@0.50	RW0547	520 ± 40	550 ± 40	< 120	760 ± 90	< 14	< 420	< 60	< 18	< 7.5
562998 - TP25 ES2@1.50	RW0548	530 ± 40	560 ± 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<sup>-1</sup> 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. <sup>226</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>235</sup>U also occurs at 186 keV. <sup>235</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>235</sup>U is reported, the <sup>226</sup>Ra result will be unreliable and overestimated. However even if <sup>235</sup>U is below the LoD there may still be a contribution to the <sup>226</sup>Ra from <sup>235</sup>U and the <sup>226</sup>Ra result may be unreliable and overestimated. If an accurate result for <sup>226</sup>Ra is required this is better obtained by radiochemical analysis.



## Analysis of Soil Samples

Client: Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 0AL

Testing Facility: SOCOTEC UK  
Unit 12  
Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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: *Charlene*

Approver's name: Charlene Hunston

Job Title: Senior Analyst

Report Date: 09 March 2018

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." (<sup>226</sup>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	Ce-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-228*	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<sup>-1</sup> 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. <sup>226</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>226</sup>U also occurs at 186 keV. <sup>226</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>214</sup>Pb is reported, the <sup>226</sup>Ra result will be unreliable and overestimated. However even if <sup>226</sup>U is below the LoD there may still be a contribution to the <sup>226</sup>Ra from <sup>235</sup>U and the <sup>226</sup>Ra result may be unreliable and overestimated. If an accurate result for <sup>226</sup>Ra is required this is better obtained by radiochemical analysis.



1015



## 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  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Aisling O'Kane  
Colm Hurley  
Darren O'Mahony  
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.:** 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

---

**Project: 17-1455 Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:										
Quotation No.: Q17-11626		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Top Depth (m):										
		Date Sampled:										
		Asbestos Lab:										
Determinand	Accred.	SOP	Units	LOD	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051
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	< 0.10
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

**Project: 17-1455 Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:										
Quotation No.: Q17-11626		Chemtest Sample ID.:		18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051
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

**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
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
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

**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



**Project: 17-1455 Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:										
Quotation No.: Q17-11626		Chemtest Sample ID.:		18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051	18-01051
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

## 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	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	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

**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		

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	
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	
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	

**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	

**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	18-01051
Quotation No.: Q17-11626		Chemtest Sample ID.:		563803	563804	563805	563806	563807	563808	563809	563810	563810
Order No.:		Client Sample Ref.:		TP8	TP20	TP20	TP9	TP9	TP9	TP9	TP9	TP19
		Client Sample ID.:		ES3	ES1	ES2	ES1	ES2	ES3	ES4	ES1	ES1
		Sample Type:		SOIL	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	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	11-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		0.92	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

## 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	18-01051
Quotation No.: Q17-11626		Chemtest Sample ID.:		563803	563804	563805	563806	563807	563808	563809	563810	563810
Order No.:		Client Sample Ref.:		TP8	TP20	TP20	TP9	TP9	TP9	TP9	TP9	TP19
		Client Sample ID.:		ES3	ES1	ES2	ES1	ES2	ES3	ES4	ES1	ES1
		Sample Type:		SOIL	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	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	11-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	< 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



**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	18-01051
Quotation No.: Q17-11626		Chemtest Sample ID.:		563811	563812	563813	563815	563816	563817	563818	563818	563819
Order No.:		Client Sample Ref.:		TP19	TP11	TP11	TP11	TP12	TP12	TP12	TP12	TP13
		Client Sample ID.:		ES2	ES1	ES2	ES4	ES1	ES2	ES3	ES3	ES1
		Sample Type:		SOIL	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	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	11-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	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

**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								

**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

**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

**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	18-01051
Quotation No.: Q17-11626		Chemtest Sample ID.:		563811	563812	563813	563815	563816	563817	563818	563819	563819
Order No.:		Client Sample Ref.:		TP19	TP11	TP11	TP11	TP12	TP12	TP12	TP12	TP13
		Client Sample ID.:		ES2	ES1	ES2	ES4	ES1	ES2	ES3	ES3	ES1
		Sample Type:		SOIL	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	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	11-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		0.87	< 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	< 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	< 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

## 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	18-01051
Quotation No.: Q17-11626		Chemtest Sample ID.:		563811	563812	563813	563815	563816	563817	563818	563818	563819
Order No.:		Client Sample Ref.:		TP19	TP11	TP11	TP11	TP12	TP12	TP12	TP12	TP13
		Client Sample ID.:		ES2	ES1	ES2	ES4	ES1	ES2	ES3	ES3	ES1
		Sample Type:		SOIL	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	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	11-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	< 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

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

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
Total Petroleum Hydrocarbons	N	2680	mg/kg	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	



**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
Phenol	N	2790	mg/kg	0.050	< 0.050
2-Chlorophenol	N	2790	mg/kg	0.050	< 0.050
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.050	< 0.050
1,3-Dichlorobenzene	N	2790	mg/kg	0.050	< 0.050
1,4-Dichlorobenzene	N	2790	mg/kg	0.050	< 0.050
1,2-Dichlorobenzene	N	2790	mg/kg	0.050	< 0.050
2-Methylphenol	N	2790	mg/kg	0.050	< 0.050
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.050	< 0.050
Hexachloroethane	N	2790	mg/kg	0.050	< 0.050
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.050	< 0.050
4-Methylphenol	N	2790	mg/kg	0.050	< 0.050
Nitrobenzene	N	2790	mg/kg	0.050	< 0.050
Isophorone	N	2790	mg/kg	0.050	< 0.050
2-Nitrophenol	N	2790	mg/kg	0.050	< 0.050
2,4-Dimethylphenol	N	2790	mg/kg	0.050	< 0.050
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.050	< 0.050
2,4-Dichlorophenol	N	2790	mg/kg	0.050	< 0.050

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

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

**Project: 17-1455 Arklow WWTW Land GI**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>		18-01051	18-01051		
Quotation No.: Q17-11626	<b>Chemtest Sample ID.:</b>		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		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
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

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563794					Limits		
Sample Ref: TP18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 12-Jan-2018							
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

Chemtest Job No: 18-01051				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563796				Limits			
Sample Ref: TP18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.50							
Bottom Depth(m):							
Sampling Date: 12-Jan-2018							
Determinand	SOP	Accred.	Units				
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

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563797					Limits		
Sample Ref: TP6					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 12-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563798					Limits		
Sample Ref: TP6					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
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	%	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.



**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563799					Limits		
Sample Ref: TP7					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 12-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 563800					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 563801					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP8							
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 12-Jan-2018							
Determinand	SOP	Accred.	Units				
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

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563802					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP8							
Sample ID: ES2							
Top Depth(m): 1.00							
Bottom Depth(m):							
Sampling Date: 12-Jan-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-01051				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563803				Limits			
Sample Ref: TP8					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.00							
Bottom Depth(m):							
Sampling Date: 12-Jan-2018							
Determinand	SOP	Accred.	Units				
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

Chemtest Job No: 18-01051				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563804				Limits			
Sample Ref: TP20					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 11-Jan-2018							
Determinand	SOP	Accred.	Units				
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

Chemtest Job No: 18-01051				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563805				Limits			
Sample Ref: TP20					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
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	%	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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563806					Limits		
Sample Ref: TP9					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 11-Jan-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563807				Limits			
Sample Ref: TP9				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563808					Limits		
Sample Ref: TP9					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.50							
Bottom Depth(m):							
Sampling Date: 11-Jan-2018							
Determinand	SOP	Accred.	Units				
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

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				Landfill Waste Acceptance Criteria			
				Limits			
				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	%	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

Chemtest Job No: 18-01051				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563811				Limits			
Sample Ref: TP19					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
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	%	< 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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563812					Limits		
Sample Ref: TP11					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
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	%	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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 563813					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: TP11							
Sample ID: ES2							
Top Depth(m): 1.20							
Bottom Depth(m):							
Sampling Date: 11-Jan-2018							
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

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563816					Limits		
Sample Ref: TP12					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 11-Jan-2018							
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563817					Limits		
Sample Ref: TP12					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
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	%	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.



**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-01051					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 563818					Limits		
Sample Ref: TP12					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.30							
Bottom Depth(m):							
Sampling Date: 11-Jan-2018							
Determinand	SOP	Accred.	Units				
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**

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				Landfill Waste Acceptance Criteria Limits			
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-01051				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 563820				Limits			
Sample Ref: TP21					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 11-Jan-2018							
Determinand	SOP	Accred.	Units				
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**

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				Landfill Waste Acceptance Criteria			
				Limits			
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.23	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.

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	Alkaline 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-diphenylcarbazine.
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

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) ICES7 Congeners 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](mailto: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.



1663



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
soil type		N	in house	n/a		Type 3	Type 3	Type 3	Type 3	Type 3	Type 3	Type 3	Type 3	Type 3	Other type	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
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
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
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
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
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
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
nitrocellulose (NC)	9004-70-0	U	376	mg/kg	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
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
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
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
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
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



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	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
description of removed material		N	in house	n/a			Stones	Stones	Stones	Stones	Stones
soil type		N	in house	n/a		Other type	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
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
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
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
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
cyclotetramethylenetetranitramine (HMX)	2691-41-0	M	375	mg/kg as DW	5	< 200.0	< 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
nitrocellulose (NC)	9004-70-0	U	376	mg/kg	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
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
picrite	556-88-7	M	375	mg/kg as DW	5	< 20.00	< 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
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
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



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**

<b>RPS Sample Number</b>	<b>Customer Number</b>	<b>Sample Comments</b>
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-submission 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



## 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  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Aisling O'Kane  
Colm Hurley  
Darren O'Mahony  
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.:** 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

**Site Address:**

**Date Sampled:** 15-Jan-2018

**Date Received:** 17-Jan-2018

**Your Ref.:**

**Project:** 17-1455 - Arklow  
WWTW Land GI

**Job Number:** 18-01350

**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)

**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	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	15-Jan-2018	15-Jan-2018
	Asbestos Lab:		COVENTRY	COVENTRY	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



**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								
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	

**Project: 17-1455 - Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:											
Quotation No.: Q17-11626		Chemtest Sample ID.:		18-01350	18-01350	18-01350	18-01350	18-01350	18-01350	18-01350	18-01350	18-01350	18-01350
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	15-Jan-2018	15-Jan-2018
		Asbestos Lab:		COVENTRY	COVENTRY	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	

**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	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

**Project: 17-1455 - Arklow WWTW Land GI**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>				18-01350
Quotation No.: Q17-11626	<b>Chemtest Sample ID.:</b>				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
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>	
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

Project: 17-1455 - Arklow WWTW Land GI

<b>Client:</b> Causeway Geotech Ltd	<b>Chemtest Job No.:</b>		18-01350		
Quotation No.: Q17-11626	<b>Chemtest Sample ID.:</b>		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

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

**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**

Chemtest Job No: 18-01350				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 565019				Limits			
Sample Ref: TP2					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-01350				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 565020				Limits			
Sample Ref: TP2				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES2							
Top Depth(m): 1.20							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-01350				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 565021				Limits			
Sample Ref: TP2				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES3							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-01350				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 565022				Limits			
Sample Ref: TP2					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES4							
Top Depth(m): 2.50							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-01350				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 565023				Limits			
Sample Ref: TP3A				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-01350				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 565024				Limits			
Sample Ref: TP3A				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES2							
Top Depth(m): 1.50				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Bottom Depth(m):							
Sampling Date: 15-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	%	4.3	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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-01350					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 565025					Limits		
Sample Ref: TP14					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-01350					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 565026					Limits		
Sample Ref: TP14					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-01350				Landfill Waste Acceptance Criteria Limits			
Chemtest Sample ID: 565027							
Sample Ref: TP14				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: ES3							
Top Depth(m): 1.60							
Bottom Depth(m):							
Sampling Date: 15-Jan-2018							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	26	3	5	
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	
<b>Eluate Analysis</b>				<b>10:1 Eluate mg/l</b>	<b>10:1 Eluate mg/kg</b>	<b>Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg</b>	
Arsenic	1450	U		0.016	0.16	0.5	
Barium	1450	U		0.064	0.64	20	
Cadmium	1450	U		< 0.00010	< 0.010	0.04	
Chromium	1450	U		0.0017	< 0.050	0.5	
Copper	1450	U		0.026	0.26	2	
Mercury	1450	U		0.00095	0.0095	0.01	
Molybdenum	1450	U		< 0.0010	< 0.050	0.5	
Nickel	1450	U		0.0023	< 0.050	0.4	
Lead	1450	U		0.45	4.5	0.5	
Antimony	1450	U		0.0019	0.019	0.06	
Selenium	1450	U		0.0028	0.028	0.1	
Zinc	1450	U		0.023	< 0.50	4	
Chloride	1220	U		1.4	14	800	
Fluoride	1220	U		0.080	< 1.0	10	
Sulphate	1220	U		22	220	1000	
Total Dissolved Solids	1020	N		42	420	4000	
Phenol Index	1920	U		< 0.030	< 0.30	1	
Dissolved Organic Carbon	1610	U		6.8	68	500	

<b>Solid Information</b>	
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.



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	Alkaline 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-diphenylcarbazine.
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–C44 Aromatics: >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.

