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ANNUAL MONITORING REPORT FOR ARTHURSTOWN LANDFILL: GROUNDWATER MONITORING

**Report Period: January 01 – December 31,
2023**

**Industrial Emissions Licence Ref. No. W0004-
04**

Prepared for:

South Dublin County Council



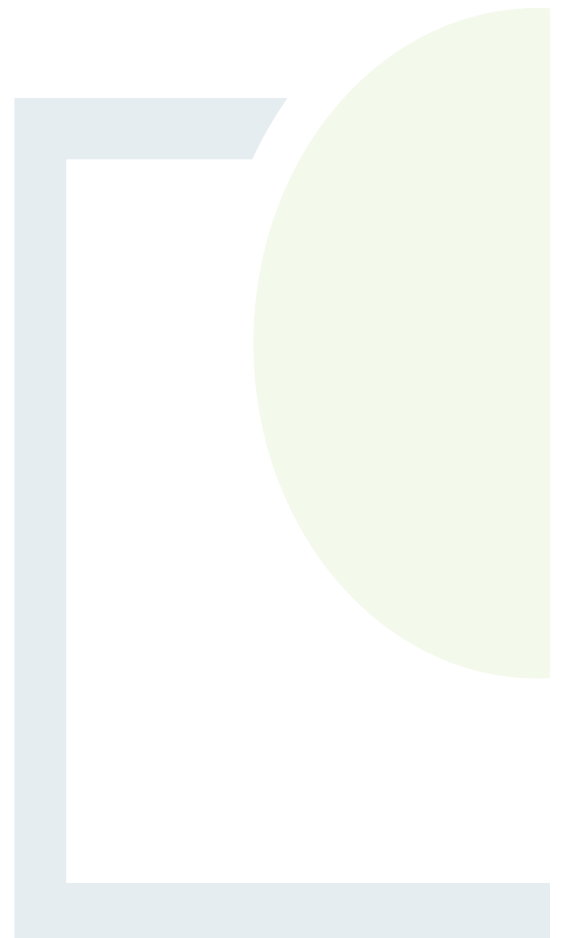
Date: January 2024

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REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT

User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
0	Final Issue	SF/AMW	JS	TR	11/01/2024

Client: South Dublin City County Council (SDCC).

Keywords: Annual report, Landfill Environmental Monitoring, Landfill, Groundwater Monitoring

Abstract: This report details the results of quarterly monitoring of groundwater quality at Arthurstown Landfill, Kill, Co. Kildare during 2023.

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1. INTROUCTION

In August 2022, South Dublin County Council (SDCC) appointed Fehily Timoney and Company (FT) to carry out the quarterly groundwater monitoring programme as required by their Waste Licence (Registration Number W0004-04). This report details the monitoring that was carried out as part of the 2023 quarterly groundwater monitoring events, including the sampling and analytical methods used.

Arthurstown Landfill is located approximately 1.6 km southeast of Kill, Co. Kildare. The landfill was operated by, and remains in the ownership of, SDCC. Prior to SDCC purchase of the land in the early 1990s, the site was used as a sand and gravel quarry. The Environmental Protection Agency (EPA) issued the site with Waste Licence. W0004-04 in 2009 and the landfill operations ceased in 2010.

Groundwater quality was monitored quarterly at 7 monitoring locations. Annual parameters were also carried out in Q3.



2. GROUNDWATER MONITORING

2.1 Sampling Methodology

Normal FT groundwater sampling practice is to purge every groundwater well prior to sampling. This includes measurement of the depth of each well and depth to groundwater using a dip-meter to determine well volume. At least 3 well volumes of groundwater are removed from each well prior to sampling. This is in accordance with standard practice (EPA, 2003) and is carried out to remove any stagnant water in the well casing to ensure stable sampling conditions of the aquifer.

2.2 Monitoring Locations

Seven monitoring wells (MW-2, MW-3, MW-6, MW-8, MW-9, MW-16 and MW-20) were monitored to comply with the routine quarterly monitoring as set out in Schedule D.1 of the Licence.

Samples were not required from the remaining groundwater wells; however, the water level was measured in all 22 wells using a well dip meter. The locations of all groundwater water monitoring points are included in Appendix 1.

2.3 Monitoring Parameters

Monitoring was carried out in line with Condition 5 of schedule D of the licence. All reporting was carried out in line with Schedule E of the licence. The parameters and monitoring frequency as specified in the licence are shown in Table 2-1:

Table 2-1: Monitoring Parameters and Frequency

Parameter	Monitoring Frequency
Ammonia (as N)	Quarterly
Chloride	Quarterly
Dissolved Oxygen	Quarterly
Electrical Conductivity	Quarterly
pH	Quarterly
Temperature	Quarterly
Total Organic Carbon	Quarterly
Total Oxidised Nitrogen	Annually
Total Ortho Phosphate	Annually
Total Alkalinity	Annually
Sulphate	Annually
Mercury	Annually
Fluoride	Annually
Total Cyanide Annually	Annually



Parameter	Monitoring Frequency
Faecal Coliforms	Annually
Total Coliforms	Annually
Boron	Annually
Cadmium	Annually
Calcium	Annually
Total Chromium	Annually
Copper	Annually
Iron	Annually
Lead	Annually
Magnesium	Annually
Manganese	Annually
Nickel	Annually
Potassium	Annually
Sodium	Annually
Zinc	Annually
List 1/11 organic substances	Annually



3. GROUNDWATER WELL RESULTS

3.1 Field Data

The field data (well depth (m) and depth to water (m)), are contained in Table 3-1:

Table 3-1: Groundwater field data

Well ID	Well Depth (m)	Q1	Q2	Q3	Q4
MW1	Represented by MW2				
MW2	Tap				
MW3	10.16	3.5	4.41	4.2	3.94
MW4	2.31	DRY	DRY	DRY	DRY
MW5	2.1	DRY	DRY	DRY	DRY
MW6	6.09	1.18	1.6	1.55	1.22
MW7	6.09	DRY	DRY	DRY	DRY
MW8	30.78	7.36	7.38	DRY	DRY
MW9	28.4	6.36	7.27	6.67	6.22
MW10	2.56	DRY	DRY	DRY	DRY
MW11	3.38	DRY	DRY	DRY	DRY
MW12	4.26	DRY	DRY	DRY	DRY
MW13	8.32	DRY	DRY	DRY	DRY
MW14	16.64	1.24	1.24	1.2	1.19
MW15	Tap				
MW16	22.43	5.63	6.41	5.72	5.33
MW17	10.51	4.81	4.95	4.6	4.75
MW18	27	8.2	6.63	8.31	8.26
MW19	26.2	13.99	12.42	11.36	13.01
MW20	8.96	6.02	6.51	6.35	6.12
MW21	7.01	DRY	DRY	DRY	DRY

Notes:

* = Levels are measured as meters below Top of Casing (mbTOC)



3.2 Laboratory Data

The groundwater results were screened against the EPA Guideline Threshold Values (GTVs) or Interim Guideline Values (IGVs). The GTVs take precedence over the IGVs; IGVs are used only in the absence of a GTV for that particular parameter. The sources of the GTV and IGV thresholds are as follows:

Guideline Threshold Values (GTVs)

- European Union Environmental Objectives (Groundwater) Regulations, 2016 (S.I. No.366 of 2016) and
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

Interim Guideline Values (IGVs)

- Environmental Protection Agency (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report. Environmental Protection Agency, Wexford.

The complete laboratory reports are presented in Appendix II.



The results of the Q1 water quality parameters in the groundwater monitoring wells are contained in Table 3-2. Exceedances are summarised below:

Table 3-2: Groundwater Monitoring Results Q1

Parameter	Date: 25/01/23		MW6	MW8	MW20	MW3	MW2	MW9	MW16
	Units	IGV ² / GTV ¹	Up-Gradient	Up-Gradient	Up-Gradient	Cross-Gradient	Cross-Gradient	Down-Gradient	Down-Gradient
pH (Field)	pH units	>6.5 & <9.5 ²	7.58	7.74	7.45	7.54	8.01	8.03	7.8
pH (Laboratory)	pH units	>6.5 & <9.5 ²	7.63	7.88	7.55	7.61	8.13	8.18	7.91
Temperature (Field)	(°C)	25°C ²	8.5	10.2	10.4	10.2	8	11.1	11.2
Electrical Conductivity (Field)	(mS/cm)	1.875 ¹	0.711	0.739	1.277	1.219	0.57	0.601	0.592
Electrical Conductivity (Laboratory)	(mS/cm)	1.875 ¹	0.559	0.567	1.25	1.03	0.496	0.521	0.527
Dissolved Oxygen (Field)	(mg/l)	NAC ²	6.01	1.84	7.72	5.11	10.31	6.81	4.51
Dissolved Oxygen (Field)	%	NAC ²	51.1	16	68.6	45.0	86.5	62.1	40.2
Ammoniacal Nitrogen as N	mg/l	0.136 ^{1*}	0.035	21.5	0.05	0.055	0.032	0.048	0.03
Chloride	mg/l	187.5 ¹	13.4	13.2	16	37.3	11	12.3	13
Total Organic Carbon	mg/l	NAC ²	3.08	11.4	3.47	4.29	<3	<3	<3

¹ European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

² Environmental Protection Agency (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report. Environmental Protection Agency

*GTV is 0.175 for Ammonium



The results of the Q2 water quality parameters in the groundwater monitoring wells are contained in Table 3-3. Exceedances are summarised below:

Table 3-3: Groundwater monitoring results Q2

Parameter	Date: 13/04/23		MW6	MW8	MW20	MW3	MW2	MW9	MW16
	Units	IGV ² / GTV ¹	Up-Gradient	Up-Gradient	Up-Gradient	Cross-Gradient	Cross-Gradient	Down-Gradient	Down-Gradient
pH (Field)	pH units	>6.5 & <9.5 ²	7.6	8.1	7.4	7.23	8.06	8.03	7.94
pH (Laboratory)	pH units	>6.5 & <9.5 ²	7.57	8.18	7.36	7.2	8.09	8.08	7.94
Temperature (Field)	(°C)	25°C ²	9.1	10.2	10.4	10.3	9.1	11.1	11.3
Electrical Conductivity (Field)	(mS/cm)	1.875 ¹	0.635	0.367	1.56	1.5	0.555	0.612	0.591
Electrical Conductivity (Laboratory)	(mS/cm)	1.875 ¹	0.628	0.347	1.52	1.46	0.524	0.547	0.57
Dissolved Oxygen (Field)	(mg/l)	NAC ²	3.41	4.05	6.66	4.04	4.3	3.56	6.02
Ammoniacal Nitrogen as N	mg/l	0.136 ^{1*}	0.048	0.078	0.055	0.069	0.012	0.077	0.027
Chloride	mg/l	187.5 ¹	12.3	7.1	10.8	71.1	10.9	11.9	13
Total Organic Carbon	mg/l	NAC ²	<3	<3	5.29	6.31	<3	<3	<3

¹ European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

² Environmental Protection Agency (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report. Environmental Protection Agency

*GTV is 0.175 for Ammonium



The results of the Q3 water quality parameters in the groundwater monitoring wells are contained in Table 3-4. Exceedances are summarised below:

Table 3-4: Groundwater monitoring results Q3

Parameter	Date: 14/09/23		MW6	MW8	MW20	MW3	MW2	MW9	MW16
	Units	IGV ² / GTV ¹	Up-Gradient	Up-Gradient	Up-Gradient	Cross-Gradient	Cross-Gradient	Down-Gradient	Down-Gradient
pH (Field)	pH units	>6.5 & <9.5 ²	7.43	7.53	7.21	7.25	7.8	7.9	7.56
pH (Laboratory)	pH units	>6.5 & <9.5 ²	7.4	7.49	7.14	7.22	7.74	7.77	7.6
Temperature (Field)	(°C)	25°C ²	13	12.2	11.8	12.5	12.5	12.2	12.9
Electrical Conductivity (Field)	(mS/cm)	1.875 ¹	0.623	0.521	1.098	1.45	0.548	0.519	0.58
Electrical Conductivity (Laboratory)	(mS/cm)	1.875 ¹	0.591	0.478	1.180	1.360	0.527	0.549	0.573
Dissolved Oxygen (Field)	(mg/l)	NAC ²	9.82	9.41	9.92	9.52	9.73	10.20	10.70
Ammoniacal Nitrogen as N	mg/l	0.136 ^{1*}	0.036	2.57	0.085	0.082	0.019	0.139	0.038
Chloride	mg/l	187.5 ¹	12.1	6.3	21.9	66.2	11	11.8	13.2
Total Organic Carbon	mg/l	NAC ²	<3	6.45	9.55	4.32	<3	<3	<3