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](mailto:customerservices@chemtest.co.uk)



## 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  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Aisling O'Kane  
Colm Hurley  
Darren O'Mahony  
Gabiella 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.:** 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

---

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
Moisture	N	2030	%	0.020	11	14	18
Cyanide (Complex)	U	2300	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] 7.9
Cyanide (Free)	U	2300	mg/kg	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
Arsenic	U	2450	mg/kg	1.0	13	10	3.4
Barium	U	2450	mg/kg	10	44	< 10	38
Cadmium	U	2450	mg/kg	0.10	0.67	1.1	< 0.10
Molybdenum	U	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	75	540	13
Mercury	U	2450	mg/kg	0.10	0.17	< 0.10	0.33
Nickel	U	2450	mg/kg	0.50	9.4	7.0	5.0
Lead	U	2450	mg/kg	0.50	740	170	25
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	17	15	9.7
Zinc	U	2450	mg/kg	0.50	260	470	28
Chromium (Trivalent)	N	2490	mg/kg	1.0	13	6.4	6.6
Chromium (Hexavalent)	N	2490	mg/kg	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
Aliphatic TPH >C6-C8	N	2680	mg/kg	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
Aliphatic TPH >C10-C12	N	2680	mg/kg	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
Aliphatic TPH >C16-C21	N	2680	mg/kg	0.10	[B] 140	[B] 24	[B] < 0.10
Aliphatic TPH >C21-C35	N	2680	mg/kg	0.10	[B] 1200	[B] 200	[B] < 0.10
Aliphatic TPH >C35-C44	N	2680	mg/kg	0.10	[B] 140	[B] 2.6	[B] < 0.10
Total Aliphatic Hydrocarbons	N	2680	mg/kg	1.0	[B] 1500	[B] 230	[B] < 1.0
Aromatic TPH >C5-C7	N	2680	mg/kg	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
Aromatic TPH >C8-C10	N	2680	mg/kg	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
Aromatic TPH >C12-C16	N	2680	mg/kg	0.10	[B] 11	[B] < 0.10	[B] < 0.10
Aromatic TPH >C16-C21	N	2680	mg/kg	0.10	[B] 44	[B] 12	[B] < 0.10
Aromatic TPH >C21-C35	N	2680	mg/kg	0.10	[B] 550	[B] 120	[B] < 0.10
Aromatic TPH >C35-C44	N	2680	mg/kg	0.10	[B] 36	[B] < 0.10	[B] < 0.10
Total Aromatic Hydrocarbons	N	2680	mg/kg	1.0	[B] 640	[B] 130	[B] < 1.0

**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

**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

**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



**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04058				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 577747				Limits			
Sample Ref: BH20				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID:							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 07-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

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				Landfill Waste Acceptance Criteria Limits			
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-04058				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 577749				Limits			
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04058					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 577750					Limits		
Sample Ref: BH20					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Top Depth(m): 3.00							
Bottom Depth(m):							
Sampling Date: 07-Feb-2018							
Determinand	SOP	Accred.	Units				
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

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	Alkaline 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-diphenylcarbazine.
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

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) ICES7 Congeners 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](mailto:customerservices@chemtest.co.uk)





## 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  
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.:** 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

---

**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	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

**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	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		

**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		

**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		

**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	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		

## 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	

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04450					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 579614					Limits		
Sample Ref: BH06A					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 12-Feb-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04450					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 579615					Limits		
Sample Ref: BH06A					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 12-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-04450				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 579616				Limits			
Sample Ref: BH06A					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.00							
Bottom Depth(m):							
Sampling Date: 12-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04450					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 579617					Limits		
Sample Ref: BH06A					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES4							
Top Depth(m): 3.00							
Bottom Depth(m):							
Sampling Date: 12-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04450					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 579618					Limits		
Sample Ref: BH07					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES1							
Top Depth(m): 0.50							
Bottom Depth(m):							
Sampling Date: 13-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04450					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 579619					Limits		
Sample Ref: BH07					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES2							
Top Depth(m): 1.50							
Bottom Depth(m):							
Sampling Date: 13-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04450					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 579620					Limits		
Sample Ref: BH07					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.50							
Bottom Depth(m):							
Sampling Date: 13-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 Arklow WWTW Land GI**

Chemtest Job No: 18-04450					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 579622					Limits		
Sample Ref: BH07					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES5							
Top Depth(m): 4.50							
Bottom Depth(m):							
Sampling Date: 13-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

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	Alkaline 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-diphenylcarbazine.
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



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) ICES7 Congeners 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](mailto:customerservices@chemtest.co.uk)



## 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  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Aisling O'Kane  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
John Cameron  
Lucy Peaker  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Paul McNamara  
Stephen Curtis  
Stephen Franey  
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

---

## Results - Soil

Project: 17-1455 - Arklow WWTW Land GI

Client: Causeway Geotech Ltd	Chemtest Job No.:											
Quotation No.: Q17-11626	Chemtest Sample ID.:											
Order No.:	Client Sample Ref.:											
	Client Sample ID.:											
	Sample Type:											
	Top Depth (m):											
	Date Sampled:											
	Asbestos Lab:											
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

**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	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	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
Total Petroleum Hydrocarbons	N	2680	mg/kg	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		

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	

**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	

**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	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				



## 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		

**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
Moisture	N	2030	%	0.020	13	18	16	14
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	1.2	0.82	1.2	1.3
Arsenic	U	2450	mg/kg	1.0	10	8.6	9.1	8.7
Barium	U	2450	mg/kg	10	< 10	< 10	< 10	< 10
Cadmium	U	2450	mg/kg	0.10	0.34	0.17	< 0.10	< 0.10
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	11	5.3	2.5	2.4
Mercury	U	2450	mg/kg	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
Lead	U	2450	mg/kg	0.50	2.3	1.9	1.6	1.7
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	13	11	10	11
Zinc	U	2450	mg/kg	0.50	140	30	14	15
Chromium (Trivalent)	N	2490	mg/kg	1.0	7.4	5.8	5.0	5.0
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

Project: 17-1455 - Arklow WWTW Land GI

Client: Causeway Geotech Ltd		Chemtest Job No.:							
Quotation No.: Q17-11626		18-05269	18-05269	18-05269	18-05269	18-05269			
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					

**Project: 17-1455 - Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:				
Quotation No.: Q17-11626		Chemtest Sample ID.:				
Order No.:		Client Sample Ref.:				
		Client Sample ID.:				
		Sample Type:				
		Top Depth (m):				
		Date Sampled:				
		Asbestos Lab:				
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		

**Project: 17-1455 - Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:				
Quotation No.: Q17-11626		Chemtest Sample ID.:				
Order No.:		Client Sample Ref.:				
		Client Sample ID.:				
		Sample Type:				
		Top Depth (m):				
		Date Sampled:				
		Asbestos Lab:				
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		

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
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	< 0.010	< 0.010	< 0.010	< 0.010
Anthracene	N	2800	mg/kg	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
Pyrene	N	2800	mg/kg	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
Chrysene	N	2800	mg/kg	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
Benzo[k]fluoranthene	N	2800	mg/kg	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
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	< 0.20	< 0.20	< 0.20	< 0.20
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				
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				

## Results - Soil

**Project: 17-1455 - Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:				
Quotation No.: Q17-11626		18-05269	18-05269	18-05269	18-05269	18-05269
Order No.:		Chemtest Sample ID.:				
		583370	583371	583372	583373	583374
		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		

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05269					Landfill Waste Acceptance Criteria Limits		
Chemtest Sample ID: 583354					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample Ref: BH10B							
Sample ID: ES3							
Top Depth(m): 3.00							
Bottom Depth(m):							
Sampling Date: 19-Feb-2018							
Determinand	SOP	Accred.	Units				
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.



**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583355				Limits			
Sample Ref: BH10B					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES4							
Top Depth(m): 4.00							
Bottom Depth(m):							
Sampling Date: 19-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583364				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05269					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 583365					Limits		
Sample Ref: BH18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES4							
Top Depth(m): 3.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05269					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 583366					Limits		
Sample Ref: BH18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES5							
Top Depth(m): 4.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583367				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES6							
Top Depth(m): 5.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05269					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 583368					Limits		
Sample Ref: BH18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES7							
Top Depth(m): 6.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583369				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES8							
Top Depth(m): 7.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583370				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES9							
Top Depth(m): 8.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583371				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES10							
Top Depth(m): 9.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583372				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES11							
Top Depth(m): 10.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583373				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES12							
Top Depth(m): 11.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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**

Chemtest Job No: 18-05269				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 583374				Limits			
Sample Ref: BH18					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES13							
Top Depth(m): 12.50							
Bottom Depth(m):							
Sampling Date: 16-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

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	Alkaline 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-diphenylcarbazine.
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

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) ICES7 Congeners 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](mailto:customerservices@chemtest.co.uk)



## 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  
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.:** 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

---



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

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
Total Petroleum Hydrocarbons	N	2680	mg/kg	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

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

**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
Benzo[a]pyrene	N	2800	mg/kg	0.010	0.090	0.060	0.15
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2800	mg/kg	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
Coronene	N	2800	mg/kg	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
PCB 28	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 52	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 90+101	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 118	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 153	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 138	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 180	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
Total PCBs (7 congeners)	N	2815	mg/kg	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**

Chemtest Job No: 18-05585				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 584684				Limits			
Sample Ref: BH8					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 2.00							
Bottom Depth(m):							
Sampling Date: 22-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05585					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 584685					Limits		
Sample Ref: BH8					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES4							
Top Depth(m): 3.00							
Bottom Depth(m):							
Sampling Date: 22-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05585					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 584690					Limits		
Sample Ref: BH9					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES3							
Top Depth(m): 3.00							
Bottom Depth(m):							
Sampling Date: 21-Feb-2018							
Determinand	SOP	Accred.	Units				
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.

**Project: 17-1455 - Arklow WWTW Land GI**

Chemtest Job No: 18-05585					Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 584691					Limits		
Sample Ref: BH9					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: ES4							
Top Depth(m): 4.00							
Bottom Depth(m):							
Sampling Date: 21-Feb-2018							
Determinand	SOP	Accred.	Units				
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.



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	Alkaline 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-diphenylcarbazine.
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

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) ICES7 Congeners 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](mailto:customerservices@chemtest.co.uk)



## 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  
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.:** 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

---

**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	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

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	18-09812
Quotation No.: Q17-11626		Chemtest Sample ID.:		604828	604829	604830	604831	604832	604833	604834	604835	604836	604836
Order No.:		Client Sample Ref.:		BH08	BH06A	BH10B	SW03	SW01	SW01	SW02	SW02	SW03	SW03
		Client Sample ID.:		WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1
		Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Top Depth (m):					HW	LW	HW	LW	HW	LW	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	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

**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	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

**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	18-09812
Quotation No.: Q17-11626		Chemtest Sample ID.:		604828	604829	604830	604831	604832	604833	604834	604835	604836	604836
Order No.:		Client Sample Ref.:		BH08	BH06A	BH10B	SW03	SW01	SW01	SW02	SW02	SW03	SW03
		Client Sample ID.:		WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1
		Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Top Depth (m):					HW	LW	HW	LW	HW	LW	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	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			



## 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	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

**Project: 17-1455 Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.: 18-09812											
Quotation No.: Q17-11626		Chemtest Sample ID.: 604837											
Order No.:		Client Sample Ref.: BH14											
		Client Sample ID.: WS1											
		Sample Type: WATER											
		Top Depth (m):											
		Date Sampled: 09-Apr-2018											
Determinand	Accred.	SOP	Units	LOD	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812
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

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	18-09812
Quotation No.: Q17-11626		Chemtest Sample ID.:		604837	604838	604839	604840	604841	604842	604843	604844	604845	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	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

**Project: 17-1455 Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:											
Quotation No.: Q17-11626		Chemtest Sample ID.:											
Order No.:		Client Sample Ref.:											
		Client Sample ID.:											
		Sample Type:											
		Top Depth (m):											
		Date Sampled:											
Determinand	Accred.	SOP	Units	LOD	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812	18-09812
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

**Project: 17-1455 Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:											
Quotation No.: Q17-11626		Chemtest Sample ID.:											
Order No.:		Client Sample Ref.:											
		Client Sample ID.:											
		Sample Type:											
		Top Depth (m):											
		Date Sampled:											
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	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	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

**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	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

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	18-09812
Quotation No.: Q17-11626		Chemtest Sample ID.:		604846	604847	604848	604849	604850	604851	604852	604853	604854	604854
Order No.:		Client Sample Ref.:		BH17	BH18	BH19	SW05	SW06	SW07	SW08	SW05	SW06	SW06
		Client Sample ID.:		WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1	WS1
		Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Top Depth (m):					LW	HW	LW	LW	HW	LW	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	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



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	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

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	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
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
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					
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	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

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

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
Trichlorofluoromethane	U	1760	µg/l	1.0	< 1.0
1,1-Dichloroethene	U	1760	µg/l	1.0	< 1.0
Trans 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0
1,1-Dichloroethane	U	1760	µg/l	1.0	< 1.0
cis 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0
Bromochloromethane	U	1760	µg/l	5.0	< 5.0
Trichloromethane	U	1760	µg/l	1.0	< 1.0
1,1,1-Trichloroethane	U	1760	µg/l	1.0	< 1.0
Tetrachloromethane	U	1760	µg/l	1.0	< 1.0
1,1-Dichloropropene	U	1760	µg/l	1.0	< 1.0
Benzene	U	1760	µg/l	1.0	< 1.0
1,2-Dichloroethane	U	1760	µg/l	2.0	< 2.0
Trichloroethene	N	1760	µg/l	1.0	< 1.0
1,2-Dichloropropane	U	1760	µg/l	1.0	< 1.0
Dibromomethane	U	1760	µg/l	10	< 10
Bromodichloromethane	U	1760	µg/l	5.0	< 5.0
cis-1,3-Dichloropropene	N	1760	µg/l	10	< 10
Toluene	U	1760	µg/l	1.0	< 1.0
Trans-1,3-Dichloropropene	N	1760	µg/l	10	< 10
1,1,2-Trichloroethane	U	1760	µg/l	10	< 10
Tetrachloroethene	U	1760	µg/l	1.0	< 1.0
1,3-Dichloropropane	U	1760	µg/l	2.0	< 2.0
Dibromochloromethane	U	1760	µg/l	10	< 10
1,2-Dibromoethane	U	1760	µg/l	5.0	< 5.0
Chlorobenzene	N	1760	µg/l	1.0	< 1.0
1,1,1,2-Tetrachloroethane	U	1760	µg/l	2.0	< 2.0
Ethylbenzene	U	1760	µg/l	1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0
Styrene	U	1760	µg/l	1.0	< 1.0
Tribromomethane	U	1760	µg/l	1.0	< 1.0
Isopropylbenzene	U	1760	µg/l	1.0	< 1.0
Bromobenzene	U	1760	µg/l	1.0	< 1.0
1,2,3-Trichloropropane	N	1760	µg/l	50	< 50
N-Propylbenzene	U	1760	µg/l	1.0	< 1.0
2-Chlorotoluene	U	1760	µg/l	1.0	< 1.0
1,3,5-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0
4-Chlorotoluene	U	1760	µg/l	1.0	< 1.0

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
1,2,4-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0
Sec-Butylbenzene	U	1760	µg/l	1.0	< 1.0
1,3-Dichlorobenzene	N	1760	µg/l	1.0	< 1.0
4-Isopropyltoluene	U	1760	µg/l	1.0	< 1.0
1,4-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0
N-Butylbenzene	U	1760	µg/l	1.0	< 1.0
1,2-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	1760	µg/l	50	< 50
1,2,4-Trichlorobenzene	U	1760	µg/l	1.0	< 1.0
Hexachlorobutadiene	U	1760	µg/l	1.0	< 1.0
1,2,3-Trichlorobenzene	U	1760	µg/l	2.0	< 2.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1.0	< 1.0
N-Nitrosodimethylamine	N	1790	µg/l	0.50	< 0.50
Phenol	N	1790	µg/l	0.50	< 0.50
2-Chlorophenol	N	1790	µg/l	0.50	< 0.50
Bis-(2-Chloroethyl)Ether	N	1790	µg/l	0.50	< 0.50
1,3-Dichlorobenzene	N	1790	µg/l	0.50	< 0.50
1,4-Dichlorobenzene	N	1790	µg/l	0.50	< 0.50
1,2-Dichlorobenzene	N	1790	µg/l	0.50	< 0.50
2-Methylphenol (o-Cresol)	N	1790	µg/l	0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	N	1790	µg/l	0.50	< 0.50
Hexachloroethane	N	1790	µg/l	0.50	< 0.50
N-Nitrosodi-n-propylamine	N	1790	µg/l	0.50	< 0.50
4-Methylphenol	N	1790	µg/l	0.50	< 0.50
Nitrobenzene	N	1790	µg/l	0.50	< 0.50
Isophorone	N	1790	µg/l	0.50	< 0.50
2-Nitrophenol	N	1790	µg/l	0.50	< 0.50
2,4-Dimethylphenol	N	1790	µg/l	0.50	< 0.50
Bis(2-Chloroethoxy)Methane	N	1790	µg/l	0.50	< 0.50
2,4-Dichlorophenol	N	1790	µg/l	0.50	< 0.50
1,2,4-Trichlorobenzene	N	1790	µg/l	0.50	< 0.50
Naphthalene	N	1790	µg/l	0.50	< 0.50
4-Chloroaniline	N	1790	µg/l	0.50	< 0.50
Hexachlorobutadiene	N	1790	µg/l	0.50	< 0.50
4-Chloro-3-Methylphenol	N	1790	µg/l	0.50	< 0.50
2-Methylnaphthalene	N	1790	µg/l	0.50	< 0.50
Hexachlorocyclopentadiene	N	1790	µg/l	0.50	< 0.50
2,4,6-Trichlorophenol	N	1790	µg/l	0.50	< 0.50

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
2-Chloronaphthalene	N	1790	µg/l	0.50	< 0.50
2-Nitroaniline	N	1790	µg/l	0.50	< 0.50
Acenaphthylene	N	1790	µg/l	0.50	< 0.50
Dimethylphthalate	N	1790	µg/l	0.50	< 0.50
2,6-Dinitrotoluene	N	1790	µg/l	0.50	< 0.50
Acenaphthene	N	1790	µg/l	0.50	< 0.50
3-Nitroaniline	N	1790	µg/l	0.50	< 0.50
Dibenzofuran	N	1790	µg/l	0.50	< 0.50
4-Chlorophenylphenylether	N	1790	µg/l	0.50	< 0.50
2,4-Dinitrotoluene	N	1790	µg/l	0.50	< 0.50
Fluorene	N	1790	µg/l	0.50	< 0.50
Diethyl Phthalate	N	1790	µg/l	0.50	< 0.50
4-Nitroaniline	N	1790	µg/l	0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	1790	µg/l	0.50	< 0.50
Azobenzene	N	1790	µg/l	0.50	< 0.50
4-Bromophenylphenyl Ether	N	1790	µg/l	0.50	< 0.50
Hexachlorobenzene	N	1790	µg/l	0.50	< 0.50
Pentachlorophenol	N	1790	µg/l	0.50	< 0.50
Phenanthrene	N	1790	µg/l	0.50	< 0.50
Anthracene	N	1790	µg/l	0.50	< 0.50
Carbazole	N	1790	µg/l	0.50	< 0.50
Di-N-Butyl Phthalate	N	1790	µg/l	0.50	< 0.50
Fluoranthene	N	1790	µg/l	0.50	< 0.50
Pyrene	N	1790	µg/l	0.50	< 0.50
Butylbenzyl Phthalate	N	1790	µg/l	0.50	< 0.50
Benzo[a]anthracene	N	1790	µg/l	0.50	< 0.50
Chrysene	N	1790	µg/l	0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	N	1790	µg/l	0.50	< 0.50
Di-N-Octyl Phthalate	N	1790	µg/l	0.50	< 0.50
Benzo[b]fluoranthene	N	1790	µg/l	0.50	< 0.50
Benzo[k]fluoranthene	N	1790	µg/l	0.50	< 0.50
Benzo[a]pyrene	N	1790	µg/l	0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	N	1790	µg/l	0.50	< 0.50
Dibenz(a,h)Anthracene	N	1790	µg/l	0.50	< 0.50
Benzo[g,h,i]perylene	N	1790	µg/l	0.50	< 0.50
4-Nitrophenol	N	1790	µg/l	0.50	< 0.50
Gamma Spectrometry (Subcon)	S			N/A	
Gross Alpha/Beta (Subcon)	S			N/A	

**Project: 17-1455 Arklow WWTW Land GI**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>				18-09812	18-09812
Quotation No.: Q17-11626	<b>Chemtest Sample ID.:</b>				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
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
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

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](mailto:customerservices@chemtest.co.uk)

## Analysis of Water Samples

**Client:** Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 0AL

**Testing Facility:** SOCOTEC UK  
Unit 12, Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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

## 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.\* (<sup>226</sup>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.

## 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	10.8 ± 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<sup>-1</sup> 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.





**SQCOTEC**

## 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	<68	<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<sup>-1</sup> 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. <sup>226</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>232</sup>U also occurs at 186 keV. <sup>230</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>230</sup>U is reported, the <sup>226</sup>Ra result will be unreliable and overestimated. However even if <sup>230</sup>U is below the LoD there may still be a contribution to the <sup>226</sup>Ra from <sup>230</sup>U and the <sup>226</sup>Ra result may be unreliable and overestimated. If an accurate result for <sup>226</sup>Ra is required this is better obtained by radiochemical analysis.



1015



# 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  
Gabiella 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

**Order No.:**

**No. of Samples:** 11

**Turnaround (Wkdays):** 11

**Date Approved:** 11-Jun-2018

**Date Received:** 25-Apr-2018

**Date Instructed:** 10-May-2018

**Results Due:** 24-May-2018

**Subcon Results Due:** 12-Jun-2018

**Approved By:**

**Details:** Martin Dyer, Laboratory Manager

---

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	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	
Phosphate	SN		mg/l	0.0100	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	[B] < 0.10	[BC] < 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	[B] < 0.10	[BC] < 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	[B] < 0.10	[BC] < 0.10	[B] < 0.10	[B] < 0.10	[B] < 0.10

**Project: 17-1455 - Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.: 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

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	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
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
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
Dibromochloromethane	U	1760	µg/l	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
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
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
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
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
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
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
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
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
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
1,2,3-Trichloropropane	N	1760	µg/l	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
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
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
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
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
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
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
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
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
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
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
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
1,2-Dibromo-3-Chloropropane	U	1760	µg/l	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
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
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
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
N-Nitrosodimethylamine	N	1790	µg/l	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
2-Chlorophenol	N	1790	µg/l	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
1,3-Dichlorobenzene	N	1790	µg/l	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
1,2-Dichlorobenzene	N	1790	µg/l	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

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	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
Hexachloroethane	N	1790	µg/l	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
4-Methylphenol	N	1790	µg/l	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
Isophorone	N	1790	µg/l	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
2,4-Dimethylphenol	N	1790	µg/l	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
2,4-Dichlorophenol	N	1790	µg/l	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
Naphthalene	N	1790	µg/l	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
Hexachlorobutadiene	N	1790	µg/l	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
2-Methylnaphthalene	N	1790	µg/l	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
2,4,6-Trichlorophenol	N	1790	µg/l	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
2-Chloronaphthalene	N	1790	µg/l	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
Acenaphthylene	N	1790	µg/l	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
2,6-Dinitrotoluene	N	1790	µg/l	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
3-Nitroaniline	N	1790	µg/l	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
4-Chlorophenylphenylether	N	1790	µg/l	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
Fluorene	N	1790	µg/l	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
4-Nitroaniline	N	1790	µg/l	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
Azobenzene	N	1790	µg/l	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
Hexachlorobenzene	N	1790	µg/l	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
Phenanthrene	N	1790	µg/l	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
Carbazole	N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

**Project: 17-1455 - Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.:										
Quotation No.: Q18-13033		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Date Sampled:										
Determinand	Accred.	SOP	Units	LOD	18-11282	18-11282	18-11282	18-11282	18-11282	18-11282	18-11282	18-11282
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

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



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

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

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

**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

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-C44 Aromatics: >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

i2 Analytical Ltd.  
 7 Woodshots Meadow,  
 Oxley Green  
 Business Park,  
 Watford,  
 Herts,  
 WD18 8YS

**t:** 01638 60 60 70  
**f:** 01638 60 60 71  
**e:** Subcontracting@chemtest.co.uk

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

## **Analytical Report Number : 18-86510**

<b>Project / Site name:</b>	Arklow WWTW Land GI	<b>Samples received on:</b>	24/05/2018
<b>Your job number:</b>	18-11282	<b>Samples instructed on:</b>	24/05/2018
<b>Your order number:</b>	61725	<b>Analysis completed by:</b>	29/05/2018
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	04/06/2018
<b>Samples Analysed:</b>	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.

## **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](mailto: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



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**

Parameter	Units	Limit	Standard	966715	966716	966717	966718	966719
Total Phosphate as P	µg/l	20	ISO 17025	230	88	< 20	450	40

U/S = Unsuitable Sample I/S = Insufficient Sample



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



**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)**

<b>Analytical Test Name</b>	<b>Analytical Method Description</b>	<b>Analytical Method Reference</b>	<b>Method number</b>	<b>Wet / Dry Analysis</b>	<b>Accreditation Status</b>
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 discrete 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 30°C.**

Sample Deviation Report



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

## Analysis of Water Samples

Client: Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 0AL

Testing Facility: SOCOTEC UK  
Unit 12  
Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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: *CHunston*

Approver's name: Charlene Hunston

Job Title: Senior Analyst

Report Date: 31 May 2018



SOCOTEC



UKAS

## 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. (<sup>226</sup>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.



1015



**SOCOTEC**

## Results Summary – Gamma Spectrometry

Customer Reference	Laboratory Reference	Ba-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	< 2.0

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<sup>-1</sup> 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. <sup>226</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>235</sup>U also occurs at 186 keV. <sup>235</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>226</sup>Ra is reported, the <sup>226</sup>Ra result will be unreliable and overestimated. However even if <sup>235</sup>U is below the LoD there may still be a contribution to the <sup>226</sup>Ra from <sup>235</sup>U and the <sup>226</sup>Ra result may be unreliable and overestimated. If an accurate result for <sup>226</sup>Ra is required this is better obtained by radiochemical analysis.



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.



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	< 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
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
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
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
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
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
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
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	< 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	< 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



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**

<b>Job</b>	<b>Description</b>	<b>Job Comments</b>
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.

<b>RPS Sample Number</b>	<b>Customer Number</b>	<b>Sample Comments</b>
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-submission 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



# Final Report

---

**Report No.:** 18-11516-1

**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

**Order No.:**

**No. of Samples:** 18

**Turnaround (Wkdays):** 19

**Date Approved:** 11-Jun-2018

**Date Received:** 26-Apr-2018

**Date Instructed:** 27-Apr-2018

**Results Due:** 24-May-2018

**Subcon Results Due:** 12-Jun-2018

**Approved By:**

**Details:** Martin Dyer, Laboratory Manager

---

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



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	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	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

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	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
Trans-1,3-Dichloropropene	N	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
1,1,2-Trichloroethane	U	1760	µg/l	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
1,3-Dichloropropane	U	1760	µg/l	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
1,2-Dibromoethane	U	1760	µg/l	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
1,1,1,2-Tetrachloroethane	U	1760	µg/l	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
m & p-Xylene	U	1760	µg/l	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
Styrene	U	1760	µg/l	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
Isopropylbenzene	U	1760	µg/l	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
1,2,3-Trichloropropane	N	1760	µg/l	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
2-Chlorotoluene	U	1760	µg/l	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
4-Chlorotoluene	U	1760	µg/l	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
1,2,4-Trimethylbenzene	U	1760	µg/l	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
1,3-Dichlorobenzene	N	1760	µg/l	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
1,4-Dichlorobenzene	U	1760	µg/l	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
1,2-Dichlorobenzene	U	1760	µg/l	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
1,2,4-Trichlorobenzene	U	1760	µg/l	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
1,2,3-Trichlorobenzene	U	1760	µg/l	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
N-Nitrosodimethylamine	N	1790	µg/l	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
2-Chlorophenol	N	1790	µg/l	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
1,3-Dichlorobenzene	N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

**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	18-11516
Quotation No.: Q18-13033		Chemtest Sample ID.:		613772	613773	613774	613775	613776	613777	613778	613779	613779
Order No.:		Client Sample Ref.:		BH14	BH15D	SW01	SW01	SW02	SW02	SW03	SW03	SW03
		Client Sample ID.:		WS2	WS2	WS2	WS2	WS2	WS2	WS2	WS2	WS2
		Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Top Depth (m):				LW	HW	LW	HW	LW	HW	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	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