¹ European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

² Environmental Protection Agency (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report. Environmental Protection Agency

*GTV is 0.175 for Ammonium



The results of the Q4 water quality parameters in the groundwater monitoring wells are contained in Table 3-5. Exceedances are summarised below:

Table 3-5: Groundwater monitoring results Q4

Parameter	Date: 28/11/2023		MW6	MW8	MW20	MW3	MW2	MW9	MW16
	Units	IGV ² / GTV ¹	Up-Gradient	Up-Gradient	Up-Gradient	Cross-Gradient	Cross-Gradient	Down-Gradient	Down-Gradient
pH (Field)	pH units	>6.5 & <9.5 ²	7.7	7.61	7.13	7.25	7.8	7.61	7.5
pH (Laboratory)	pH units	>6.5 & <9.5 ²	7.67	7.59	7.12	7.27	7.81	7.65	7.61
Temperature (Field)	(°C)	25°C ²	12	11.2	11.8	12.3	11.7	12	11.8
Electrical Conductivity (Field)	(mS/cm)	1.875 ¹	0.58	0.421	1.34	1.33	0.512	0.55	0.561
Electrical Conductivity (Laboratory)	(mS/cm)	1.875 ¹	0.563	0.438	1.29	1.36	0.521	0.547	0.564
Dissolved Oxygen (Field)	(mg/l)	NAC ²	2.34	1.13	7.45	3.21	6.8	4.3	2.05
Ammoniacal Nitrogen as N	mg/l	0.136 ^{1*}	0.039	4.07	0.052	0.96	0.021	0.018	0.019
Chloride	mg/l	187.5 ¹	11.3	3.9	21.7	60	11.1	11.7	13
Total Organic Carbon	mg/l	NAC ²	<3	3.95	<3	5.68	<3	<3	<3

¹ European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

² Environmental Protection Agency (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report. Environmental Protection Agency

*GTV is 0.175 for Ammonium



The laboratory results of the metal water quality parameters in the groundwater monitoring wells are shown in Table 3.6:

Table 3-6: Annual Groundwater Monitoring Results (Metals)

Metal Analysis	Date: 16/08/22		MW6	MW8	MW20	MW3	MW2	MW9	MW16
Parameter	Units	IGV ² /GTV ¹	Up-Gradient	Up-Gradient	Up-Gradient	Cross-Gradient	Cross-Gradient	Down-Gradient	Down-Gradient
Boron	µg/l	750 ¹	<10	<10	20.8	108	<10	11.6	<10
Cadmium	µg/l	3.75 ¹	<0.08	<0.08	<0.08	0.22	<0.08	<0.08	0.2
Calcium	mg/l	200 ²	123	89.4	255	242	81.2	91.6	93.9
Chromium	µg/l	37.5 ¹	<1	<1	<1	<1	<1	<1	<1
Copper	µg/l	1500 ¹	<0.3	<0.3	0.304	1	5.25	<0.3	0.458
Iron	mg/l	200 ²	<0.019	<0.019	<0.019	<0.019	0.046	<0.019	<0.019
Lead	µg/l	18.75 ¹	<0.2	<0.2	<0.2	<0.2	0.238	<0.2	<0.2
Magnesium	mg/l	50 ²	8.38	5.82	14.5	22.5	15.9	14.1	15.3
Manganese	µg/l	50 ²	150	303	16.3	40.3	32.4	94.5	938
Mercury	µg/l	0.75 ¹	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	µg/l	15 ¹	0.531	0.677	0.688	2.65	0.462	0.901	0.425
Potassium	mg/l	5 ²	0.428	1.23	0.461	5.85	0.784	1.17	0.827
Sodium	mg/l	150 ¹	7	4.91	13.9	55.4	16.2	9.29	9.84
Zinc	µg/l	75 ¹	1.03	1.86	4.72	3.78	11.5	1.84	1.27

¹ European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

² Environmental Protection Agency (2003), Towards Setting Guideline Values for the Protection of Groundwater in Ireland – Interim Report. Environmental Protection Agency



The full suite of data is contained in the laboratory reports, included in Appendix 3, and the results of some of the more pertinent parameters are contained in Table 3-7:

Table 3-7: Annual Groundwater Monitoring Results (List 1 and List 2 Organic Substances)

Parameter	Date: 16/08/22	MW6	MW8	MW20	MW3	MW2	MW9	MW16
	Units	Up-Gradient	Up-Gradient	Up-Gradient	Cross-Gradient	Cross-Gradient	Down-Gradient	Down-Gradient
p, p-DDE	µg/l	<0.02	<0.05	<0.1	<0.2	<0.01	<0.01	<0.01
o, p-DDT	µg/l	<0.08	<0.2	<0.1	<0.2	<0.04	<0.04	<0.02
p, p-TDE	µg/l	<0.02	<0.05	<0.1	<0.2	<0.01	<0.01	<0.01
Di-n-octylphthalate	µg/l	<20	<40	<50	<500	<5	<5	<5
Isophorone	µg/l	<4	<8	<10	<100	<1	<1	<1
Bis(2-ethylhexyl) phthalate	µg/l	<8	<16	<20	<200	<2	<2	<2
Dichloromethane	µg/l	<3	<3	<3	<3	<3	<3	<3



4. PRIVATE WELL RESULTS

4.1 Non-Metals

The laboratory data for chemical analysis of the five private wells are shown in Table 4-1 to Table 4-3. These wells are monitored annually. For comparative purposes, the European Union Drinking Water Regulations 2014 (S.I. No. 122 of 2014) thresholds, where available, are included as assessment criteria in the tables. The full laboratory reports are included in Appendix 3.

Table 4-1: Private Well Results (Non-Metals)

Parameter	Units	Drinking water Regulations	PW1	PW2	PW3	PW4	PW5
Colour	-	-	Clear	Clear	Clear	Clear	Clear
Odour	-	-	None	None	None	None	None
pH	pH units	>6.5 & <9.5	7.85	7.74	7.92	7.64	7.53
Temperature	(°C)	-	12.1	11.2	11.2	12.4	11.5
Electrical Conductivity	(mS/cm)	2.5	0.570	0.509	0.652	0.606	0.706
Dissolved Oxygen	mg/l	-	10.4	9.7	9.3	10.0	10.6
Ammoniacal Nitrogen as N	mg/l	0.3	0.024	0.019	0.012	0.022	0.014
Fluoride	mg/l	1.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloride	mg/l	250	13	11	12.3	21.8	30.1
Alkalinity, Total as CaCO ₃	mg/l	-	319	274	371	304	361
Phosphate (ortho) as PO ₄	mg/l	-	0.054	0.125	<0.05	<0.05	0.111
Total Oxidised Nitrogen as N	mg/l	50.5	0.796	<0.1	0.954	3.94	5
Total Organic Carbon	mg/l	-	<3	<3	<3	<3	<3



4.2 Metals

The laboratory results of the metal water quality parameters in the groundwater monitoring wells are contained in Table 4-2:

Table 4-2: Private Well Results (Metals)

Parameter	Units	Drinking water Regulations	PW1	PW2	PW3	PW4	PW5
Boron	µg/l	750 ¹	<10	<10	<10	<10	<10
Cadmium	µg/l	3.75 ¹	<0.08	<0.08	<0.08	<0.08	<0.08
Calcium	mg/l	200 ²	81.1	81.2	139	111	141
Chromium	µg/l	37.5 ¹	<1	<1	<1	<1	<1
Copper	µg/l	1500 ¹	4.93	5.25	11	42.9	5.84
Iron	mg/l	0.2 ²	0.0197	0.046	<0.019	<0.019	<0.019
Lead	µg/l	18.75 ¹	0.427	0.238	0.212	1.29	0.223
Magnesium	mg/l	50 ²	25.5	15.9	7.18	16.2	9.91
Manganese	µg/l	50 ²	<3	32.4	<3	7.46	4.8
Mercury	µg/l	0.75 ¹	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	µg/l	15 ¹	0.546	0.462	<0.4	0.598	<0.4
Potassium	mg/l	5 ²	1.11	0.784	0.537	0.849	1.38
Sodium	mg/l	150 ¹	15.3	16.2	6.58	8.83	19.1
Zinc	µg/l	75 ¹	4.89	11.5	5.6	31.1	5.22



4.3 List 1 and List 2 Organic Substances

The full suite of data is contained in the laboratory reports, included in Appendix 3, and the results of some of the more pertinent parameters are contained in Table 4-3:

Table 4-3: Private Well Results (List 1 and List 2 Organic Substances)

Parameter	Units	PW1	PW2	PW3	PW4	PW5
p, p-DDT	µg/l	<0.1	<0.1	<0.01	<0.1	<0.01
Heptachlor	µg/l	<0.02	<0.02	<0.01	<0.02	<0.01
Azinphos Methyl	µg/l	<0.04	<0.04	<0.02	<0.04	<0.02
Bis(2-ethylhexyl) phthalate	µg/l	<2	<2	<2	<2	<2
Di-n-octylphthalate	µg/l	<5	<5	<5	<5	<5
Dichloromethane	µg/l	<3	<3	<1	<3	<1



5. INTERPRETATION OF RESULTS

5.1 Groundwater Wells

The laboratory results of the non-metal water quality parameters in the groundwater monitoring wells are contained in Tables 3-2 to 3-5 above. Exceedances are summarised below.

Upgradient monitoring wells:

- MW-20 – no exceedances;
- MW-8 – There were exceedances of ammoniacal nitrogen as N (in each quarter with the exception of Q2 (Q1 – 21.5mg/l, Q3 – 2.57mg/l, Q4 – 4.07mg/l));
- MW-6 – no exceedances.

The ammoniacal nitrogen level of 21.5mg/l at MW-8 in Q1 is significantly above the GTV and is the highest observed at this location in 2023, and is within the higher range of results when reviewed against historical results. All other non-metal parameters were below their respective IGV and GTV thresholds.

Cross- and down-gradient monitoring wells:

- MW-3 - ammoniacal nitrogen as N in Q4 (0.96mg/l);
- MW-2 – no exceedances;
- MW-9 - ammoniacal nitrogen as N in Q3 (0.139mg/l);
- MW-16 – no exceedances.

All other non-metal parameters were below their respective IGV and GTV thresholds.

The laboratory results of the metal water quality parameters in the groundwater monitoring wells are shown in Table 3-6. There were exceedances of the IGV for manganese in the up-gradient monitoring wells (MW-6 and MW-8) and down-gradient wells (MW-9 and MW-16). The concentration of calcium exceeded the IGV in an up-gradient monitoring well MW-20 (255mg/l) and cross-gradient well MW-3 (242mg/l). There were exceedances of the IGV for potassium in the cross-gradient well MW-3 (5.85mg/l). All other metal parameters were below their respective IGVs and GTVs.

All List 1 and List 2 Substances were below the limit of detection.

5.2 Private wells

All non-metal water quality parameters were below their respective European Union Drinking Water Regulations 2014 (S.I. No. 122 of 2014) thresholds.

All metals concentration were below their respective European Union Drinking Water Regulations 2014 (S.I. No. 122 of 2014) thresholds.

All List 1 and List 2 Substances were below the limit of detection.



6. SUMMARY

Analysis of groundwater quality at the site shows there were exceedances of ammoniacal Nitrogen as N in up-gradient, cross-gradient and down-gradient wells.