Project: 17-1455 - Arklow WWTW Land GI

Client: Causeway Geotech Ltd		Chemtest Job No.: 18-11516										
Quotation No.: Q18-13033		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Top Depth (m):										
		Date Sampled:										
Determinand	Accred.	SOP	Units	LOD	18-11516	18-11516	18-11516	18-11516	18-11516	18-11516	18-11516	18-11516
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

**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

**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	18-11516
Quotation No.: Q18-13033		Chemtest Sample ID.:		613780	613781	613782	613783	613784	613785	613786	613787	613787
Order No.:		Client Sample Ref.:		SW04	SW04	SW05	SW05	SW06	SW06	SW07	SW07	SW07
		Client Sample ID.:		WS2	WS2	WS2	WS2	WS2	WS2	WS2	WS2	WS2
		Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Top Depth (m):		LW	HW	LW	HW	LW	HW	LW	HW	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	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

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	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
Trans-1,3-Dichloropropene	N	1760	µg/l	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
1,1,2-Trichloroethane	U	1760	µg/l	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
1,3-Dichloropropane	U	1760	µg/l	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
1,2-Dibromoethane	U	1760	µg/l	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
1,1,1,2-Tetrachloroethane	U	1760	µg/l	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
m & p-Xylene	U	1760	µg/l	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
Styrene	U	1760	µg/l	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
Isopropylbenzene	U	1760	µg/l	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
1,2,3-Trichloropropane	N	1760	µg/l	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
2-Chlorotoluene	U	1760	µg/l	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
4-Chlorotoluene	U	1760	µg/l	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
1,2,4-Trimethylbenzene	U	1760	µg/l	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
1,3-Dichlorobenzene	N	1760	µg/l	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
1,4-Dichlorobenzene	U	1760	µg/l	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
1,2-Dichlorobenzene	U	1760	µg/l	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
1,2,4-Trichlorobenzene	U	1760	µg/l	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
1,2,3-Trichlorobenzene	U	1760	µg/l	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
N-Nitrosodimethylamine	N	1790	µg/l	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
2-Chlorophenol	N	1790	µg/l	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
1,3-Dichlorobenzene	N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

**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	18-11516
Quotation No.: Q18-13033		Chemtest Sample ID.:		613780	613781	613782	613783	613784	613785	613786	613787	613787
Order No.:		Client Sample Ref.:		SW04	SW04	SW05	SW05	SW06	SW06	SW07	SW07	SW07
		Client Sample ID.:		WS2	WS2	WS2	WS2	WS2	WS2	WS2	WS2	WS2
		Sample Type:		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
		Top Depth (m):		LW	HW	LW	HW	LW	HW	LW	HW	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	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



**Project: 17-1455 - Arklow WWTW Land GI**

Client: Causeway Geotech Ltd		Chemtest Job No.: 18-11516										
Quotation No.: Q18-13033		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Top Depth (m):										
		Date Sampled:										
Determinand	Accred.	SOP	Units	LOD	18-11516	18-11516	18-11516	18-11516	18-11516	18-11516	18-11516	18-11516
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

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

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
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0
Total Petroleum Hydrocarbons	N	1675	µg/l	10	< 10
Dichlorodifluoromethane	U	1760	µg/l	1.0	< 1.0
Chloromethane	U	1760	µg/l	1.0	< 1.0
Vinyl Chloride	N	1760	µg/l	1.0	< 1.0
Bromomethane	U	1760	µg/l	5.0	< 5.0
Chloroethane	U	1760	µg/l	2.0	< 2.0
Trichlorofluoromethane	U	1760	µg/l	1.0	< 1.0
1,1-Dichloroethene	U	1760	µg/l	1.0	< 1.0
Trans 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0
1,1-Dichloroethane	U	1760	µg/l	1.0	< 1.0
cis 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0
Bromochloromethane	U	1760	µg/l	5.0	< 5.0
Trichloromethane	U	1760	µg/l	1.0	< 1.0
1,1,1-Trichloroethane	U	1760	µg/l	1.0	< 1.0
Tetrachloromethane	U	1760	µg/l	1.0	< 1.0
1,1-Dichloropropene	U	1760	µg/l	1.0	< 1.0
Benzene	U	1760	µg/l	1.0	< 1.0
1,2-Dichloroethane	U	1760	µg/l	2.0	< 2.0
Trichloroethene	N	1760	µg/l	1.0	< 1.0
1,2-Dichloropropane	U	1760	µg/l	1.0	< 1.0
Dibromomethane	U	1760	µg/l	10	< 10
Bromodichloromethane	U	1760	µg/l	5.0	< 5.0
cis-1,3-Dichloropropene	N	1760	µg/l	10	< 10

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
Trans-1,3-Dichloropropene	N	1760	µg/l	10	< 10
1,1,2-Trichloroethane	U	1760	µg/l	10	< 10
Tetrachloroethene	U	1760	µg/l	1.0	< 1.0
1,3-Dichloropropane	U	1760	µg/l	2.0	< 2.0
Dibromochloromethane	U	1760	µg/l	10	< 10
1,2-Dibromoethane	U	1760	µg/l	5.0	< 5.0
Chlorobenzene	N	1760	µg/l	1.0	< 1.0
1,1,1,2-Tetrachloroethane	U	1760	µg/l	2.0	< 2.0
Ethylbenzene	U	1760	µg/l	1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0
Styrene	U	1760	µg/l	1.0	< 1.0
Tribromomethane	U	1760	µg/l	1.0	< 1.0
Isopropylbenzene	U	1760	µg/l	1.0	< 1.0
Bromobenzene	U	1760	µg/l	1.0	< 1.0
1,2,3-Trichloropropane	N	1760	µg/l	50	< 50
N-Propylbenzene	U	1760	µg/l	1.0	< 1.0
2-Chlorotoluene	U	1760	µg/l	1.0	< 1.0
1,3,5-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0
4-Chlorotoluene	U	1760	µg/l	1.0	< 1.0
Tert-Butylbenzene	U	1760	µg/l	1.0	< 1.0
1,2,4-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0
Sec-Butylbenzene	U	1760	µg/l	1.0	< 1.0
1,3-Dichlorobenzene	N	1760	µg/l	1.0	< 1.0
4-Isopropyltoluene	U	1760	µg/l	1.0	< 1.0
1,4-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0
N-Butylbenzene	U	1760	µg/l	1.0	< 1.0
1,2-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	1760	µg/l	50	< 50
1,2,4-Trichlorobenzene	U	1760	µg/l	1.0	< 1.0
Hexachlorobutadiene	U	1760	µg/l	1.0	< 1.0
1,2,3-Trichlorobenzene	U	1760	µg/l	2.0	< 2.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1.0	< 1.0
N-Nitrosodimethylamine	N	1790	µg/l	0.50	< 0.50
Phenol	N	1790	µg/l	0.50	< 0.50
2-Chlorophenol	N	1790	µg/l	0.50	< 0.50
Bis-(2-Chloroethyl)Ether	N	1790	µg/l	0.50	< 0.50
1,3-Dichlorobenzene	N	1790	µg/l	0.50	< 0.50

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
1,2-Dichlorobenzene	N	1790	µg/l	0.50	< 0.50
2-Methylphenol (o-Cresol)	N	1790	µg/l	0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	N	1790	µg/l	0.50	< 0.50
Hexachloroethane	N	1790	µg/l	0.50	< 0.50
N-Nitrosodi-n-propylamine	N	1790	µg/l	0.50	< 0.50
4-Methylphenol	N	1790	µg/l	0.50	< 0.50
Nitrobenzene	N	1790	µg/l	0.50	< 0.50
Isophorone	N	1790	µg/l	0.50	< 0.50
2-Nitrophenol	N	1790	µg/l	0.50	< 0.50
2,4-Dimethylphenol	N	1790	µg/l	0.50	< 0.50
Bis(2-Chloroethoxy)Methane	N	1790	µg/l	0.50	< 0.50
2,4-Dichlorophenol	N	1790	µg/l	0.50	< 0.50
1,2,4-Trichlorobenzene	N	1790	µg/l	0.50	< 0.50
Naphthalene	N	1790	µg/l	0.50	< 0.50
4-Chloroaniline	N	1790	µg/l	0.50	< 0.50
Hexachlorobutadiene	N	1790	µg/l	0.50	< 0.50
4-Chloro-3-Methylphenol	N	1790	µg/l	0.50	< 0.50
2-Methylnaphthalene	N	1790	µg/l	0.50	< 0.50
Hexachlorocyclopentadiene	N	1790	µg/l	0.50	< 0.50
2,4,6-Trichlorophenol	N	1790	µg/l	0.50	< 0.50
2,4,5-Trichlorophenol	N	1790	µg/l	0.50	< 0.50
2-Chloronaphthalene	N	1790	µg/l	0.50	< 0.50
2-Nitroaniline	N	1790	µg/l	0.50	< 0.50
Acenaphthylene	N	1790	µg/l	0.50	< 0.50
Dimethylphthalate	N	1790	µg/l	0.50	< 0.50
2,6-Dinitrotoluene	N	1790	µg/l	0.50	< 0.50
Acenaphthene	N	1790	µg/l	0.50	< 0.50
3-Nitroaniline	N	1790	µg/l	0.50	< 0.50
Dibenzofuran	N	1790	µg/l	0.50	< 0.50
4-Chlorophenylphenylether	N	1790	µg/l	0.50	< 0.50
2,4-Dinitrotoluene	N	1790	µg/l	0.50	< 0.50
Fluorene	N	1790	µg/l	0.50	< 0.50
Diethyl Phthalate	N	1790	µg/l	0.50	< 0.50
4-Nitroaniline	N	1790	µg/l	0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	1790	µg/l	0.50	< 0.50
Azobenzene	N	1790	µg/l	0.50	< 0.50
4-Bromophenylphenyl Ether	N	1790	µg/l	0.50	< 0.50
Hexachlorobenzene	N	1790	µg/l	0.50	< 0.50

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



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-C44 Aromatics: >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](mailto:customerservices@chemtest.co.uk)



**Jason King**  
 Chemtest Ltd  
 11 Depot Road  
 Newmarket  
 Suffolk  
 CB8 0AL

i2 Analytical Ltd.  
 7 Woodshots Meadow,  
 Croxley Green  
 Business Park,  
 Watford,  
 Herts,  
 WD18 8YS

**t:** 01638 60 60 70  
**f:** 01638 60 60 71  
**e:** Subcontracting@chemtest.co.uk

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

## **Analytical Report Number : 18-86508**

<b>Project / Site name:</b>	Arklow WWTW Land GI	<b>Samples received on:</b>	24/05/2018
<b>Your job number:</b>	18-11516	<b>Samples instructed on:</b>	24/05/2018
<b>Your order number:</b>	16726	<b>Analysis completed by:</b>	29/05/2018
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	04/06/2018
<b>Samples Analysed:</b>	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.



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



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



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



Analytical Report Number: 18-86508

Project / Site name: Arklow WWTW Land GI

Your Order No: 16726

<b>Lab Sample Number</b>				966703	966704	966705		
<b>Sample Reference</b>				613787 (SW07 WS2 HW)	613788 (SW08 WS2 LW)	613789 (SW08 WS2 HW)		
<b>Sample Number</b>				None Supplied	None Supplied	None Supplied		
<b>Depth (m)</b>				None Supplied	None Supplied	None Supplied		
<b>Date Sampled</b>				24/04/2018	24/04/2018	24/04/2018		
<b>Time Taken</b>				None Supplied	None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

Total Phosphate as P	µg/l	20	ISO 17025	< 20	< 20	28		
----------------------	------	----	-----------	------	------	----	--	--

U/S = Unsuitable Sample I/S = Insufficient Sample



**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 discrete 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 30°C.**



## Sample Deviation Report



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

## Analysis of Water Samples

Client: Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 0AL

Testing Facility: SOCOTEC UK  
Unit 12  
Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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: *Kiran*

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



## 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." (<sup>226</sup>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.



## 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	< 34	< 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	< 5.6	< 200	< 26	< 1.8	< 2.5

**Notes:**

1. Analysis marked with an asterisk is not UKAS accredited.
2. Results are presented as Bq.L<sup>-1</sup> 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. <sup>226</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>226</sup>U also occurs at 186 keV. <sup>226</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>226</sup>U is reported, the <sup>226</sup>Ra result will be unreliable and overestimated. However even if <sup>226</sup>U is below the LoD there may still be a contribution to the <sup>226</sup>Ra from <sup>235</sup>U and the <sup>226</sup>Ra result may be unreliable and overestimated if an accurate result for <sup>226</sup>Ra is required this is better obtained by radiochemical analysis.





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.



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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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	< 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

Determinand	CAS No	Codes	SOP	Units	RL	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
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**

<b>RPS Sample Number</b>	<b>Customer Number</b>	<b>Sample Comments</b>
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-submission 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



## 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  
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:** 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

---

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

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
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
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

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
1,3-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

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
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

**Project: 17-1455 Arklow WWTW Land GI**

<b>Client: Causeway Geotech Ltd</b>		<b>Chemtest Job No.:</b>		18-12798	18-12798	18-12798	18-12798	18-12798
Quotation No.: Q18-13033		<b>Chemtest Sample ID.:</b>		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
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>				
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
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:
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

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-C44 Aromatics: >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](mailto:customerservices@chemtest.co.uk)



**Customer Service**

Chemtest Ltd.  
11 Depot Road  
Newmarket  
Suffolk  
CB8 0AL

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 01638 60 60 70  
**f:** 01638 60 60 71  
**e:** Subcontracting@chemtest.co.uk

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

## **Analytical Report Number : 18-85155**

Replaces Analytical Report Number : 18-85155, issue no. 1

<b>Project / Site name:</b>	18-12798	<b>Samples received on:</b>	14/05/2018
<b>Your job number:</b>	18-12798	<b>Samples instructed on:</b>	14/05/2018
<b>Your order number:</b>	16699	<b>Analysis completed by:</b>	24/05/2018
<b>Report Issue Number:</b>	2	<b>Report issued on:</b>	24/05/2018
<b>Samples Analysed:</b>	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.