Based on the information gathered in this report and supported by the groundwater contour map, the exceedances are most likely related to offsite sources, however the site will be routinely monitored to ensure the landfill is not impacting the groundwater beneath the facility.

All private well parameters were below their respective IGV and GTV thresholds.

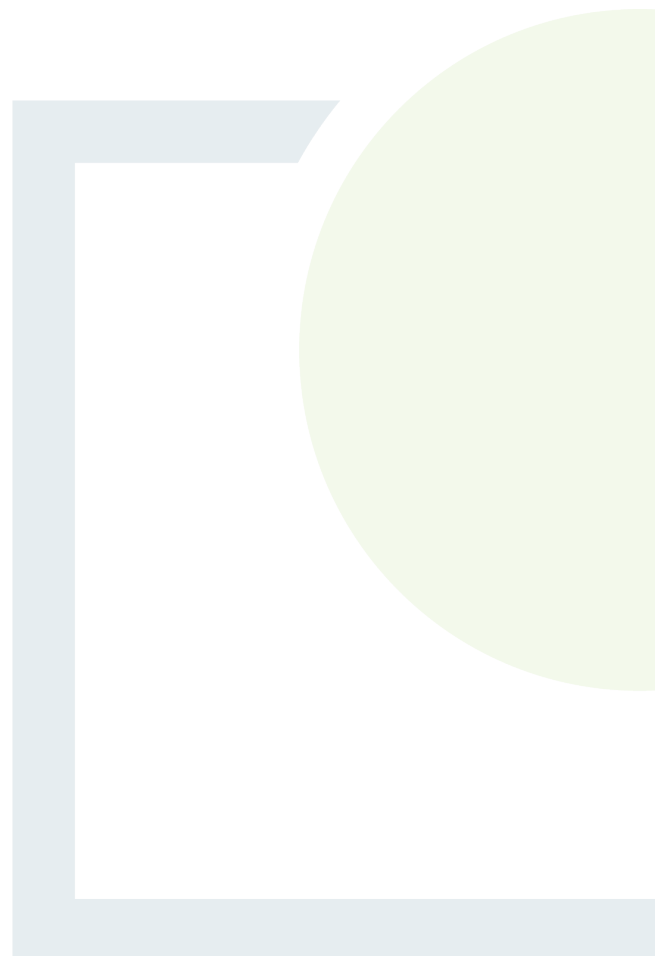
Monitoring will continue in Q1 2024.

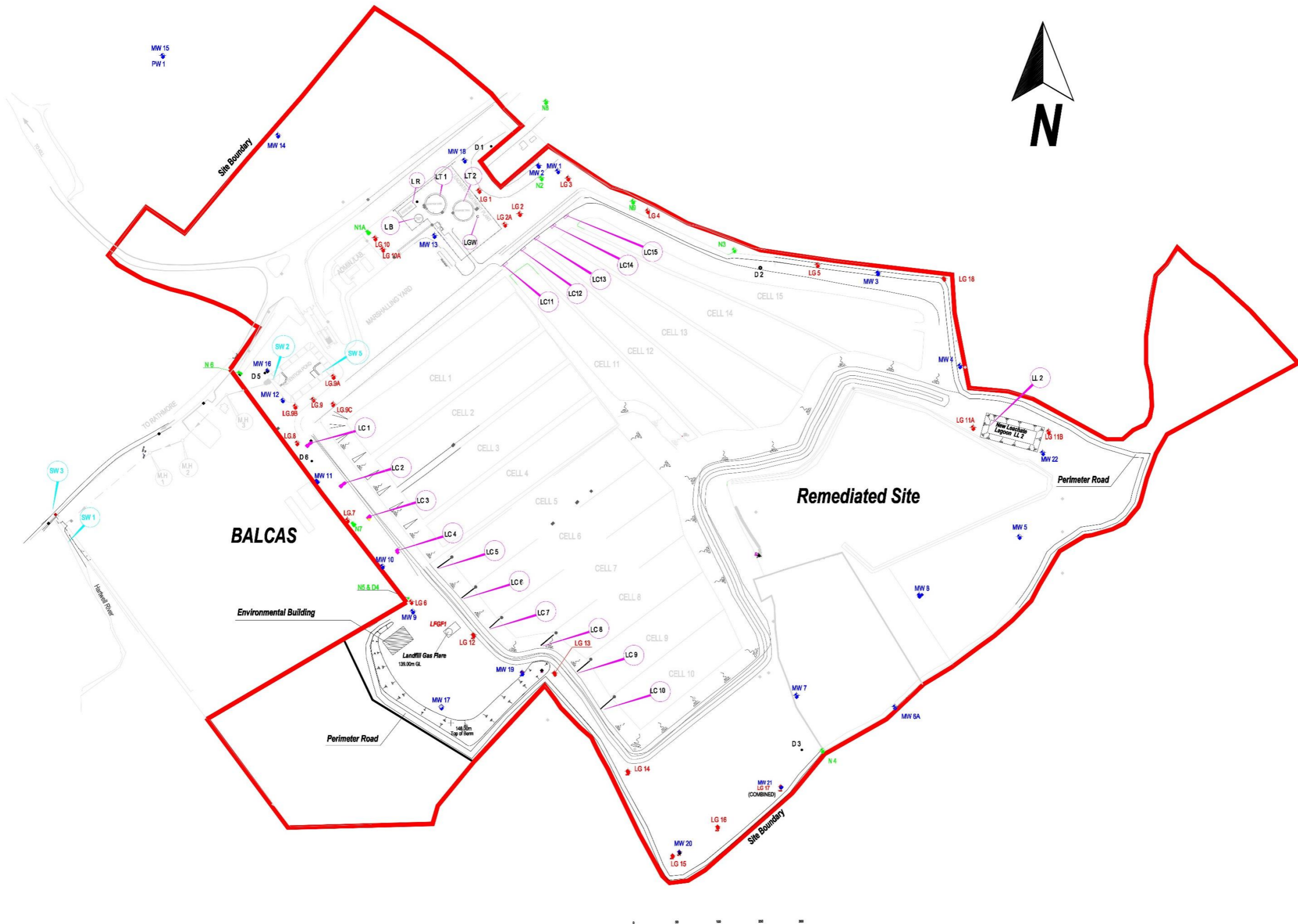


CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX 1

Environmental Monitoring
Location Map





REF.NO.	EASTING	NORTHING
LG 1	E 285463.69	N 221911.09
LG 2	E 285514.04	N 221292.45
LG 3	E 285572.13	N 221335.87
LG 4	E 285588.13	N 221288.04
LG 5	E 285889.54	N 221218.69
LG 6	E 285784.37	N 220254.94
LG 7	E 285319.38	N 220303.80
LG 8	E 285248.77	N 221016.74
LG 9	E 285267.44	N 221089.11
LG 10	E 285341.83	N 221283.29
LG 2A	E 285652.43	N 221042.04
LG 12	E 285459.22	N 220784.84
LG 13	E 285555.97	N 220738.57
LG 14	E 285643.58	N 220620.27
LG 15	E 285686.99	N 220518.67
LG 16	E 285760.70	N 220553.36
LG 17	E 285825.96	N 220301.99
LG 18	E 285430.06	N 220789.52
LG 9A	E 285262.18	N 221086.38
LG 9B	E 285246.55	N 221089.23
LG 9C	E 285291.86	N 221063.08
LG 9D	E 285351.130	N 221243.77
LG 11A	E 285436.80	N 221219.84
LG 11B	E 285020.57	N 22114.50

MW 1	E 285589.79	N 221344.42
MW 2	E 285720.16	N 221370.59
MW 3	E 285955.28	N 221234.57
MW 4	E 286338.27	N 221101.92
MW 5	E 286110.31	N 220953.486
MW 6	E 285878.02	N 220780.81
MW 6A	E 285961.57	N 220988.19
MW 7	E 285944.53	N 220711.84
MW 8	E 285981.70	N 22032.78
MW 9	E 285386.73	N 220813.52
MW 10	E 285300.35	N 220867.70
MW 11	E 285273.39	N 220870.03
MW 12	E 285229.74	N 221054.09
MW 13	E 285410.523	N 221257.164
MW 14	E 285328.74	N 221324.20
MW 15	E 285356.72	N 221336.43
MW 16	E 285213.03	N 221104.03
MW 17	E 285419.05	N 220780.28
MW 18	E 285229.74	N 221064.09
MW 19	E 285517.39	N 220738.43
MW 20	E 285785.04	N 220523.05
MW 21	E 285825.96	N 22061.83

LC 1	E 285285.28	N 221015.80
LC 2	E 285305.42	N 220867.24
LC 3	E 285335.25	N 220827.54
LC 4	E 285364.89	N 220894.64
LC 5	E 285399.63	N 221047.88
LC 6	E 285418.7	N 221256.3
LC 7	E 285437.6	N 221256.3
LC 8	E 285388.21	N 221257.56
LC 9	E 285382.12	N 221256.93
LC 10	E 285494.47	N 221289.18
LC 11	E 285495.14	N 221230.89
LC 12	E 28515.85	N 221248.00
LC 13	E 28532.53	N 221282.99
LC 14	E 28553.80	N 221278.69
LC 15	E 28571.44	N 221282.14
LC 16	E 285414.48	N 220994.34
LC 17	E 285445.43	N 220828.09
LC 18	E 285477.38	N 22071.85
LC 19	E 285490.25	N 22071.56
LC 20	E 28581.50	N 220738.92
LC 21	E 285812.95	N 220984.97

D 1	E 285480.3	N 221374.1
D 2	E 285902.1	N 221226.5
D 3	E 285851.94	N 220645.35
D 4	E 285382.02	N 220826.35
D 5	E 285210.86	N 221100.53
D 6	E 285286.45	N 220694.24
N 1A	E 285223.76	N 221380.59
N 2	E 285540.25	N 221335.84
N 3	E 286770.27	N 221249.01
N 4	E 286873.73	N 220645.70
N 5	E 285381.689	N 220929.59
N 6	E 285180.73	N 221180.38
N 7	E 285316.42	N 220918.37
N 8	E 285645.70	N 221477.91
N 9	E 285849.83	N 221387.91
SW 1	E 284810.08	N 220807.13
SW 2	E 285211.85	N 221080.47
SW 3	E 284953.86	N 220841.86
SW 4	E 285043.74	N 221084.48
SW 5	E 285077.71	N 221080.38