Iss No 18-85155-2 18-12798 18-12798

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.

Page 1 of 3



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



**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 discrete 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 30°C.**



# Final Report

---

**Report No.:** 18-12800-1

**Initial Date of Issue:** 31-May-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:** 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

---

**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
pH	U	1010		N/A	7.8	7.9	7.7
Electrical Conductivity	U	1020	µS/cm	1.0	49000	49000	44000
Suspended Solids At 105C	U	1030	mg/l	5.0	260	310	1800
Total Dissolved Solids	N	1020	mg/l	1.0	29000	29000	27000
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	130	150	11
Dissolved Oxygen	N	1150	mg O2/l	0.50	8.1	7.9	8.6
Redox Potential	N	1170	mV	N/A	250	240	220
Alkalinity (Total)	U	1220	mg/l	10	47	50	300
Chloride	U	1220	mg/l	1.0	24000	21000	1600
Ammoniacal Nitrogen	U	1220	mg/l	0.050	0.70	0.71	0.075
Nitrate	U	1220	mg/l	0.50	< 0.50	< 0.50	0.75
Sulphate	U	1220	mg/l	1.0	2700	2800	310
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	320	400	190
Potassium	U	1415	mg/l	0.50	350	390	34
Magnesium	U	1415	mg/l	0.50	1000	1300	150
Sodium	U	1415	mg/l	0.50	9300	11000	780
Arsenic (Dissolved)	U	1450	µg/l	1.0	140	150	16
Barium (Dissolved)	U	1450	µg/l	5.0	12	12	62
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080	0.084	0.70
Copper (Dissolved)	U	1450	µg/l	1.0	120	460	36
Iron (Dissolved)	N	1450	µg/l	20	800	900	290
Manganese (Dissolved)	U	1450	µg/l	1.0	7.6	7.8	1100
Molybdenum (Dissolved)	U	1450	µg/l	1.0	13	19	12
Nickel (Dissolved)	U	1450	µg/l	1.0	9.0	8.9	4.4
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Antimony (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	190	220	88
Zinc (Dissolved)	U	1450	µg/l	1.0	83	84	55
Mercury Low Level	U	1460	µg/l	0.010	0.070	0.080	0.10
Chromium (Trivalent)	N	1490	µg/l	20	570	670	260
Low-Level Chromium (Hexavalent)	U	1495	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10



**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
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	1675	µg/l	10	< 10	< 10	< 10
Dichlorodifluoromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Chloromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Bromomethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
Chloroethane	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Trichlorofluoromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Trans 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
Trichloromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Benzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Trichloroethene	N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	U	1760	µg/l	10	< 10	< 10	< 10
Bromodichloromethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene	N	1760	µg/l	10	< 10	< 10	< 10
Toluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0

**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
1,1,2-Trichloroethane	U	1760	µg/l	10	< 10	< 10	< 10
Tetrachloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Dibromochloromethane	U	1760	µg/l	10	< 10	< 10	< 10
1,2-Dibromoethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene	N	1760	µg/l	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
Ethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Styrene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane	N	1760	µg/l	50	< 50	< 50	< 50
N-Propylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Tert-Butylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Sec-Butylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
4-Isopropyltoluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
N-Butylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	1760	µg/l	50	< 50	< 50	< 50
1,2,4-Trichlorobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1.0	< 1.0	< 1.0	< 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

**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
2-Methylphenol (o-Cresol)	N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50
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

**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
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
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		
Gross Alpha/Beta (Subcon)	S			N/A	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:
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

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-C44 Aromatics: >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](mailto:customerservices@chemtest.co.uk)



**Customer Service**

Chemtest Ltd.  
11 Depot Road  
Newmarket  
Suffolk  
CB8 0AL

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 01638 60 60 70  
**f:** 01638 60 60 71  
**e:** Subcontracting@chemtest.co.uk

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

## **Analytical Report Number : 18-85154**

Replaces Analytical Report Number : 18-85154, issue no. 1

<b>Project / Site name:</b>	18-12800	<b>Samples received on:</b>	14/05/2018
<b>Your job number:</b>	18-12800	<b>Samples instructed on:</b>	14/05/2018
<b>Your order number:</b>	16700	<b>Analysis completed by:</b>	24/05/2018
<b>Report Issue Number:</b>	2	<b>Report issued on:</b>	24/05/2018
<b>Samples Analysed:</b>	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.

Iss No 18-85154-2 18-12800 18-12800

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.

Page 1 of 3





Analytical Report Number: 18-85154

Project / Site name: 18-12800

Your Order No: 16700

<b>Lab Sample Number</b>				959396	959397	959398	959399	
<b>Sample Reference</b>				619392 (SW01 LW WS3)	619393 (SW02 LW WS3)	619394 (SW03 LW WS3)	619395 (BH14 WS3)	
<b>Sample Number</b>				None Supplied	None Supplied	None Supplied	None Supplied	
<b>Depth (m)</b>				None Supplied	None Supplied	None Supplied	None Supplied	
<b>Date Sampled</b>				07/05/2018	07/05/2018	07/05/2018	07/05/2018	
<b>Time Taken</b>				None Supplied	None Supplied	None Supplied	None Supplied	
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

Total Phosphate as P	µg/l	20	ISO 17025	< 20	< 20	< 20	< 20	
----------------------	------	----	-----------	------	------	------	------	--

U/S = Unsuitable Sample I/S = Insufficient Sample



**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)**

<b>Analytical Test Name</b>	<b>Analytical Method Description</b>	<b>Analytical Method Reference</b>	<b>Method number</b>	<b>Wet / Dry Analysis</b>	<b>Accreditation Status</b>
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 discrete 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 30°C.**

## Analysis of Water Samples

**Client:** Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 0AL

**Testing Facility:** SOCOTEC UK  
Unit 12, Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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

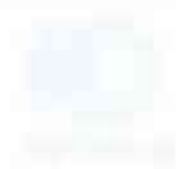
**Approved By:**



**Approver's name:** Charlene Hunston

**Job Title:** Senior Analyst

**Report Date:** 31 May 2018



### 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." (<sup>226</sup>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
619392 (SW01 WS3 LW)	RW2882	24/05/2018	<3.5	14.1 ± 6.1

**Notes:**

1. Results are presented as Bq.L<sup>-1</sup> 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.





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<sup>-1</sup> 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. <sup>235</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>235</sup>U also occurs at 186 keV. <sup>235</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>235</sup>U is reported, the <sup>235</sup>Ra result will be unreliable and overestimated. However even if <sup>235</sup>U is below the LoD there may still be a contribution to the <sup>235</sup>Ra from <sup>235</sup>U and the <sup>235</sup>Ra result may be unreliable and overestimated. If an accurate result for <sup>235</sup>Ra is required this is better obtained by radiochemical analysis.



1015



# Final Report

---

**Report No.:** 18-12809-1

**Initial Date of Issue:** 21-May-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  
Gabiella Horan  
John Cameron  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Paul McNamara  
Stephen Curtis  
Stephen Franey  
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

---

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
pH	U	1010		N/A	7.9	8.1	8.2
Electrical Conductivity	U	1020	µS/cm	1.0	4700	4800	4800
Suspended Solids At 105C	U	1030	mg/l	5.0	350	300	320
Total Dissolved Solids	N	1020	mg/l	1.0	2900	2900	2900
Biochemical Oxygen Demand	N	1090	mg O2/l	4.0	[B] < 4.0	[B] < 4.0	[B] 6.0
Chemical Oxygen Demand	U	1100	mg O2/l	10	140	140	140
Dissolved Oxygen	N	1150	mg O2/l	0.50	8.5	8.5	8.4
Redox Potential	N	1170	mV	N/A	270	250	230
Alkalinity (Total)	U	1220	mg/l	10	56	48	< 10
Chloride	U	1220	mg/l	1.0	22000	21000	21000
Ammoniacal Nitrogen	U	1220	mg/l	0.050	0.72	0.69	0.75
Nitrate	U	1220	mg/l	0.50	< 0.50	< 0.50	< 0.50
Sulphate	U	1220	mg/l	1.0	2700	2700	2600
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	380	380	360
Potassium	U	1415	mg/l	0.50	380	360	370
Magnesium	U	1415	mg/l	0.50	1200	1300	1200
Sodium	U	1415	mg/l	0.50	11000	11000	10000
Arsenic (Dissolved)	U	1450	µg/l	1.0	130	120	120
Barium (Dissolved)	U	1450	µg/l	5.0	10	8.3	9.6
Cadmium (Dissolved)	U	1450	µg/l	0.080	0.092	< 0.080	< 0.080
Copper (Dissolved)	U	1450	µg/l	1.0	260	310	320
Iron (Dissolved)	N	1450	µg/l	20	870	890	890
Manganese (Dissolved)	U	1450	µg/l	1.0	12	7.6	8.2
Molybdenum (Dissolved)	U	1450	µg/l	1.0	13	12	13
Nickel (Dissolved)	U	1450	µg/l	1.0	9.8	9.7	10
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Antimony (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	160	160	160
Zinc (Dissolved)	U	1450	µg/l	1.0	84	82	82
Mercury Low Level	U	1460	µg/l	0.010	0.90	0.10	0.12
Chromium (Trivalent)	N	1490	µg/l	20	500	490	490
Low-Level Chromium (Hexavalent)	U	1495	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10



**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
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	1675	µg/l	10	< 10	< 10	< 10
Dichlorodifluoromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Chloromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Bromomethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
Chloroethane	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Trichlorofluoromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Trans 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
Trichloromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Benzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Trichloroethene	N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	U	1760	µg/l	10	< 10	< 10	< 10
Bromodichloromethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene	N	1760	µg/l	10	< 10	< 10	< 10
Toluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0

**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
1,1,2-Trichloroethane	U	1760	µg/l	10	< 10	< 10	< 10
Tetrachloroethene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Dibromochloromethane	U	1760	µg/l	10	< 10	< 10	< 10
1,2-Dibromoethane	U	1760	µg/l	5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene	N	1760	µg/l	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
Ethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Styrene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane	N	1760	µg/l	50	< 50	< 50	< 50
N-Propylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Tert-Butylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Sec-Butylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
4-Isopropyltoluene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
N-Butylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	1760	µg/l	50	< 50	< 50	< 50
1,2,4-Trichlorobenzene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1.0	< 1.0	< 1.0	< 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

**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
2-Methylphenol (o-Cresol)	N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50
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

**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
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
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		
Gross Alpha/Beta (Subcon)	S			N/A	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:
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

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-C44 Aromatics: >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](mailto:customerservices@chemtest.co.uk)

**Customer Service**

Chemtest Ltd  
11 Depot Road  
Newmarket  
Suffolk  
CB8 0AL

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 01638 60 60 70  
**f:** 01638 60 60 71  
**e:** Subcontracting@chemtest.co.uk

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

## **Analytical Report Number : 18-85137**

Replaces Analytical Report Number : 18-85137, issue no. 1

<b>Project / Site name:</b>	18-12809	<b>Samples received on:</b>	14/05/2018
<b>Your job number:</b>	18-12809	<b>Samples instructed on:</b>	14/05/2018
<b>Your order number:</b>	16695	<b>Analysis completed by:</b>	22/05/2018
<b>Report Issue Number:</b>	2	<b>Report issued on:</b>	22/05/2018
<b>Samples Analysed:</b>	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.





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



**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 discrete 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 30°C.**

## Analysis of Water Samples

Client: Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 0AL

Testing Facility: SOCOTEC UK  
Unit 12, Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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

## 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." (<sup>226</sup>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<sup>-1</sup> 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.



1015

## Results Summary – Gamma Spectrometry

Customer Reference	Laboratory Reference	Ba-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<sup>-1</sup> 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. <sup>226</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>235</sup>U also occurs at 186 keV. <sup>235</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>235</sup>U is reported, the <sup>226</sup>Ra result will be unreliable and overestimated. However even if <sup>235</sup>U is below the LoD there may still be a contribution to the <sup>226</sup>Ra from <sup>235</sup>U and the <sup>226</sup>Ra result may be unreliable and overestimated. If an accurate result for <sup>226</sup>Ra is required this is better obtained by radiochemical analysis.