**SOUTH DUBLIN COUNTY COUNCIL
ENVIRONMENTAL SERVICES DEPT.
TOWN CENTRE, TALLAGHT, D.24**



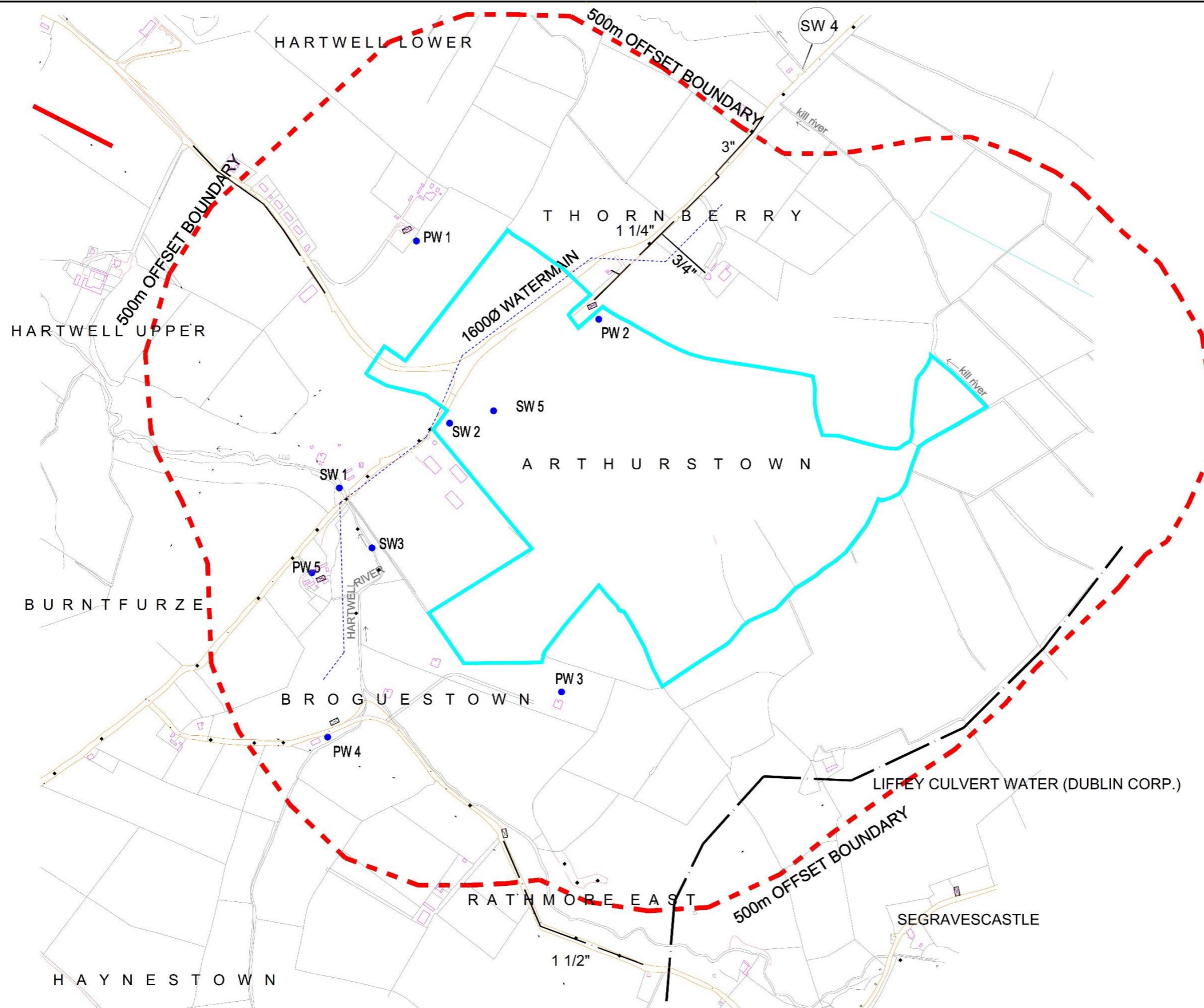
ARTHURSTOWN LANDFILL
Location of Monitoring Points

PREPARED BY J Smith	SURVEYED BY J Smith
CHECKED BY J Smith	DATE August 2006.
SCALES 1: 2500	TITLE AWL03 - 14C

Revision	Date	Description	By
AWL03-14	Oct 2003.	Replaces Dwg AWL02-14C	MH
C	Feb 2000	Addition of New Monitoring Points From Stage 2	MH
B	Aug 99	Exchange of Sampling Points SW1 & SW2	MH


JOHN SMITH
 FACILITY MANAGER
 ARTHURSTOWN LANDFILL
 ENVIRONMENTAL SERVICES DEPARTMENT

MARY PYNE
 DIRECTOR OF SERVICES
 ENVIRONMENTAL SERVICES DEPARTMENT

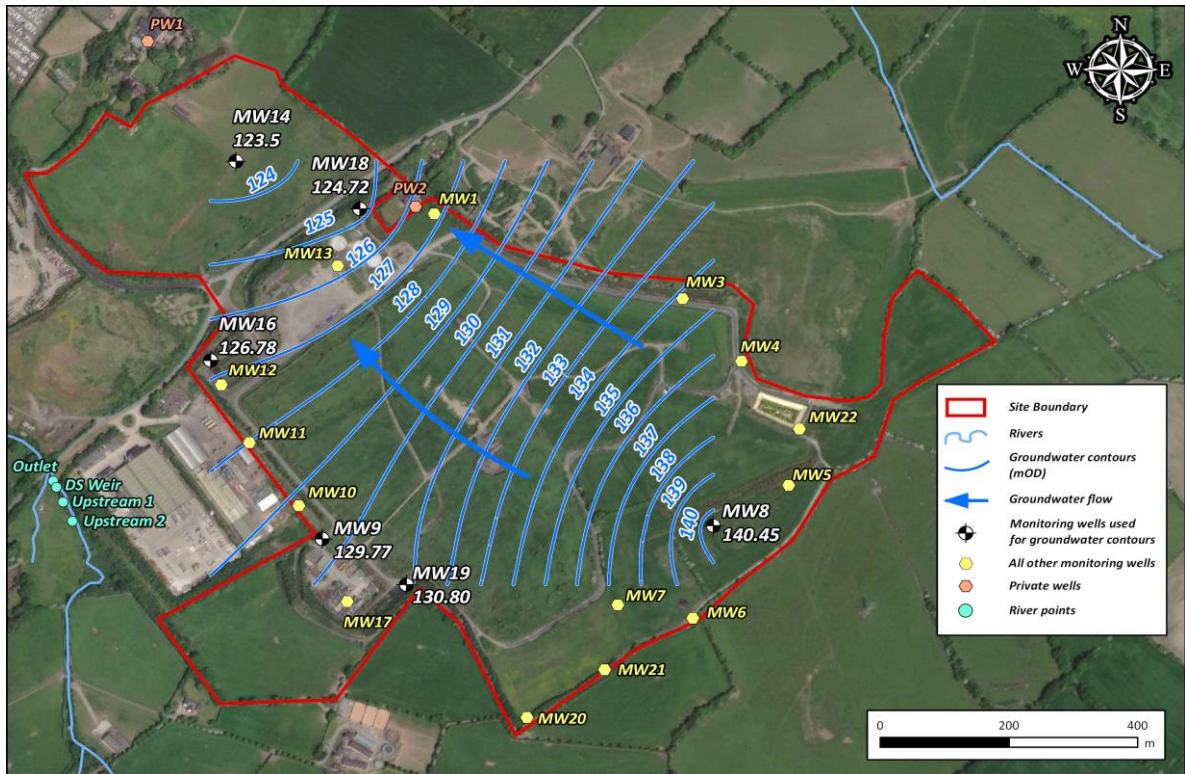


LEGEND

- WATERMAIN (AS SIZED)
- PW PRIVATE WELL
- SW SURFACE WATER MONITORING POINT NO 4
E 295992.90
N 221934.35

SOUTH DUBLIN COUNTY COUNCIL ENVIRONMENTAL SERVICES DEPT. TOWN CENTRE, TALLAGHT, D.24			PROJECT ARTHURSTOWN LANDFILL		PREPARED BY M.H.	SURVEYED J.S.
			TITLE Location of Remote Monitoring Points		CHECKED BY J.S.	DATE August 2006
					SCALES 1: 5000	
					DRAWING NO. AWL03 - 15C_2006	
AWL02-15	Oct 2003.	Replaces Dwg AWL02- 15	MH	JOHN SMITH FACILITY MANAGER ARTHURSTOWN LANDFILL ENVIRONMENTAL SERVICES DEPARTMENT		
Revision	Date	Description	By	MARY PYNE DIRECTOR OF SERVICES ENVIRONMENTAL SERVICES DEPT.		

Appendix 2 Groundwater Contour Map





CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX 2

Groundwater Monitoring
Results





Fehily Timoney
3rd Floor
North Park Offices
North Park Business Park
North Road
Dublin
Dublin 11

Attention: Sean Foley

CERTIFICATE OF ANALYSIS

Date of report Generation: 01 February 2023
Customer: Fehily Timoney
Sample Delivery Group (SDG): 230126-89
Your Reference: P21-222
Location: Arthurstown Landfill
Report No: 677035
Order Number: Z3477

We received 5 samples on Thursday January 26, 2023 and 5 of these samples were scheduled for analysis which was completed on Wednesday February 01, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

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

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

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

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 230126-89
Client Ref.: P21-222

Report Number: 677035
Location: Arthurstown Landfill

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
27463728	SW1		0.00 - 0.00	24/01/2023
27463732	SW2		0.00 - 0.00	24/01/2023
27463738	SW3		0.00 - 0.00	24/01/2023
27463744	SW4		0.00 - 0.00	24/01/2023
27463750	SW5		0.00 - 0.00	24/01/2023

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



CERTIFICATE OF ANALYSIS

Validated

SDG: 230126-89
Client Ref.: P21-222

Report Number: 677035
Location: Arthurstown Landfill

Superseded Report:

Results Legend	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container		Sample Type
	X Test	N No Determination Possible									
<p>Sample Types -</p> <ul style="list-style-type: none"> S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other 			27463728		27463732		27463738		27463744		27463750
			SW1		SW2		SW3		SW4		SW5
			0.00 - 0.00		0.00 - 0.00		0.00 - 0.00		0.00 - 0.00		0.00 - 0.00
			500ml Plastic (ALE208) 250ml BOD (ALE212) H2SO4 (ALE244)		500ml Plastic (ALE208) 250ml BOD (ALE212) H2SO4 (ALE244)		500ml Plastic (ALE208) 250ml BOD (ALE212) H2SO4 (ALE244)		500ml Plastic (ALE208) 250ml BOD (ALE212) H2SO4 (ALE244)		500ml Plastic (ALE208) 250ml BOD (ALE212) H2SO4 (ALE244)
			SW		SW		SW		SW		SW
	Ammonium Low	All	NDPs: 0 Tests: 5	X	X	X	X	X	X	X	X
	Anions by Kone (w)	All	NDPs: 0 Tests: 5	X	X	X	X	X	X	X	X
	BOD True Total	All	NDPs: 0 Tests: 5	X	X	X	X	X	X	X	X
	COD Unfiltered	All	NDPs: 0 Tests: 5	X	X	X	X	X	X	X	X
pH Value	All	NDPs: 0 Tests: 5	X	X	X	X	X	X	X	X	
Suspended Solids	All	NDPs: 0 Tests: 5	X	X	X	X	X	X	X	X	



CERTIFICATE OF ANALYSIS

Validated

SDG: 230126-89
Client Ref.: P21-222

Report Number: 677035
Location: Arthurstown Landfill

Superseded Report:

Table with columns: Component, LOD/Units, Method, SW1, SW2, SW3, SW4, SW5. Contains data for parameters like Suspended solids, BOD, Ammoniacal Nitrogen, COD, Chloride, pH, and Conductivity across five sample locations.