## 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  
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 - 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

---

**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
pH	U	1010		N/A	8.0	7.7	7.5	7.8
Electrical Conductivity	U	1020	µS/cm	1.0	1100	990	1300	150
Suspended Solids At 105C	U	1030	mg/l	5.0	5.0	< 5.0	< 5.0	< 5.0
Total Dissolved Solids	N	1020	mg/l	1.0	680	600	770	93
Biochemical Oxygen Demand	N	1090	mg O2/l	4.0	[B] < 4.0	[B] < 4.0	[B] < 4.0	[B] 5.0
Chemical Oxygen Demand	U	1100	mg O2/l	10	< 10	< 10	< 10	< 10
Dissolved Oxygen	N	1150	mg O2/l	0.50	8.4	8.5	8.4	8.4
Redox Potential	N	1170	mV	N/A	220	240	260	270
Alkalinity (Total)	U	1220	mg/l	10	17	11	< 10	25
Chloride	U	1220	mg/l	1.0	400	340	400	290
Ammoniacal Nitrogen	U	1220	mg/l	0.050	0.10	0.20	0.14	0.12
Nitrate	U	1220	mg/l	0.50	5.7	5.7	5.9	5.7
Sulphate	U	1220	mg/l	1.0	68	59	67	51
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	14	13	14	12
Potassium	U	1415	mg/l	0.50	7.9	7.1	8.9	6.4
Magnesium	U	1415	mg/l	0.50	25	22	27	20
Sodium	U	1415	mg/l	0.50	180	160	200	140
Arsenic (Dissolved)	U	1450	µg/l	1.0	8.1	8.3	2.2	1.7
Barium (Dissolved)	U	1450	µg/l	5.0	6.3	7.1	7.1	7.4
Cadmium (Dissolved)	U	1450	µg/l	0.080	0.24	0.23	0.28	0.30
Copper (Dissolved)	U	1450	µg/l	1.0	17	17	15	15
Iron (Dissolved)	N	1450	µg/l	20	250	260	300	290
Manganese (Dissolved)	U	1450	µg/l	1.0	51	48	66	71
Molybdenum (Dissolved)	U	1450	µg/l	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
Lead (Dissolved)	U	1450	µg/l	1.0	1.8	2.1	2.1	2.1
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	5.0	2.7
Vanadium (Dissolved)	U	1450	µg/l	1.0	53	52	4.7	2.1
Zinc (Dissolved)	U	1450	µg/l	1.0	100	100	98	98
Mercury Low Level	U	1460	µg/l	0.010	< 0.010	< 0.010	< 0.010	0.010
Chromium (Trivalent)	N	1490	µg/l	20	160	160	< 20	< 20
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



**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

**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
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
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

**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
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
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

**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
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
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	0.67	< 0.50	< 0.50	< 0.50
Chrysene	N	1790	µg/l	0.50	0.82	< 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	0.65	< 0.50	< 0.50	< 0.50
Benzo[k]fluoranthene	N	1790	µg/l	0.50	0.82	< 0.50	< 0.50	< 0.50
Benzo[a]pyrene	N	1790	µg/l	0.50	0.66	< 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
Dibenz(a,h)Anthracene	N	1790	µg/l	0.50	1.8	< 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
4-Nitrophenol	N	1790	µg/l	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
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:
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

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-C44 Aromatics: >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](mailto:customerservices@chemtest.co.uk)



**Customer Service**

Chemtest Ltd.  
11 Depot Road  
Newmarket  
Suffolk  
CB8 0AL

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 01638 60 60 70  
**f:** 01638 60 60 71  
**e:** Subcontracting@chemtest.co.uk

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

## **Analytical Report Number : 18-85153**

Replaces Analytical Report Number : 18-85153, issue no. 1

<b>Project / Site name:</b>	18-12845	<b>Samples received on:</b>	14/05/2018
<b>Your job number:</b>	18-12845	<b>Samples instructed on:</b>	14/05/2018
<b>Your order number:</b>	16693	<b>Analysis completed by:</b>	24/05/2018
<b>Report Issue Number:</b>	2	<b>Report issued on:</b>	24/05/2018
<b>Samples Analysed:</b>	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.

Iss No 18-85153-2 18-12845 18-12845

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.

Page 1 of 3





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



**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 discrete 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.**



# Final Report

---

**Report No.:** 18-13031-1

**Initial Date of Issue:** 31-May-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 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

---

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

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	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

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								
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

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								
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

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	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



**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
pH	U	1010		N/A	7.4	7.9	7.5
Electrical Conductivity	U	1020	µS/cm	1.0	27000	4300	11000
Suspended Solids At 105C	U	1030	mg/l	5.0	16000	940	3400
Total Dissolved Solids	N	1020	mg/l	1.0	16000	2600	6400
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	93	13	30
Dissolved Oxygen	N	1150	mg O2/l	0.50	8.1	8.6	8.6
Redox Potential	N	1170	mV	N/A	40	160	190
Alkalinity (Total)	U	1220	mg/l	10	270	220	320
Chloride	U	1220	mg/l	1.0	10000	1500	3300
Ammoniacal Nitrogen	U	1220	mg/l	0.050	0.93	0.18	0.93
Nitrate	U	1220	mg/l	0.50	< 0.50	1.5	< 0.50
Sulphate	U	1220	mg/l	1.0	1900	500	910
Cyanide (Free) Low-Level	N	1300	mg/l	0.0050	< 0.0050	I/S	< 0.0050
Cyanide (Complex) Low-Level	N	1300	mg/l	0.0050	< 0.0050	I/S	< 0.0050
Calcium	U	1415	mg/l	5.0	540	240	500
Potassium	U	1415	mg/l	0.50	280	33	120
Magnesium	U	1415	mg/l	0.50	840	94	330
Sodium	U	1415	mg/l	0.50	5400	720	2700
Arsenic (Dissolved)	U	1450	µg/l	1.0	73	11	26
Barium (Dissolved)	U	1450	µg/l	5.0	76	42	140
Cadmium (Dissolved)	U	1450	µg/l	0.080	1.4	0.74	7.5
Copper (Dissolved)	U	1450	µg/l	1.0	77	17	47
Iron (Dissolved)	N	1450	µg/l	20	830	460	710
Manganese (Dissolved)	U	1450	µg/l	1.0	2200	150	330
Molybdenum (Dissolved)	U	1450	µg/l	1.0	29	5.7	7.2
Nickel (Dissolved)	U	1450	µg/l	1.0	40	3.9	8.9
Lead (Dissolved)	U	1450	µg/l	1.0	3.1	3.9	< 1.0
Antimony (Dissolved)	U	1450	µg/l	1.0	5.2	< 1.0	1.1
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0	9.6	39
Vanadium (Dissolved)	U	1450	µg/l	1.0	70	19	33
Zinc (Dissolved)	U	1450	µg/l	1.0	160	240	1100
Mercury Low Level	U	1460	µg/l	0.010	< 0.010	< 0.010	< 0.010
Chromium (Trivalent)	N	1490	µg/l	20	210	54	93
Low-Level Chromium (Hexavalent)	U	1495	µg/l	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
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10	[C] I/S	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	[C] I/S	< 0.10
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	[C] I/S	< 0.10

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

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

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
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
Di-N-Butyl Phthalate	N	1790	µg/l	0.50	< 0.50	< 0.50	< 0.50

**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
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	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
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:
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

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- C44 Aromatics: >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](mailto:customerservices@chemtest.co.uk)





**Customer Service**

Chemtest Ltd.  
11 Depot Road  
Newmarket  
Suffolk  
CB8 0AL

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 01638 60 60 70  
**f:** 01638 60 60 71  
**e:** Subcontracting@chemtest.co.uk

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

**Analytical Report Number : 18-85140**

Replaces Analytical Report Number : 18-85140, issue no. 1

<b>Project / Site name:</b>	18-13031	<b>Samples received on:</b>	14/05/2018
<b>Your job number:</b>	18-13031	<b>Samples instructed on:</b>	14/05/2018
<b>Your order number:</b>	16696	<b>Analysis completed by:</b>	24/05/2018
<b>Report Issue Number:</b>	2	<b>Report issued on:</b>	24/05/2018
<b>Samples Analysed:</b>	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.



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



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



Analytical Report Number: 18-85140

Project / Site name: 18-13031

Your Order No: 16696

<b>Lab Sample Number</b>				959599	959600			
<b>Sample Reference</b>				620295(BH18 WS3)	620296(BH19 WS3)			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				None Supplied	None Supplied			
<b>Date Sampled</b>				08/05/2018	08/05/2018			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

Total Phosphate as P	µg/l	20	ISO 17025	57	< 20			
----------------------	------	----	-----------	----	------	--	--	--

U/S = Unsuitable Sample I/S = Insufficient Sample



**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 discrete 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 30°C.**

## Analysis of Water Samples

Client: Chemtest Ltd  
Depot Road  
Newmarket  
Suffolk  
CB8 9AL

Testing Facility: SOCOTEC UK  
Unit 12, Moorbrook  
Southmead Industrial Park  
Didcot  
Oxfordshire  
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

## 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 (BH10 WS3)	RW2883	Water	08/05/2018 12:00
620283 (BH09 WS1)	RW2884	Water	08/05/2018 12:00
620285 (BH18 WS3)	RW2885	Water	08/05/2018 12:00
620286 (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." (<sup>226</sup>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 (BH100 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<sup>-1</sup> 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.





## 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<sup>-1</sup> 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. <sup>226</sup>Ra has only one gamma ray at 186 keV and the major gamma ray from <sup>235</sup>U also occurs at 186 keV. <sup>235</sup>U can be measured by the lower abundance gamma ray at 144 keV and if a positive result for <sup>235</sup>U is reported, the <sup>226</sup>Ra result will be unreliable and overestimated. However even if <sup>235</sup>U is below the LoD there may still be a contribution to the <sup>226</sup>Ra from <sup>235</sup>U and the <sup>226</sup>Ra result may be unreliable and overestimated. If an accurate result for <sup>226</sup>Ra is required this is better obtained by radiochemical analysis.



**CAUSEWAY**  
— GEOTECH

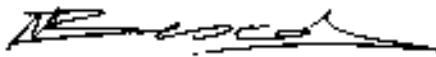

**APPENDIX L**

**Radman Associates Radiological Survey Report**





## Non-intrusive & Intrusive Radiological Survey Report

Author:	 Dr Mark Bescoby Accredited Radiation Protection Adviser Radioactive Waste Adviser
Document status:	1 <sup>st</sup> Issue
Document reference:	CGT/AWwTP/SR1
Document approved:	 Robert Collins Accredited Radiation Protection Adviser
Date:	15 January 2018
Client:	<b>Causeway Geotech</b>
Address:	8 Drumahiskey Road Ballymoney Co. Antrim BT53 7QL
Client contact:	Neil Haggan Senior Engineering Geologist
Address of premises surveyed:	Arklow Wastewater Treatment Plant N Quay Ferrybank Arklow Co. Wicklow Ireland
Survey dates:	08-09 January 2018
<p><i>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.</i></p>	

## 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<sup>1</sup> and in accordance with guidance published by the National Physical Laboratory<sup>2</sup>

## **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  $\mu\text{Sv/h}$ .

Material from TP27 gave elevated readings upto 400 cps (0.2  $\mu\text{Sv/h}$ ) 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  $\mu\text{Sv/h}$ ) 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  $\mu\text{Sv/h}$  which is slightly above the background of 0.1  $\mu\text{Sv/h}$ . 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]<sup>4</sup>) 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)**

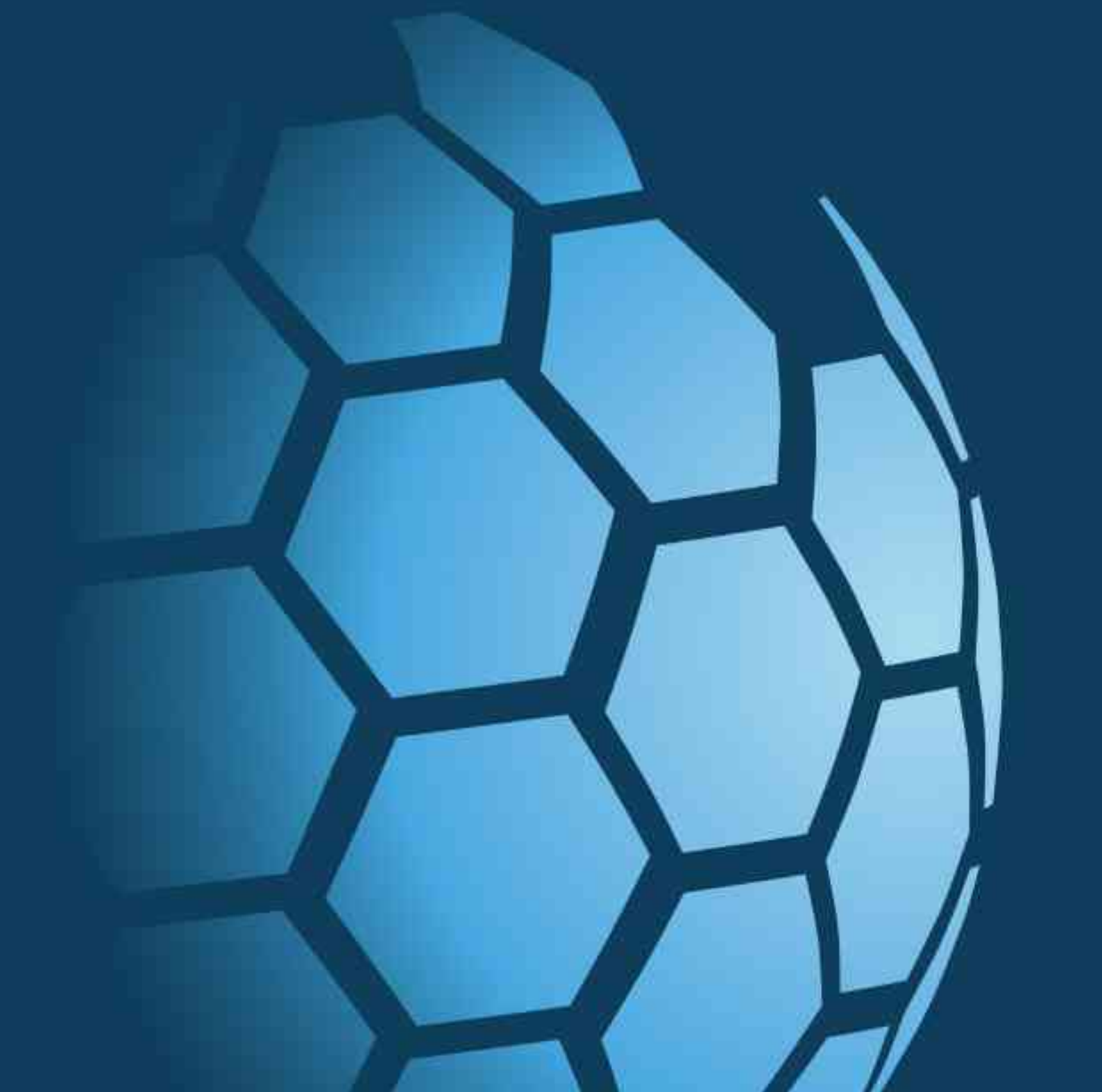




**CAUSEWAY**  
— GEOTECH

**APPENDIX M**

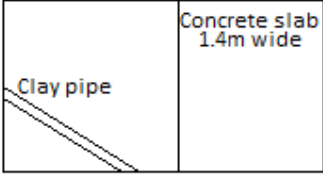
**IAC Archaeology Survey Report**

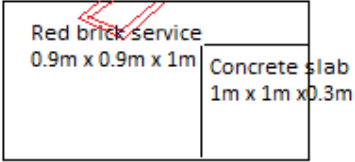


Monitored By: Liza Kavanagh and Red Tobin

January 2018

Trial Pit	Date	Length (m)	Width (m)	Depth (m)	Stratigraphy
1	9/01/18	6.1	1.1	1.6	<p>Orientated NW-SE</p> <p>1.1: Hardcore                      1.2: Rubble infill, composed of red brick, sand and concrete.                      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.</p>
2	15/01/18	3	1.2	2.3	<p>Orientated N-S</p> <p>2.1 Tarmacadam                      2.2 Sub-base material                      2.3 Demolition waste                      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.                      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.                      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.                      2.7 Sand – clean</p>
3	15/01/18	4	1.3	0.2	<p>Orientated WSW-ENE</p> <p>3.1 Concrete                      3.2 Concrete floor, extended throughout trench so trench abandoned and Trench 3a dug to the south.</p>