CERTIFICATE OF ANALYSIS

Validated

SDG: 230126-89
Client Ref.: P21-222

Report Number: 677035
Location: Arthurstown Landfill

Superseded Report:

Table of Results - Appendix

Method No	Reference	Description
TM022	Method 2540D, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part120 1981;BS EN 872	Determination of total suspended solids in waters
TM045	MEWAM BOD5 2nd Ed.HMSO 1988 / Method 5210B, AWWA/APHA, 20th Ed., 1999; SCA Blue Book 130	Determination of BOD5 (ATU) Filtered by Oxygen Meter on liquids
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM107	ISO 6060-1989	Determination of Chemical Oxygen Demand using COD Dr Lange Kit
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4, Standard Methods for the examination of waters and wastewaters 20th Edition, PHA, Washington DC, USA. ISBN 0-87553-235-7 and The Determination of Alkalinity and Acidity in water HMSO, 1981, ISBN 0 11 751601 5.	Determination of pH, EC, TDS and Alkalinity in Aqueous samples

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

Validated

SDG: 230126-89
Client Ref.: P21-222

Report Number: 677035
Location: Arthurstown Landfill

Superseded Report:

Test Completion Dates

Lab Sample No(s)	27463728	27463732	27463738	27463744	27463750
Customer Sample Ref.	SW1	SW2	SW3	SW4	SW5
AGS Ref.					
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water

Ammonium Low	01-Feb-2023	01-Feb-2023	01-Feb-2023	01-Feb-2023	01-Feb-2023
Anions by Kone (w)	27-Jan-2023	27-Jan-2023	27-Jan-2023	27-Jan-2023	27-Jan-2023
BOD True Total	01-Feb-2023	01-Feb-2023	01-Feb-2023	01-Feb-2023	01-Feb-2023
COD Unfiltered	31-Jan-2023	30-Jan-2023	31-Jan-2023	30-Jan-2023	30-Jan-2023
pH Value	30-Jan-2023	30-Jan-2023	30-Jan-2023	30-Jan-2023	30-Jan-2023
Suspended Solids	27-Jan-2023	28-Jan-2023	28-Jan-2023	28-Jan-2023	28-Jan-2023



CERTIFICATE OF ANALYSIS

SDG: 230126-89
Client Ref: P21-222

Report Number: 677035
Location: Arthurstown Landfill

Superseded Report:

Appendix

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

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

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

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

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

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

7. Results relate only to the items tested.

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

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

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

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

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

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

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

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

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

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

General

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

19. Sample Deviations

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

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

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

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

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

Visual Estimation Of Fibre Content

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

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

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

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



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

Tel: (01244) 528777

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

Fehily Timoney
3rd Floor
North Park Offices
North Park Business Park
North Road
Dublin
Dublin 11

Attention: Sean Foley

CERTIFICATE OF ANALYSIS

Date of report Generation:	19 April 2023
Customer:	Fehily Timoney
Sample Delivery Group (SDG):	230417-35
Your Reference:	P21-222
Location:	Arthurstown Landfill
Report No:	686296
Order Number:	Z3477

We received 7 samples on Monday April 17, 2023 and 7 of these samples were scheduled for analysis which was completed on Wednesday April 19, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

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

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

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

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 230417-35
Client Ref.: P21-222

Report Number: 686296
Location: Arthurstown Landfill

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
27847481	MW2		0.00 - 0.00	13/04/2023
27847475	MW3		0.00 - 0.00	13/04/2023
27847465	MW6		0.00 - 0.00	13/04/2023
27847472	MW8		0.00 - 0.00	13/04/2023
27847478	MW9		0.00 - 0.00	13/04/2023
27847485	MW16		0.00 - 0.00	13/04/2023
27847469	MW20		0.00 - 0.00	13/04/2023

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



CERTIFICATE OF ANALYSIS

Validated

SDG: 230417-35
Client Ref.: P21-222

Report Number: 686296
Location: Arthurstown Landfill

Superseded Report:

Results Legend <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: yellow; border: 1px solid black; margin-right: 5px;"></div> Test </div> <div style="display: flex; align-items: center;"> <div style="width: 15px; height: 15px; background-color: red; color: white; border: 1px solid black; margin-right: 5px; display: flex; align-items: center; justify-content: center;">N</div> No Determination Possible </div> </div> Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type											
		27947481	MM2		0.00 - 0.00	500ml Plastic (ALE208)	GW										
		27947475	MM3		0.00 - 0.00	500ml Plastic (ALE208)	GW										
		27947465	MM6		0.00 - 0.00	500ml Plastic (ALE208)	GW										
		27947472	MM8		0.00 - 0.00	500ml Plastic (ALE208)	GW										
		27947478	MM9		0.00 - 0.00	500ml Plastic (ALE208)	GW										
		27947485	MM16		0.00 - 0.00	500ml Plastic (ALE208)	GW										
	27947469	MM20		0.00 - 0.00	500ml Plastic (ALE208)	GW											
Ammonium Low	All	NDPs: 0 Tests: 7					X	X	X	X	X	X	X	X	X	X	
Anions by Kone (w)	All	NDPs: 0 Tests: 7					X	X	X	X	X	X	X	X	X	X	
pH Value	All	NDPs: 0 Tests: 7					X	X	X	X	X	X	X	X	X	X	
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 7					X	X	X	X	X	X	X	X	X	X	X



CERTIFICATE OF ANALYSIS

Validated

SDG: 230417-35
 Client Ref.: P21-222

Report Number: 686296
 Location: Arthurstown Landfill

Superseded Report:

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			13/04/2023	13/04/2023	13/04/2023	13/04/2023	13/04/2023	13/04/2023	13/04/2023
diss.filt	Dissolved / filtered sample.		
tot.unfilt	Total / unfiltered sample.			17/04/2023	17/04/2023	17/04/2023	17/04/2023	17/04/2023	17/04/2023	17/04/2023
*	Subcontracted - refer to subcontractor report for accreditation status.			230417-35	230417-35	230417-35	230417-35	230417-35	230417-35	230417-35
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			27847481	27847475	27847465	27847472	27847478	27847485	
(F)	Trigger breach confirmed									
1-4*\$@	Sample deviation (see appendix)									
Component	LOD/Units	Method								
Organic Carbon, Total	<3 mg/l	TM090	<3	6.31	<3	<3	<3	<3	<3	
			#	#	#	#	#	#	#	
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.012	0.069	0.048	0.078	0.077	0.027		
			#	#	#	#	#	#	#	
Chloride	<2 mg/l	TM184	10.9	71.1	12.3	7.1	11.9	13		
			#	#	#	#	#	#	#	
pH	<1 pH Units	TM256	8.09	7.2	7.57	8.18	8.08	7.94		
			#	#	#	#	#	#	#	
Conductivity @ 20 deg.C	<0.02 mS/cm	TM256	0.524	1.46	0.628	0.347	0.547	0.57		
			#	#	#	#	#	#	#	



CERTIFICATE OF ANALYSIS

Validated

SDG: 230417-35
Client Ref.: P21-222

Report Number: 686296
Location: Arthurstown Landfill

Superseded Report:

Results Legend		Customer Sample Ref.					
#	ISO17025 accredited.	MW20					
M	mCERTS accredited.	Depth (m)	0.00 - 0.00				
aq	Aqueous / settled sample.	Sample Type	Ground Water (GW)				
diss.filt	Dissolved / filtered sample.	Date Sampled	13/04/2023				
tot.unfilt	Total / unfiltered sample.	Sample Time					
	* Subcontracted - refer to subcontractor report for accreditation status.	Date Received	17/04/2023				
	** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	SDG Ref	230417-35				
(F)	Trigger breach confirmed	Lab Sample No.(s)	27847469				
1-4*\$@	Sample deviation (see appendix)	AGS Reference					
Component	LOD/Units	Method					
Organic Carbon, Total	<3 mg/l	TM090	5.29	#			
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.055	#			
Chloride	<2 mg/l	TM184	10.8	#			
pH	<1 pH Units	TM256	7.36	#			
Conductivity @ 20 deg.C	<0.02 mS/cm	TM256	1.52	#			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230417-35
Client Ref.: P21-222

Report Number: 686296
Location: Arthurstown Landfill

Superseded Report:

Table of Results - Appendix

Method No	Description
TM090	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM099	Determination of Ammonium in Water Samples using the Kone Analyser
TM184	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM256	Determination of pH, EC, TDS and Alkalinity in Aqueous samples

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

Validated

SDG: 230417-35
Client Ref.: P21-222

Report Number: 686296
Location: Arthurstown Landfill

Superseded Report:

Test Completion Dates

Lab Sample No(s)	27847481	27847475	27847465	27847472	27847478	27847485	27847469
Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	MW20
AGS Ref.							
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Ammonium Low	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023
Anions by Kone (w)	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023
pH Value	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023
Total Organic and Inorganic Carbon	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023	19-Apr-2023



CERTIFICATE OF ANALYSIS

SDG: 230417-35
Client Ref: P21-222

Report Number: 686296
Location: Arthurstown Landfill

Superseded Report:

Appendix

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

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

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

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

7. Results relate only to the items tested.

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

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

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

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

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

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

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

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

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

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

General

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

19. Sample Deviations

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

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

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

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

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

Visual Estimation Of Fibre Content

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

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

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

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



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Fehily Timoney
3rd Floor
North Park Offices
North Park Business Park
North Road
Dublin
Dublin 11

Attention: Sean Foley

CERTIFICATE OF ANALYSIS

Date of report Generation: 27 September 2023
Customer: Fehily Timoney
Sample Delivery Group (SDG): 230918-42
Your Reference: P21-222
Location: Arthurstown Landfill
Report No: 705445
Order Number: Z3477

This report has been revised and directly supersedes 704362 in its entirety.

We received 9 samples on Monday September 18, 2023 and 9 of these samples were scheduled for analysis which was completed on Wednesday September 27, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

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

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

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

Approved By:

Sonia McWhan
Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
28644651	MW2		0.00 - 0.00	14/09/2023
28644696	MW3		0.00 - 0.00	14/09/2023
28644671	MW6		0.00 - 0.00	14/09/2023
28644680	MW8		0.00 - 0.00	14/09/2023
28644704	MW9		0.00 - 0.00	14/09/2023
28644712	MW16		0.00 - 0.00	14/09/2023
28644688	MW20		0.00 - 0.00	14/09/2023
28644642	PW1		0.00 - 0.00	14/09/2023
28644662	PW4		0.00 - 0.00	14/09/2023

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



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend X Test N No Determination Possible Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type																	
		28644651	MW2		0.00 - 0.00	0.5l glass bottle (ALE227)	GW																
		28644696	MW3		0.00 - 0.00	0.5l glass bottle (ALE227)	GW																
		28644671	MW6		0.00 - 0.00	Vial (ALE297)	GW																
		28644680	MW8		0.00 - 0.00	0.5l glass bottle (ALE227)	GW																
						NaOH (ALE245)	GW																
Ammonium Low	All	NDPs: 0 Tests: 9				GW																	
Anions by Kone (w)	All	NDPs: 0 Tests: 9				GW																	
Coliforms (W)	All	NDPs: 0 Tests: 9				GW																	
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 9				GW																	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 9				GW																	
Dissolved Oxygen by Probe	All	NDPs: 0 Tests: 9				GW																	
Fluoride	All	NDPs: 0 Tests: 9				GW																	
Mercury Dissolved	All	NDPs: 0 Tests: 9				GW																	
Pesticides (Suite I) by GCMS	All	NDPs: 0 Tests: 9				GW																	
Pesticides (Suite II) by GCMS	All	NDPs: 0 Tests: 9				GW																	
pH Value	All	NDPs: 0 Tests: 9				GW																	
Phenols by HPLC (W)	All	NDPs: 0 Tests: 9				GW																	
Phosphate by Kone (w)	All	NDPs: 0 Tests: 9				GW																	
SVOC MS (W) - Aqueous	All	NDPs: 0 Tests: 9				GW																	
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 9				GW																	



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
X Test N No Determination Possible Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other	28644651	MW2		0.00 - 0.00	0.5l glass bottle (ALE227) Vial (ALE297) NaOH (ALE245) HNO3 Filtered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	GW
	28644696	MW3		0.00 - 0.00	0.5l glass bottle (ALE227) Vial (ALE297) NaOH (ALE245) HNO3 Filtered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	GW
	28644671	MW6		0.00 - 0.00	0.5l glass bottle (ALE227) Vial (ALE297) NaOH (ALE245) HNO3 Filtered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	GW
	28644680	MW8		0.00 - 0.00	0.5l glass bottle (ALE227) Vial (ALE297) NaOH (ALE245) HNO3 Filtered (ALE204) H2SO4 (ALE244) 500ml Plastic (ALE208) 0.5l glass bottle (ALE227)	GW
VOC MS (W)	All	NDPs: 0 Tests: 9				
						X
						X
						X

28644688	MW20	0.00 - 0.00	HNO3 Filtered (ALE204)	GW		
			H2SO4 (ALE244)	GW		
			500ml Plastic (ALE208)	GW		
			0.5l glass bottle (ALE227)	GW		
			Vial (ALE297)	GW	X	
			NaOH (ALE245)	GW		
28644712	MW16	0.00 - 0.00	HNO3 Filtered (ALE204)	GW		
			H2SO4 (ALE244)	GW		
			500ml Plastic (ALE208)	GW		
			0.5l glass bottle (ALE227)	GW		
			Vial (ALE297)	GW	X	
			NaOH (ALE245)	GW		
28644704	MW9	0.00 - 0.00	HNO3 Filtered (ALE204)	GW		
			H2SO4 (ALE244)	GW		
			500ml Plastic (ALE208)	GW		
			0.5l glass bottle (ALE227)	GW		
			Vial (ALE297)	GW	X	
			NaOH (ALE245)	GW		
28644680	MW8	0.00 - 0.00	Vial (ALE297)	GW		X
			NaOH (ALE245)	GW		
			HNO3 Filtered (ALE204)	GW		
			H2SO4 (ALE244)	GW		
			500ml Plastic (ALE208)	GW		
			0.5l glass bottle (ALE227)	GW		