3a	15/01/18	3.5	1.2	1.5	<p>Orientated NNE-SSW</p> <p>Dug through gap between two concrete floor slabs</p> <p>3a.1 Concrete 3a.2 Edge of concrete floor slab 3a.3 Dump of material which contained considerable quantities of brick, slate and fragments of asbestos sheeting.</p>
4	10/01/18	3.4	1.6	2.3	<p>Orientated ENE-WSW</p> <p>4.1: Topsoil (0.2m). 4.2: Concrete slab (0.2m). 4.3: Red and orange gravelly sand fill around a clay pipe, 0.3m in diameter (0.5). 4.4: Cut by pipe trench, beige yellow sand (0.2m). 4.5: Cut by pipe trench, dark brown gravelly sand with inclusions of white flecked mortar, red brick rubble etc (0.3m). 4.6: Beige yellow beach sand with lenses of red orange iron staining (1.6m +).</p>
5	10/01/18	4	1.3	2.8	<p>Orientated NW-SE</p> <p>NW facing section: 5.1: Topsoil and hardcore (0.6m). 5.2: Fine silty yellow sand (0.1m). 5.3: Dark black stony silty sand with inclusions of red brick and rubbish, very compact (0.5m). 5.4: Orange yellow/iron stained sand and gravel (0.15m). 5.5: Pinky mauve sand and gravel with occasional stone (0.25m). Contains disused clay pipe. 5.6: Purply pink stone, small and angular –infill (0.2m). 5.7: Orange yellow/iron stained sand and gravel (0.2m). 5.8: Beach sand.</p> <p>SE facing section: 5.1: Topsoil and hardcore (0.5m). 5.2: Fine silty yellow sand (0.1m). 5.3: Dark black stony silty sand with inclusions of red brick and rubbish, very compact (0.4m). 5.4: Creamy yellow orangey sand (0.3m). 5.5: Concrete slab (1m deep). 5.6: Beach sand.</p> 

6	12/01/18	3	1.2	2.1	<p>Orientated NNW-SSE</p> <p>6.1 Tarmacadam  6.2 Sub-base material  6.3 Demolition waste and rubble  6.4 Oxidised layer (ferrous?)  6.5 Demolition waste  6.6 Heavily oxidised layer (intense heat?)  6.7 Sands with slight evidence for leachate.</p>
7	12/01/18	4	1.2	1.5	<p>Orientated NNW-SSE</p> <p>7.1 Tarmacadam  7.2 Sub-base material  7.3 Unstratified rubble (demolition waste)  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.  7.5 Sands showing stratified leachate (ferrous, hydrocarbon, chemical) to 1.5m</p>
8	12/01/18	3	2	2.3	<p>Orientated NE-SW</p> <p>8.1 Fine gravel  8.2 Sub-base  8.3 Unstratified demolition waste, mainly rubble.  8.4 Concrete floor or mounting  8.5 Major accumulation of hydrocarbon seepage at 1.5m  8.6 Sands showing stratified leachate (ferrous, hydrocarbon, chemical) to 2.3m</p>
9	11/01/18	4.3	2.1	2.5	<p>Orientated NW-SE</p> <p>9.1: Topsoil (0.1m)  9.2: Green-grey sand and gravel infill (0.2m).  9.3: Mottled mix of dark purple brown silty clay and inclusions of building waste including red brick and concrete (0.4m).  9.4: Dark black and purple clayey silt and sand with inclusions of rubble red brick and concrete.  9.5: Brown gravelly 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.</p>  <p>The diagram shows a rectangular area divided into two sections. The left section is labeled 'Red brick service' with dimensions '0.9m x 0.9m x 1m'. The right section is labeled 'Concrete slab' with dimensions '1m x 1m x 0.3m'. A red arrow points from the top-left corner of the brick service box towards the top-right corner of the concrete slab.</p>
10	10/01/18	3.7	1.3	2	<p>Orientated NW-SE</p> <p>10.1: Hardcore and topsoil (0.2m).  10.2: Beige brown sand with occasional stone inclusions (0.5m).</p>

					<p>10.3: Concrete slab (0.25m).  10.4: Pinkish mauve sand (0.1m)  10.5: Mix of black and purple sandy gravel and clay (0.2m).  10.6: Creamy white beach sand with lenses of orange/iron staining. (1.2m+).</p>
11	11/01/18	3.5	1.3	1.9	<p>Orientated NE-SW</p> <p>11.1: Tarmacadem (0.1m)  11.2: Green-grey sand and gravel infill (0.15m).  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.  11.4: Orange yellow/iron stained sand and gravel (0.2m). This layer was cut by a plastic pipe and a storm drain.  11.5: Beige yellow gravel sandy gravel and stone (0.3m). This layer was cut by a plastic pipe and a storm drain.  11.6: Purple/red small angular stone layer. Base layer for storm drain (0.2m).  11.7: Blue grey gravel, compacted like concrete (0.2m+).</p>
12	11/01/18	3.7	1.4	2.3	<p>Orientated ENE-WSW</p> <p>12.1: Tarmacadem (0.1m)  12.2: Green-grey sand and gravel infill (0.2m).  12.3: Mauve grey sand and stony gravel with occasional red brick and stone inclusions (0.3m).  12.4: Beige brown sand and gravel with occasional inclusions of large rubblestone (0.6m).  12.5: Dark blackish grey gravel silty clay (0.3m).  12.6: Beach sand and occasional stone (0.3m).  12.7: Grey brown gravel, red brick, broken pipe, rotting wood and other waste building materials (0.5m +).</p>
13	11/01/18	2.5	1.6	0.7	<p>Orientated NW-SE</p> <p>13.1: Hardcore and topsoil (0.3m).  13.2: Very compacted dark grey stone and silt almost cemented together – had to broken out by machine (0.15m).  13.3: Hardcore dark grey stone infill (0.2m)  13.4: Iron pan (0.1m).  13.5: Beige white sand with occasional orange/iron stain lenses (0.3m).  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.</p>
14	12/01/18	4.5	1.2	2.1	<p>Orientated WNW-ESE</p>

					<p>14.1 Reinforced concrete floor (rebar)</p> <p>14.2 Demolition waste</p> <p>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.</p> <p>14.4 Sands with slightly evidence of leaching</p>
15	8/01/18	4.8	1.1	2.2	<p>Orientated NE-SW</p> <p>15.1: Hardcore, blue grey sand and clay mixed with angular and sub-angular stone (0.3m).</p> <p>15.2: Concrete slab (0.2m).</p> <p>15.3: Orange and yellow mixed gravely sand with iron pan staining evident (0.5m).</p> <p>15.4: Grey gravely sand and stone with red brick and rubble inclusions (0.5m).</p> <p>15.5: White yellow sand with inclusions of orange/iron stain noted (0.7m+).</p> <p>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.</p>
16	9/01/18	2.6	1	2.8	<p>Orientated NE-SW</p> <p>16.1: Hardcore (0.2m)</p> <p>16.2: Purply pink and black gravely rubble with stone and concrete inclusions (0.45m).</p> <p>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.</p> <p>16.4: Fine grained yellow beige beach sand (1.4m +).</p> <p>Find 1 of 1</p>
17	10/01/18	3.3	1.2	2.1	<p>Orientated NW-SE</p> <p>SE facing section:</p> <p>17.1: Concrete slab (0.15m)</p> <p>17.2: Dark blackish brown silty clay and stone</p>



					<p>(0.15m)</p> <p>17.3: Disturbed beige yellow beach sand (0.4m)</p> <p>17.4: Fine grained silt and sand orange/iron stained and yellow (0.1m).</p> <p>17.5: Dark grey and black sandy clay and stone (0.1m).</p> <p>17.6: Bright yellow / possibly sulphur, powdery silt and sand (0.4-1.1m).</p> <p>17.7: Orange /iron stained sand and gravel (1.1m).</p>
18		3	1.2	2	<p>Orientated NNW-SSE</p> <p>18.1 Tarmacadam</p> <p>18.2 Sub-base material</p> <p>18.3 Demolition waste and rubble</p> <p>18.4 Heavily oxidised layer – north east corner (intense heat?)</p> <p>18.5 Sands with slight evidence for leachate.</p>
19	11/01/18	4.7	1.9	2	<p>Orientated NW-SE</p> <p>19.1: Grey gravel infill (0.2m)</p> <p>19.2: Dark brown silty clay (0.05m)</p> <p>19.3: Purple grey stony gravel, very occasional red brick (0.5m).</p> <p>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</p> <p>19.4B: Teal coarse grained sand –fill around plastic pipe (0.25m). –East end.</p> <p>19.5: Dark grey with slight purple hue with inclusions of roots, clay, gravel and sand (0.35m).</p> <p>19.6: Yellow beige beach sand (0.4m)</p> <p>19.7: Dark grey brown gravel and sandy clay with inclusions of red brick, broken pipe and plastic (0.2m +).</p>
20					<b>Burst pipe, trench full of water.</b>
21	11/01/18	4.1	2	2.2	<p>Orientated ENE-WSW</p> <p>21.1: Topsoil (0.1m)</p> <p>21.2: Dark green grey clayey sand with waste material including broken pipe and stone (0.5m)</p> <p>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).</p>
22	10/01/18	4.2	1.4	2.3	<p>Orientated ENE-WSW</p> <p>WSW facing section:</p> <p>22.1: Topsoil (0.3m).</p> <p>22.2: Dark black and brown gravel and stone very compacted with inclusions of lumps of concrete (0.2m)</p> <p>22.3: Rubble infill of red brick and concrete rubble and beige/cream sand and gravel (0.5m)</p>

					<p>22.4: Thin layer of compacted orange sand and gravel, compacted (0.1m).  22.5: Fine silt and sand black dark brown layer with occasional red brick inclusions (0.2m).  22.6 Beige yellow beach sand.</p> <p>ENE facing section:  22.1: Toposil (0.3m).  22.2: Dark black and brown gravel and stone very compacted with inclusions of lumps of concrete (0.2).  22.3: Rubble infill of red brick and concrete rubble and beige/cream sand and gravel (0.5m).  22.4: Stone and red brick mortar bonded floor surface 1m below groundlevel and 1.5m long (0.15m).  22.5: Fine silt and sand black dark brown layer with occasional red brick inclusions (0.15m).  22.6: Beige yellow beach sand.</p> <p>Noted within the trench were two pipes, one NE-SW clay pipe, NW-SE metal pipe.</p>
23	10/01/18	3.6	1.5	2.6	<p>Orientated ENE-WSW</p> <p>23.1: Topsoil (0.15m)  23.2: Concrete slab (0.15m)  23.3: Beige white and orange/iron stained sand with inclusions of stone (0.6).  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 19<sup>th</sup> century remains of factory which stood here.  23.5: Beach sand, beige yellow sand (1.5m).  23.6: Orange gravely sand with iron staining (0.4m+).</p>
24	9/01/18	3.3	1	1.4	<p>Orientated NNW-SSE</p> <p>24.1: Phosphogypsum (1.1m).  24.2: Compacted grey brown sand and rock (0.3m).  24.3: Beige yellow beach sand (0.2m+).</p> <p>This trial pit was dug within an area used to dump waste phosphogypsum to the North of the factory.</p>
25	9/01/18	3.3	1.1	2.3	<p>Orientated NNW-SSE</p> <p>25.1: Phosphogypsum (2.1m).  25.2: Compacted grey brown sand and rock (0.2m+).</p> <p>This trial pit was dug within an area used to dump waste phosphogypsum to the North of the factory.</p>
26	9/01/18	2.6	1.1	1.6	<p>Orientated N-S</p>

					<p>26.1: Phosphogypsum (1.4m).  26.2: Compacted grey brown sand and rock (0.2m+).</p> <p>This trial pit was dug within an area used to dump waste phosphogypsum to the North of the factory.</p>
27	9/01/18	3	1.4	2.3	<p>Orientated WNW-ESE</p> <p>27.1: Light beige grey sand with inclusions of brick and gypsum (0.4m).  27.2: Purply pink and black gravelly rubble with stone and concrete inclusions (0.45m).  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 19<sup>th</sup> century factory which stood on this site.</p>