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend

- X Test
- N No Determination Possible

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

	Lab Sample No(s)	28644688	28644642	28644662											
					Customer Sample Reference	MW20	PW1	PW4							
	AGS Reference														
	Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00											
	Container	NaOH (ALE245)	Vial (ALE227)	0.5l glass bottle (ALE227)	500ml Plastic (ALE208)	H2SO4 (ALE244)	HNO3 Filtered (ALE204)	NaOH (ALE245)	Vial (ALE297)	0.5l glass bottle (ALE227)	500ml Plastic (ALE208)	H2SO4 (ALE244)	HNO3 Filtered (ALE204)	NaOH (ALE245)	Vial (ALE297)
	Sample Type	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
VOC MS (W)	All	NDPs: 0 Tests: 9		X						X					X



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
diss.filt	Dissolved / filtered sample.			18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
tot.unfilt	Total / unfiltered sample.			230918-42	230918-42	230918-42	230918-42	230918-42	230918-42	230918-42
*	Subcontracted - refer to subcontractor report for accreditation status.			28644651	28644696	28644671	28644680	28644704	28644712	
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4*\$	@ Sample deviation (see appendix)									
Component	LOD/Units	Method								
Coliforms, Total*		SUB	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached	
Coliforms, Faecal*		SUB	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached	See Attached	
Oxygen, dissolved	<0.3 mg/l	TM046	9.73	9.52	9.82	9.41	10.2	10.7		
Organic Carbon, Total	<3 mg/l	TM090	<3	4.32	<3	6.45	<3	<3		
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.019	0.082	0.036	2.57	0.139	0.038		
Fluoride	<0.5 mg/l	TM104	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Boron (diss.filt)	<10 µg/l	TM152	<10	108	<10	<10	11.6	<10		
Cadmium (diss.filt)	<0.08 µg/l	TM152	<0.08	0.22	<0.08	<0.08	<0.08	0.2		
Chromium (diss.filt)	<1 µg/l	TM152	<1	<1	<1	<1	<1	<1		
Copper (diss.filt)	<0.3 µg/l	TM152	5.25	1	<0.3	<0.3	<0.3	0.458		
Lead (diss.filt)	<0.2 µg/l	TM152	0.238	<0.2	<0.2	<0.2	<0.2	<0.2		
Manganese (diss.filt)	<3 µg/l	TM152	32.4	40.3	150	303	94.5	938		
Nickel (diss.filt)	<0.4 µg/l	TM152	0.462	2.65	0.531	0.677	0.901	0.425		
Zinc (diss.filt)	<1 µg/l	TM152	11.5	3.78	1.03	1.86	1.84	1.27		
Sodium (Dis.Filt)	<0.076 mg/l	TM152	16.2	55.4	7	4.91	9.29	9.84		
Magnesium (Dis.Filt)	<0.036 mg/l	TM152	15.9	22.5	8.38	5.82	14.1	15.3		
Potassium (Dis.Filt)	<0.2 mg/l	TM152	0.784	5.85	0.428	1.23	1.17	0.827		
Calcium (Dis.Filt)	<0.2 mg/l	TM152	81.2	242	123	89.4	91.6	93.9		
Iron (Dis.Filt)	<0.019 mg/l	TM152	0.046	<0.019	<0.019	<0.019	<0.019	<0.019		
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Phosphate (Ortho as PO4)	<0.05 mg/l	TM184	0.125	<0.05	<0.05	<0.05	0.144	<0.05		
Sulphate	<2 mg/l	TM184	22.8	313	9.8	3.6	22.6	18.2		
Chloride	<2 mg/l	TM184	11	66.2	12.1	6.3	11.8	13.2		
Total Oxidised Nitrogen as N	<0.1 mg/l	TM184	<0.1	4.86	1.03	0.189	<0.1	<0.1		
Cyanide, Total	<0.05 mg/l	TM227	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
pH	<1 pH Units	TM256	7.74	7.22	7.4	7.49	7.77	7.6		
Conductivity @ 20 deg.C	<0.02 mS/cm	TM256	0.527	1.36	0.591	0.478	0.549	0.573		
Alkalinity, Total as CaCO3	<3 mg/l	TM256	274	857	337	268	286	312		
Phenol	<0.002 mg/l	TM259	<0.002	<0.002	<0.002	0.01	<0.002	<0.002		
Cresols	<0.006 mg/l	TM259	<0.006	<0.006	<0.006	0.09	<0.006	<0.006		
Xylenols	<0.008 mg/l	TM259	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008		
Phenols, Total Detected monohydric	<0.016 mg/l	TM259	<0.016	<0.016	<0.016	0.1	<0.016	<0.016		
Trifluralin	<0.01 µg/l	TM343	<0.01	<0.2	<0.02	<0.05	<0.01	<0.01		



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
dis.filt	Dissolved / filtered sample.			18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
tot.unfilt	Total / unfiltered sample.			230918-42	230918-42	230918-42	230918-42	230918-42	230918-42	230918-42
*	Subcontracted - refer to subcontractor report for accreditation status.			28644651	28644696	28644671	28644680	28644704	28644712	28644712
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4	@ Sample deviation (see appendix)									
Component	LOD/Units	Method								
alpha-HCH	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
gamma-HCH (Lindane)	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Heptachlor	<0.01 µg/l	TM343		<0.02	<0.2	<0.04	<0.1	<0.02	<0.01	
Aldrin	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
beta-HCH	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Isodrin	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
delta-HCH	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Heptachlor epoxide	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
o,p'-DDE	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Endosulphan I	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
trans-Chlordane	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
cis-Chlordane	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
p,p'-DDE	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Dieldrin	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
o,p'-DDD (TDE)	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Endrin	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
o,p'-DDT	<0.01 µg/l	TM343		<0.04	<0.2	<0.08	<0.2	<0.04	<0.02	
p,p'-DDD (TDE)	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Endosulphan II	<0.02 µg/l	TM343		<0.02	<0.4	<0.04	<0.1	<0.02	<0.02	
p,p'-DDT	<0.01 µg/l	TM343		<0.1	<0.2	<0.2	<0.5	<0.1	<0.02	
o,p'-Methoxychlor	<0.01 µg/l	TM343		<0.04	<0.2	<0.08	<0.2	<0.04	<0.02	
p,p'-Methoxychlor	<0.01 µg/l	TM343		<0.1	<0.2	<0.2	<0.5	<0.1	<0.02	
Endosulphan Sulphate	<0.02 µg/l	TM343		<0.4	<1.6	<0.8	<2	<0.4	<0.08	
Permethrin I	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
Permethrin II	<0.01 µg/l	TM343		<0.01	<0.2	<0.02	<0.05	<0.01	<0.01	
1,3,5-Trichlorobenzene	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Hexachlorobutadiene	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
1,2,4-Trichlorobenzene	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
1,2,3-Trichlorobenzene	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Dichlorvos	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Dichlobenil	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Mevinphos	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Tecnazene	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
diss.filt	Dissolved / filtered sample.			18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
tot.unfilt	Total / unfiltered sample.			230918-42	230918-42	230918-42	230918-42	230918-42	230918-42	230918-42
*	Subcontracted - refer to subcontractor report for accreditation status.			28644651	28644696	28644671	28644680	28644704	28644712	28644712
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4*	Sample deviation (see appendix)									
Component	LOD/Units	Method								
Hexachlorobenzene	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Demeton-S-methyl	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Phorate	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Diazinon	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Triallate	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Atrazine	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Simazine	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Disulfoton	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Propetamphos	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Chlorpyrifos-methyl	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Dimethoate	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Pirimiphos-methyl	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Fenchlorophos	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Chlorpyrifos	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Methyl Parathion	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Malathion	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Fenthion	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Fenitrothion	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Triadimefon	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Pendimethalin	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Parathion	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Chlorfenvinphos	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
trans-Chlordane	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
cis-Chlordane	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Ethion	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Carbophenothion	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Triazophos	<0.01 µg/l	TM344		<0.01	<0.2	<0.1	<0.05	<0.01	<0.01	
Phosalone	<0.01 µg/l	TM344		<0.01	<0.4	<0.2	<0.1	<0.01	<0.01	
Azinphos methyl	<0.02 µg/l	TM344		<0.04	<1.2	<0.6	<0.3	<0.04	<0.04	
Azinphos ethyl	<0.02 µg/l	TM344		<0.02	<0.8	<0.2	<0.1	<0.02	<0.02	



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend		Customer Sample Ref.	MW20	PW1	PW4		
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4*\$@Sample deviation (see appendix)		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 14/09/2023	0.00 - 0.00 Ground Water (GW) 14/09/2023	0.00 - 0.00 Ground Water (GW) 14/09/2023		
Component	LOD/Units	Method					
Coliforms, Total*		SUB	See Attached	See Attached	See Attached		
Coliforms, Faecal*		SUB	See Attached	See Attached	See Attached		
Oxygen, dissolved	<0.3 mg/l	TM046	9.92	10.4	10		
Organic Carbon, Total	<3 mg/l	TM090	9.55	<3	<3		
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.085	0.024	0.022		
Fluoride	<0.5 mg/l	TM104	<0.5	<0.5	<0.5		
Boron (diss.filt)	<10 µg/l	TM152	20.8	<10	<10		
Cadmium (diss.filt)	<0.08 µg/l	TM152	<0.08	<0.08	<0.08		
Chromium (diss.filt)	<1 µg/l	TM152	<1	<1	<1		
Copper (diss.filt)	<0.3 µg/l	TM152	0.304	4.93	42.9		
Lead (diss.filt)	<0.2 µg/l	TM152	<0.2	0.427	1.29		
Manganese (diss.filt)	<3 µg/l	TM152	16.3	<3	7.46		
Nickel (diss.filt)	<0.4 µg/l	TM152	0.688	0.546	0.598		
Zinc (diss.filt)	<1 µg/l	TM152	4.72	4.89	31.1		
Sodium (Dis.Filt)	<0.076 mg/l	TM152	13.9	15.3	8.83		
Magnesium (Dis.Filt)	<0.036 mg/l	TM152	14.5	25.5	16.2		
Potassium (Dis.Filt)	<0.2 mg/l	TM152	0.461	1.11	0.849		
Calcium (Dis.Filt)	<0.2 mg/l	TM152	255	81.1	111		
Iron (Dis.Filt)	<0.019 mg/l	TM152	<0.019	0.0197	<0.019		
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01	<0.01	<0.01		
Phosphate (Ortho as PO4)	<0.05 mg/l	TM184	<0.05	0.054	<0.05		
Sulphate	<2 mg/l	TM184	294	13	26.7		
Chloride	<2 mg/l	TM184	21.9	13	21.8		
Total Oxidised Nitrogen as N	<0.1 mg/l	TM184	1.49	0.796	3.94		
Cyanide, Total	<0.05 mg/l	TM227	<0.05	<0.05	<0.05		
pH	<1 pH Units	TM256	7.14	7.85	7.64		
Conductivity @ 20 deg.C	<0.02 mS/cm	TM256	1.18	0.587	0.628		
Alkalinity, Total as CaCO3	<3 mg/l	TM256	463	319	304		
Phenol	<0.002 mg/l	TM259	<0.002	<0.002	<0.002		
Cresols	<0.006 mg/l	TM259	<0.006	<0.006	<0.006		
Xylenols	<0.008 mg/l	TM259	<0.008	<0.008	<0.008		
Phenols, Total Detected monohydric	<0.016 mg/l	TM259	<0.016	<0.016	<0.016		
Trifluralin	<0.01 µg/l	TM343	<0.1	<0.01	<0.01		