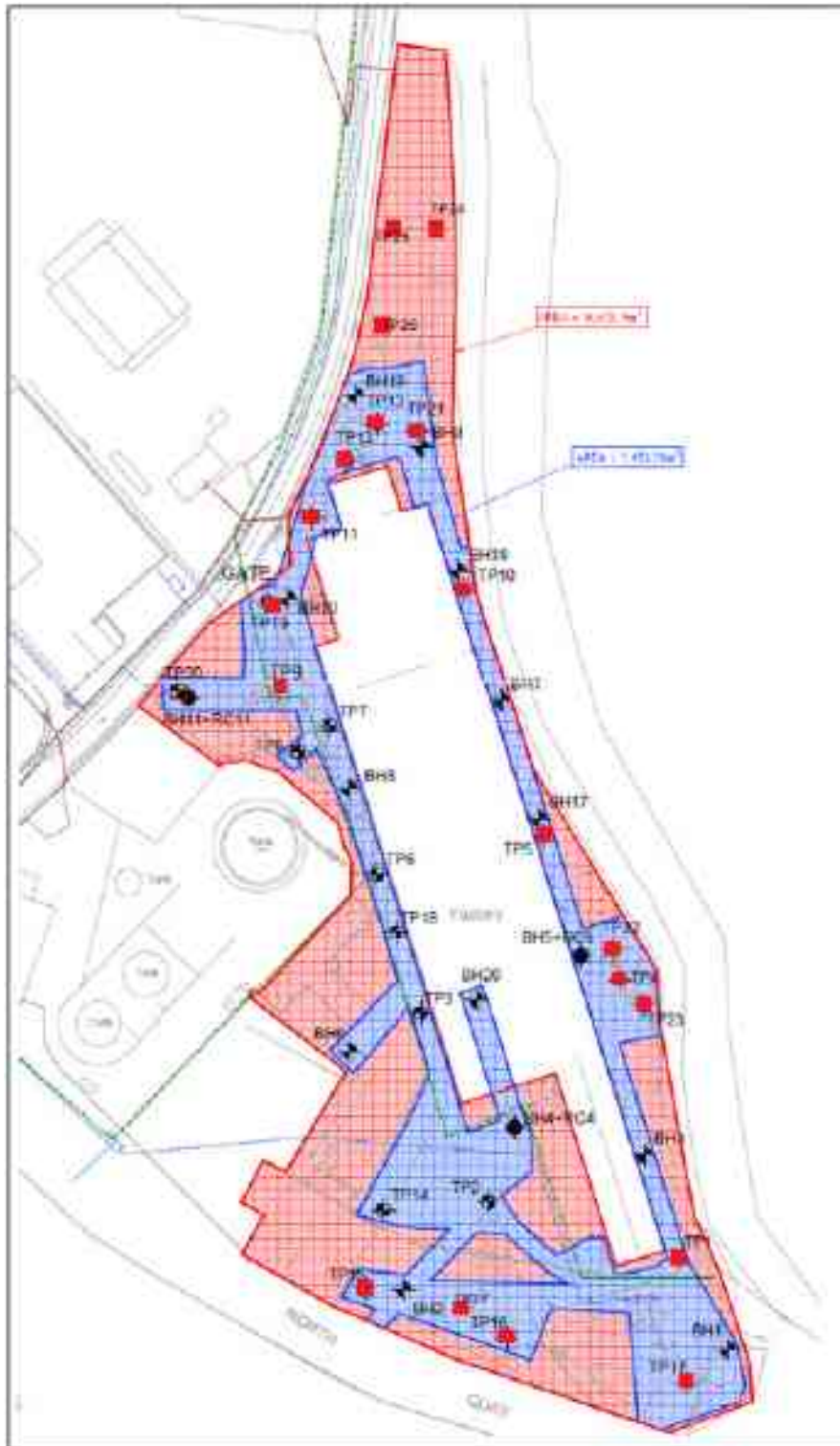


Figure 1: Plan of Trial Pits. Those highlighted red are completed.

<b>Photo Number</b>	<b>Description</b>
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



Photo 79: North view of TP7



Photo 80: Southwest view of TP7



Photo 81: Southwest view of TP6



82: Southwest view of TP18

Photo



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



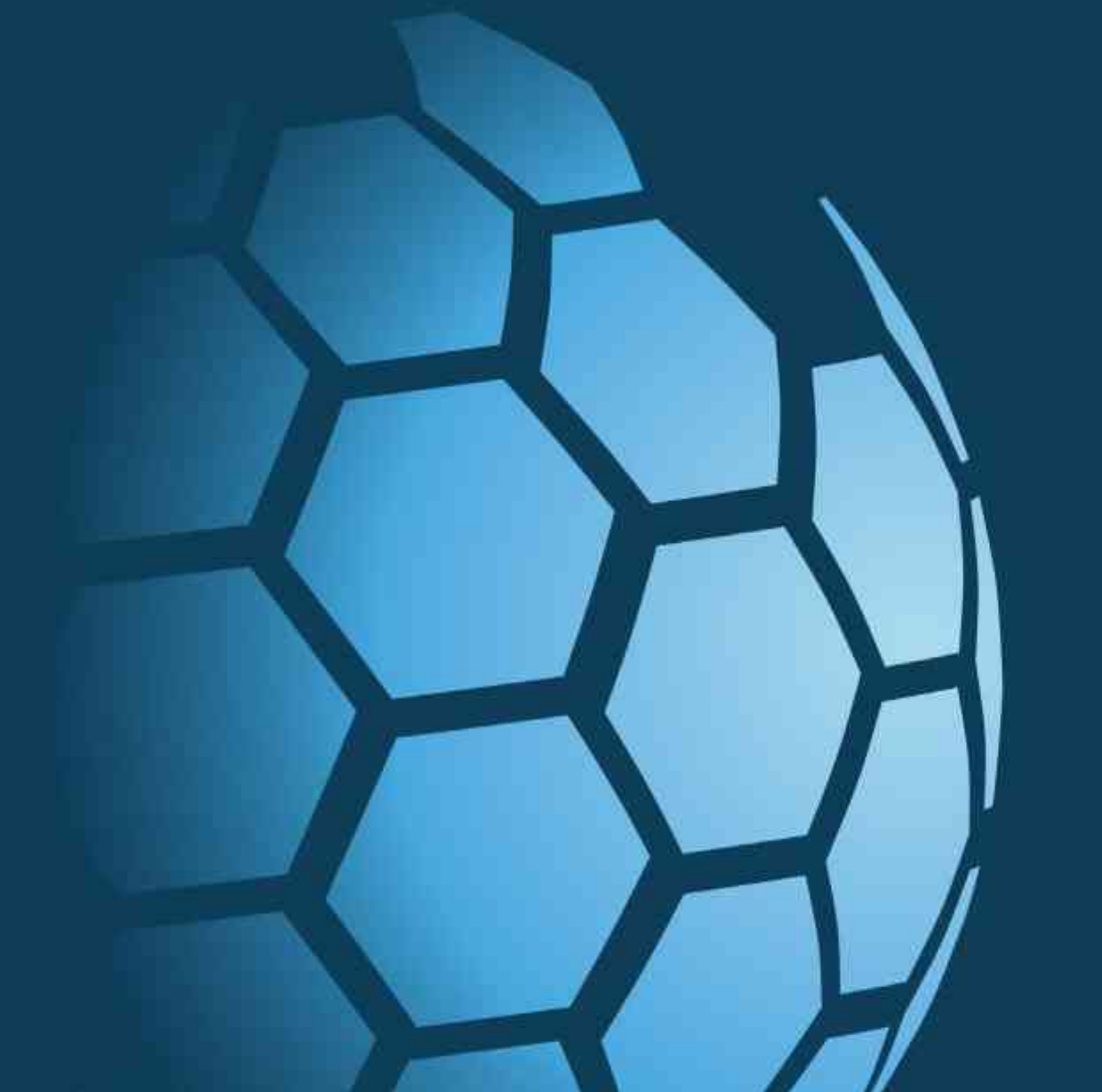
Photo 88: Southwest view of TP2



**CAUSEWAY**  
— GEOTECH

**APPENDIX N**

**SPT Hammer Energy Measurement Report**



**Southern Testing 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**

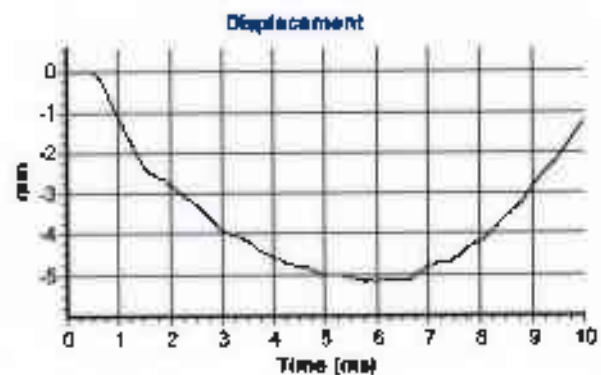
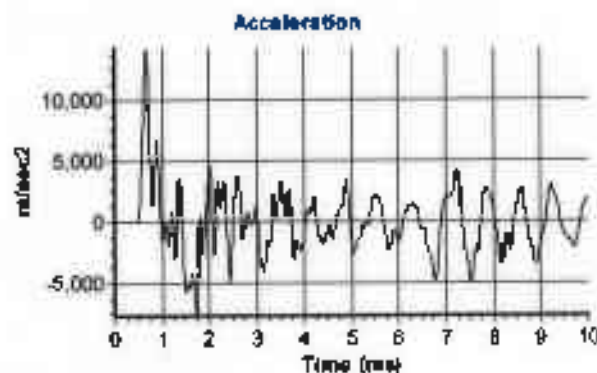
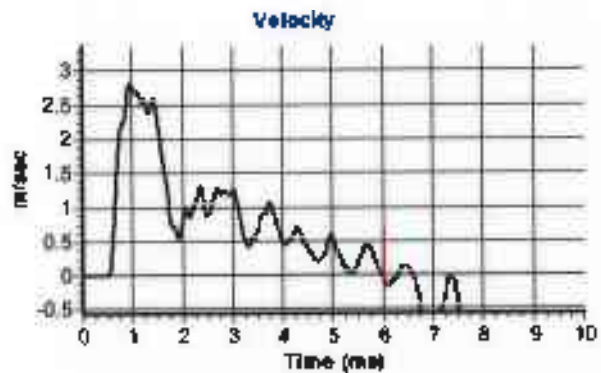
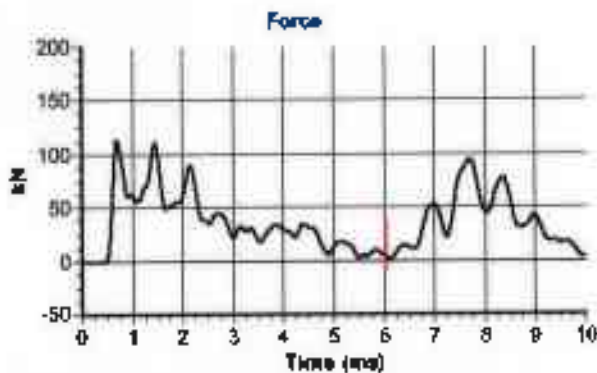
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 6458  
Accelerometer No.2: 9607

**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  $A$  (mm<sup>2</sup>): 905  
Theoretical Energy  $E_{theor}$  (J): 473  
Measured Energy  $E_{meas}$  (J): 287

**Energy Ratio  $E_r$  (%):** 61

*NPB*  
Signed: Neil Burrows  
Title: Field Operations Manager

The recommended calibration interval is 12 months

**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

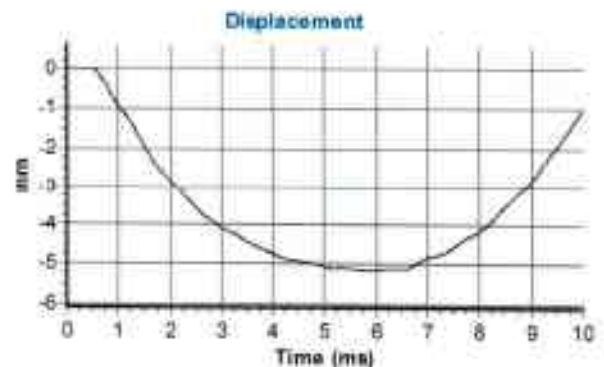
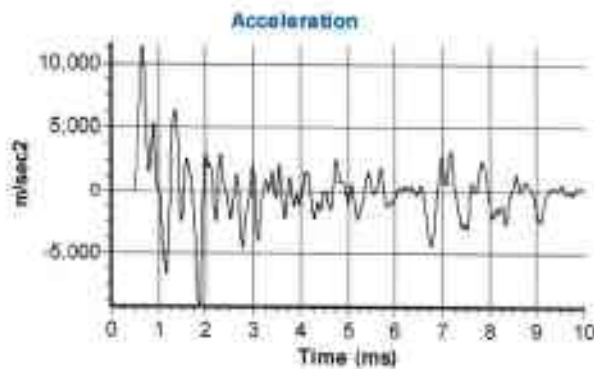
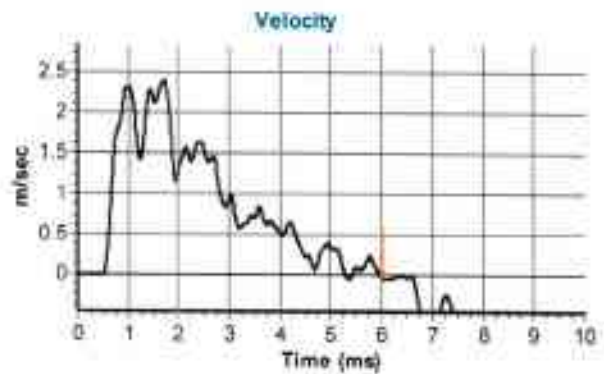
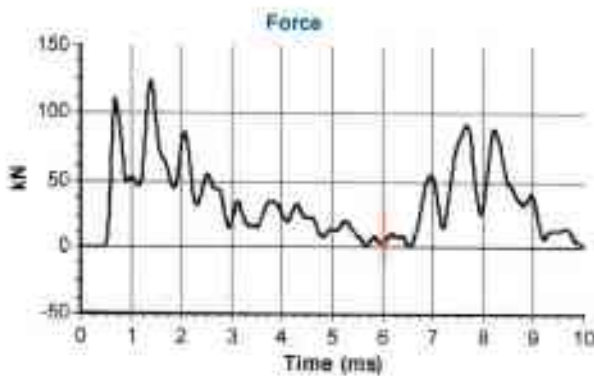
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 6458  
Accelerometer No.2: 9607

### 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 ( $\text{mm}^2$ ): 905  
Theoretical Energy  $E_{\text{theor}}$  (J): 473  
Measured Energy  $E_{\text{meas}}$  (J): 284

**Energy Ratio  $E_r$  (%):** **60**

Signed: Neil Burrows  
Title: Field Operations Manager

The recommended calibration interval is 12 months