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend			Customer Sample Ref.	MW20	PW1	PW4			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)			
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023			
dis.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.			18/09/2023	18/09/2023	18/09/2023			
*	Subcontracted - refer to subcontractor report for accreditation status.			230918-42	230918-42	230918-42			
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			28644688	28644642	28644662			
(F)	Trigger breach confirmed								
1-4	@ Sample deviation (see appendix)								
Component	LOD/Units	Method							
alpha-HCH	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
gamma-HCH (Lindane)	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Heptachlor	<0.01 µg/l	TM343		<0.1	<0.02	<0.02			
Aldrin	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
beta-HCH	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Isodrin	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
delta-HCH	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Heptachlor epoxide	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
o,p'-DDE	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Endosulphan I	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
trans-Chlordane	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
cis-Chlordane	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
p,p'-DDE	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Dieldrin	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
o,p'-DDD (TDE)	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Endrin	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
o,p'-DDT	<0.01 µg/l	TM343		<0.1	<0.04	<0.04			
p,p'-DDD (TDE)	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Endosulphan II	<0.02 µg/l	TM343		<0.2	<0.02	<0.02			
p,p'-DDT	<0.01 µg/l	TM343		<0.1	<0.1	<0.1			
o,p'-Methoxychlor	<0.01 µg/l	TM343		<0.1	<0.04	<0.04			
p,p'-Methoxychlor	<0.01 µg/l	TM343		<0.1	<0.1	<0.1			
Endosulphan Sulphate	<0.02 µg/l	TM343		<0.8	<0.4	<0.4			
Permethrin I	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
Permethrin II	<0.01 µg/l	TM343		<0.1	<0.01	<0.01			
1,3,5-Trichlorobenzene	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Hexachlorobutadiene	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
1,2,4-Trichlorobenzene	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
1,2,3-Trichlorobenzene	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Dichlorvos	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Dichlobenil	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Mevinphos	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Tecnazene	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Results Legend			Customer Sample Ref.	MW20	PW1	PW4			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00			
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)			
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023			
dis.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.			18/09/2023	18/09/2023	18/09/2023			
*	Subcontracted - refer to subcontractor report for accreditation status.			230918-42	230918-42	230918-42			
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery			28644688	28644642	28644662			
(F)	Trigger breach confirmed								
1-4	@ Sample deviation (see appendix)								
Component	LOD/Units	Method							
Hexachlorobenzene	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Demeton-S-methyl	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Phorate	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Diazinon	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Triallate	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Atrazine	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Simazine	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Disulfoton	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Propetamphos	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Chlorpyrifos-methyl	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Dimethoate	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Pirimiphos-methyl	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Fenchlorophos	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Chlorpyrifos	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Methyl Parathion	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Malathion	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Fenthion	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Fenitrothion	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Triadimefon	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Pendimethalin	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Parathion	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Chlorfenvinphos	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
trans-Chlordane	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
cis-Chlordane	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Ethion	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Carbophenothion	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Triazophos	<0.01 µg/l	TM344		<0.1	<0.01	<0.01			
Phosalone	<0.01 µg/l	TM344		<0.2	<0.01	<0.01			
Azinphos methyl	<0.02 µg/l	TM344		<0.6	<0.04	<0.04			
Azinphos ethyl	<0.02 µg/l	TM344		<0.4	<0.02	<0.02			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
diss.filt	Dissolved / filtered sample.			18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
tot.unfilt	Total / unfiltered sample.			230918-42	230918-42	230918-42	230918-42	230918-42	230918-42	230918-42
	* Subcontracted - refer to subcontractor report for accreditation status.			28644651	28644696	28644671	28644680	28644704	28644704	28644712
	** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4**	@Sample deviation (see appendix)									
Component	LOD/Units	Method								
1,2,4-Trichlorobenzene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
1,2-Dichlorobenzene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
1,3-Dichlorobenzene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
1,4-Dichlorobenzene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2,4,5-Trichlorophenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2,4,6-Trichlorophenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2,4-Dichlorophenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2,4-Dimethylphenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2,4-Dinitrotoluene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2,6-Dinitrotoluene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2-Chloronaphthalene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2-Chlorophenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2-Methylnaphthalene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2-Methylphenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2-Nitroaniline (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
2-Nitrophenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
3-Nitroaniline (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
4-Bromophenylphenylether (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
4-Chloro-3-methylphenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
4-Chloroaniline (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
4-Chlorophenylphenylether (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
4-Methylphenol (aq)	<1 µg/l	TM176	<1	<100	<4	76.3	<1	<1		
4-Nitroaniline (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
4-Nitrophenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Azobenzene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Acenaphthylene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Acenaphthene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Anthracene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
bis(2-Chloroethyl)ether (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
bis(2-Chloroethoxy)methane (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
bis(2-Ethylhexyl) phthalate (aq)	<2 µg/l	TM176	<2	<200	<8	<16	<2	<2		
Butylbenzyl phthalate (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Benzo(a)anthracene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
dis.s.filt	Dissolved / filtered sample.			18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
tot.unfilt	Total / unfiltered sample.			230918-42	230918-42	230918-42	230918-42	230918-42	230918-42	230918-42
	* Subcontracted - refer to subcontractor report for accreditation status.			28644651	28644696	28644671	28644680	28644704	28644712	28644712
	** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4*	@ Sample deviation (see appendix)									
Component	LOD/Units	Method								
Benzo(b)fluoranthene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Benzo(k)fluoranthene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Benzo(a)pyrene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Benzo(g,h,i)perylene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Carbazole (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Chrysene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Dibenzofuran (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
n-Dibutyl phthalate (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Diethyl phthalate (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Dibenzo(a,h)anthracene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Dimethyl phthalate (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
n-Dioctyl phthalate (aq)	<5 µg/l	TM176	<5	<500	<20	<40	<5	<5		
Fluoranthene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Fluorene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Hexachlorobenzene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Hexachlorobutadiene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Pentachlorophenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Phenol (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
n-Nitroso-n-dipropylamine (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Hexachloroethane (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Nitrobenzene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Naphthalene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Isophorone (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Hexachlorocyclopentadiene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Phenanthrene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Indeno(1,2,3-cd)pyrene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		
Pyrene (aq)	<1 µg/l	TM176	<1	<100	<4	<8	<1	<1		



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.	MW20	PW1	PW4		
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00		
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)		
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023		
diss.filt	Dissolved / filtered sample.			18/09/2023	18/09/2023	18/09/2023		
tot.unfilt	Total / unfiltered sample.			230918-42	230918-42	230918-42		
* Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4*\$@Sample deviation (see appendix)				28644688	28644642	28644662		
Component	LOD/Units	Method						
1,2-Trichlorobenzene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
1,2-Dichlorobenzene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
1,3-Dichlorobenzene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
1,4-Dichlorobenzene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2,4,5-Trichlorophenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2,4,6-Trichlorophenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2,4-Dichlorophenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2,4-Dimethylphenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2,4-Dinitrotoluene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2,6-Dinitrotoluene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2-Chloronaphthalene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2-Chlorophenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2-Methylnaphthalene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2-Methylphenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2-Nitroaniline (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
2-Nitrophenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
3-Nitroaniline (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
4-Bromophenylphenylether (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
4-Chloro-3-methylphenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
4-Chloroaniline (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
4-Chlorophenylphenylether (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
4-Methylphenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
4-Nitroaniline (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
4-Nitrophenol (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
Azobenzene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
Acenaphthylene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
Acenaphthene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
Anthracene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
bis(2-Chloroethyl)ether (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
bis(2-Chloroethoxy)methane (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
bis(2-Ethylhexyl) phthalate (aq)	<2 µg/l	TM176	<20	<2	<2	#	#	#
Butylbenzyl phthalate (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#
Benzo(a)anthracene (aq)	<1 µg/l	TM176	<10	<1	<1	#	#	#



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

SVOC MS (W) - Aqueous

Results Legend			Customer Sample Ref.	MW20	PW1	PW4			
#	ISO17025 accredited.								
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-4	@ Sample deviation (see appendix)								
Component	LOD/Units	Method	Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference						
Benzo(b)fluoranthene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Benzo(k)fluoranthene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Benzo(a)pyrene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Benzo(g,h,i)perylene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Carbazole (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Chrysene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Dibenzofuran (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
n-Dibutyl phthalate (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Diethyl phthalate (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Dibenzo(a,h)anthracene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Dimethyl phthalate (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
n-Dioctyl phthalate (aq)	<5 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<50 #	<5 #	<5 #			
Fluoranthene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Fluorene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Hexachlorobenzene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Hexachlorobutadiene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Pentachlorophenol (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Phenol (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
n-Nitroso-n-dipropylamine (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Hexachloroethane (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Nitrobenzene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Naphthalene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Isophorone (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Hexachlorocyclopentadiene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Phenanthrene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Indeno(1,2,3-cd)pyrene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			
Pyrene (aq)	<1 µg/l	TM176	0.00 - 0.00 Ground Water (GW) 14/09/2023	<10 #	<1 #	<1 #			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

VOC MS (W)

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023	14/09/2023
diss.filt	Dissolved / filtered sample.			18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
tot.unfilt	Total / unfiltered sample.			230918-42	230918-42	230918-42	230918-42	230918-42	230918-42	230918-42
*	Subcontracted - refer to subcontractor report for accreditation status.			28644651	28644696	28644671	28644680	28644704	28644712	28644712
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4**	@Sample deviation (see appendix)									
Component	LOD/Units	Method								
Dibromofluoromethane**	%	TM208		109	113	105	111	106	112	
Toluene-d8**	%	TM208		98.2	98.7	97.6	98	98.1	98.8	
4-Bromofluorobenzene**	%	TM208		96.1	95.2	98.5	95.5	97	96.2	
Dichlorodifluoromethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Chloromethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Vinyl chloride	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Bromomethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Chloroethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Trichlorofluoromethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,1-Dichloroethene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Carbon disulphide	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Dichloromethane	<3 µg/l	TM208		<3	<3	<3	<3	<3	<3	
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
trans-1,2-Dichloroethene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,1-Dichloroethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
cis-1,2-Dichloroethene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
2,2-Dichloropropane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Bromochloromethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Chloroform	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,1,1-Trichloroethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,1-Dichloropropene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Carbontetrachloride	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,2-Dichloroethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Benzene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Trichloroethene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,2-Dichloropropane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Dibromomethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Bromodichloromethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
cis-1,3-Dichloropropene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
Toluene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
trans-1,3-Dichloropropene	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,1,2-Trichloroethane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	
1,3-Dichloropropane	<1 µg/l	TM208		<1	<1	<1	<1	<1	<1	



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

VOC MS (W)

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / filtered sample. diss.filt Dissolved / settled sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery. (F) Trigger breach confirmed 1-4* @ Sample deviation (see appendix)			Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644651	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644696	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644671	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644680	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644704	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644712
Component	LOD/Units	Method							
Tetrachloroethene	<1 µg/l	TM208	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	<1 µg/l	TM208	#	#	#	#	#	#	#
1,2-Dibromoethane	<1 µg/l	TM208	#	#	#	#	#	#	#
Chlorobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,1,1,2-Tetrachloroethane	<1 µg/l	TM208	#	#	#	#	#	#	#
Ethylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
m,p-Xylene	<1 µg/l	TM208	#	#	#	#	#	#	#
o-Xylene	<1 µg/l	TM208	#	#	#	#	#	#	#
Styrene	<1 µg/l	TM208	#	#	#	#	#	#	#
Bromoform	<1 µg/l	TM208	#	#	#	#	#	#	#
Isopropylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,1,2,2-Tetrachloroethane	<1 µg/l	TM208	#	#	#	#	#	#	#
1,2,3-Trichloropropane	<1 µg/l	TM208	#	#	#	#	#	#	#
Bromobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
Propylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
2-Chlorotoluene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,3,5-Trimethylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
4-Chlorotoluene	<1 µg/l	TM208	#	#	#	#	#	#	#
tert-Butylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,2,4-Trimethylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
sec-Butylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
4-iso-Propyltoluene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,3-Dichlorobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,4-Dichlorobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
n-Butylbenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,2-Dichlorobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,2-Dibromo-3-chloropropane	<1 µg/l	TM208	#	#	#	#	#	#	#
1,2,4-Trichlorobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
Hexachlorobutadiene	<1 µg/l	TM208	#	#	#	#	#	#	#
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208	#	#	#	#	#	#	#
Naphthalene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,2,3-Trichlorobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#
1,3,5-Trichlorobenzene	<1 µg/l	TM208	#	#	#	#	#	#	#



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

VOC MS (W)

Results Legend			Customer Sample Ref.			MW20	PW1	PW4		
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 14/09/2023	0.00 - 0.00 Ground Water (GW) 14/09/2023	0.00 - 0.00 Ground Water (GW) 14/09/2023				
M	mCERTS accredited.									
aq	Aqueous / settled sample.									
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.									
*	Subcontracted - refer to subcontractor report for accreditation status.									
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4**	Sample deviation (see appendix)									
Component	LOD/Units	Method								
Dibromofluoromethane**	%	TM208	106	109	108					
Toluene-d8**	%	TM208	97.6	98.5	98.2					
4-Bromofluorobenzene**	%	TM208	96.7	96.9	98.2					
Dichlorodifluoromethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Chloromethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Vinyl chloride	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Bromomethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Chloroethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Trichlorofluoromethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,1-Dichloroethene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Carbon disulphide	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Dichloromethane	<3 µg/l	TM208	<3 #	<3 #	<3 #					
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208	<1 #	<1 #	<1 #					
trans-1,2-Dichloroethene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,1-Dichloroethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
cis-1,2-Dichloroethene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
2,2-Dichloropropane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Bromochloromethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Chloroform	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,1,1-Trichloroethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,1-Dichloropropene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Carbontetrachloride	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,2-Dichloroethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Benzene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Trichloroethene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,2-Dichloropropane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Dibromomethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Bromodichloromethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
cis-1,3-Dichloropropene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
Toluene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
trans-1,3-Dichloropropene	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,1,2-Trichloroethane	<1 µg/l	TM208	<1 #	<1 #	<1 #					
1,3-Dichloropropane	<1 µg/l	TM208	<1 #	<1 #	<1 #					



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

VOC MS (W)

Results Legend		Customer Sample Ref.	MW20	PW1	PW4			
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4@ Sample deviation (see appendix)		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644688	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644642	0.00 - 0.00 Ground Water (GW) 14/09/2023 18/09/2023 230918-42 28644662			
Component	LOD/Units	Method						
Tetrachloroethene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Dibromochloromethane	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,2-Dibromoethane	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Chlorobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,1,1,2-Tetrachloroethane	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Ethylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
m,p-Xylene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
o-Xylene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Styrene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Bromoform	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Isopropylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,1,2,2-Tetrachloroethane	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,2,3-Trichloropropane	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Bromobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Propylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
2-Chlorotoluene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,3,5-Trimethylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
4-Chlorotoluene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
tert-Butylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,2,4-Trimethylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
sec-Butylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
4-iso-Propyltoluene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,3-Dichlorobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,4-Dichlorobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
n-Butylbenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,2-Dichlorobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,2-Dibromo-3-chloropropane	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,2,4-Trichlorobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Hexachlorobutadiene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208	<1 #	<1 #	<1 #			
Naphthalene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,2,3-Trichlorobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			
1,3,5-Trichlorobenzene	<1 µg/l	TM208	<1 #	<1 #	<1 #			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Table of Results - Appendix

Method No	Description
TM046	Measurement of Dissolved Oxygen by Oxygen Meter
TM104	Determination of Fluoride using the Kone Analyser
TM183	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM344	Determination of selected pesticides (Suite II) by GCMS
TM090	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM099	Determination of Ammonium in Water Samples using the Kone Analyser
TM176	Determination of SVOCs in Water by GCMS
TM259	Determination of Phenols in Waters and Leachates by HPLC
TM343	Determination of Selected Pesticides (Suite I) in Liquids by GCMS
SUB	Subcontracted Test
TM152	Analysis of Aqueous Samples by ICP-MS
TM208	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM227	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate
TM256	Determination of pH, EC, TDS and Alkalinity in Aqueous samples

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

Validated

SDG: 230918-42
Client Ref.: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Test Completion Dates

Lab Sample No(s) Customer Sample Ref.	28644651	28644696	28644671	28644680	28644704	28644712	28644688	28644642	28644662
	MW2	MW3	MW6	MW8	MW9	MW16	MW20	PW1	PW4
AGS Ref.									
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Ammonium Low	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023
Anions by Kone (w)	21-Sep-2023	21-Sep-2023	21-Sep-2023	21-Sep-2023	21-Sep-2023	21-Sep-2023	21-Sep-2023	21-Sep-2023	21-Sep-2023
Coliforms (W)	19-Sep-2023	19-Sep-2023	19-Sep-2023	19-Sep-2023	19-Sep-2023	19-Sep-2023	19-Sep-2023	19-Sep-2023	19-Sep-2023
Cyanide Comp/Free/Total/Thiocyanate	27-Sep-2023	27-Sep-2023	21-Sep-2023	21-Sep-2023	27-Sep-2023	27-Sep-2023	21-Sep-2023	27-Sep-2023	21-Sep-2023
Dissolved Metals by ICP-MS	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023
Dissolved Oxygen by Probe	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	21-Sep-2023	21-Sep-2023	22-Sep-2023	22-Sep-2023
Fluoride	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023
Mercury Dissolved	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023
Pesticides (Suite I) by GCMS	22-Sep-2023	25-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	25-Sep-2023	22-Sep-2023	22-Sep-2023
Pesticides (Suite II) by GCMS	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023
pH Value	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023	22-Sep-2023
Phenols by HPLC (W)	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023
Phosphate by Kone (w)	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	21-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023
SVOC MS (W) - Aqueous	25-Sep-2023	22-Sep-2023	21-Sep-2023	25-Sep-2023	22-Sep-2023	22-Sep-2023	25-Sep-2023	25-Sep-2023	22-Sep-2023
Total Organic and Inorganic Carbon	24-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	25-Sep-2023	24-Sep-2023	24-Sep-2023
VOC MS (W)	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023	20-Sep-2023



ALS Life Sciences Ltd trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Telephone: +353 (0) 52 617 8100



Report No: ALSH-355150923

Document No: EF0011

CERTIFICATE OF ANALYSIS

Client	ALS Hawarden Units 7-8 Hawarden Business Park Manor Lane Hawarden CH5 3US	Date Submitted	15/09/2023
		Date Reported	18/09/2023
		Order Number	N/A
For the Attention of:	ALS Hawarden		
Sample Reception	9 sample(s) received in good condition.		
Comments	N/A		

Report Authorised by:

Denver Burke
Microbiology Manager

Conditions:

1. Results in this report relate only to the items tested
2. Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd
3. All queries regarding this report should be addressed to the Technical Manager at the above address
4. A * next to a method reference signifies that ALS Life Sciences Ltd is NOT INAB accredited for this method
5. Results reported as CFU/cm² are calculated based on information supplied by customer regarding area swabbed
6. SUBCON* indicates analysis subcontracted to approved subcontractors who do not hold accreditation for this test
7. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test
8. Where sampling is undertaken by ALS personnel, sampling activities are outside the scope of INAB accreditation
9. Dil next to a method reference indicates that a dilution of the water sample was undertaken during testing
10. Statement of conformity made against the result does not take into account the uncertainty of measurement associated with the method



Report No: ALSH-355150923

Document No: EF0011

CERTIFICATE OF ANALYSIS

Date Submitted 15/09/2023
Date Reported 18/09/2023
Order Number N/A

Sample Type Water
Client ID Arthurstown MW2 14/09/23 @ 11.00
Date Tested 15/09/2023
ALS ID 5758688

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	>24196	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	<10	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Sample Type Water
Client ID Arthurstown MW3 14/09/23 @ 12.45
Date Tested 15/09/2023
ALS ID 5758689

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	>24196	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	7701	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Sample Type Water
Client ID Arthurstown MW6 14/09/23 @ 11.55
Date Tested 15/09/2023
ALS ID 5758690

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	8664	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	<10	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Sample Type Water
Client ID Arthurstown MW8 14/09/23 @ 11.25
Date Tested 15/09/2023
ALS ID 5758691

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	291	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	<10	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Report Authorised by:

Denver Burke
 Microbiology Manager



Report No: ALSH-355150923

Document No: EF0011

CERTIFICATE OF ANALYSIS

Date Submitted 15/09/2023
Date Reported 18/09/2023
Order Number N/A

Sample Type Water
Client ID Arthurstown MW9 14/09/23 @ 13.50
Date Tested 15/09/2023
ALS ID 5758692

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	17329	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	627	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Sample Type Water
Client ID Arthurstown MW16 14/09/23 @ 13.10
Date Tested 15/09/2023
ALS ID 5758693

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	8164	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	426	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Sample Type Water
Client ID Arthurstown MW20 14/09/23 @ 14.45
Date Tested 15/09/2023
ALS ID 5758694

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	>24196	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	30	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Sample Type Water
Client ID Arthurstown PW1 14/09/23 @ 14.15
Date Tested 15/09/2023
ALS ID 5758695

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	24196	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	<10	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Report Authorised by:

Denver Burke
 Microbiology Manager



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 Telephone: +353 (0) 52 617 8100



Report No: ALSH-355150923

Document No: EF0011

CERTIFICATE OF ANALYSIS

Date Submitted 15/09/2023
Date Reported 18/09/2023
Order Number N/A

Sample Type Water
Client ID Arthurstown PW4 14/09/23 @ 15.10
Date Tested 15/09/2023
ALS ID 5758696

<u>Test</u>	<u>Result</u>	<u>Unit</u>	<u>Method</u>
Coliforms	11199	MPN/100ml	SP 196 Based on ISO 9308-2 (2012) - Dil
Faecal coliforms	<10	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit. - Dil

Report Authorised by:

Denver Burke
 Microbiology Manager



CERTIFICATE OF ANALYSIS

SDG: 230918-42
Client Ref: P21-222

Report Number: 705445
Location: Arthurstown Landfill

Superseded Report: 704362

Appendix

General

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

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

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

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

7. Results relate only to the items tested.

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

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

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

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

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury

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

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

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

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

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

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

19. Sample Deviations

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

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

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

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

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

Visual Estimation Of Fibre Content

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

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

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

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



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Fehily Timoney
Unit 3/4
Northwood House
Northwood Crescent
Northwood
Dublin
Dublin
DO9 X899

Attention: Sean Foley

CERTIFICATE OF ANALYSIS

Date of report Generation: 07 December 2023
Customer: Fehily Timoney
Sample Delivery Group (SDG): 231130-75
Your Reference: P21-222
Location: Arthurstown Landfill
Report No: 713582
Order Number:

We received 7 samples on Thursday November 30, 2023 and 7 of these samples were scheduled for analysis which was completed on Thursday December 07, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

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

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

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

Approved By:

Sonia McWhan
Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-75
Client Ref.: P21-222

Report Number: 713582
Location: Arthurstown Landfill

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
29024544	MW2		0.00 - 0.00	28/11/2023
29024538	MW3		0.00 - 0.00	28/11/2023
29024524	MW6		0.00 - 0.00	28/11/2023
29024534	MW8		0.00 - 0.00	28/11/2023
29024541	MW9		0.00 - 0.00	28/11/2023
29024547	MW16		0.00 - 0.00	28/11/2023
29024530	MW20		0.00 - 0.00	28/11/2023

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



CERTIFICATE OF ANALYSIS

Validated

 SDG: 231130-75
 Client Ref.: P21-222

 Report Number: 713582
 Location: Arthurstown Landfill

Superseded Report:

Results Legend <div style="font-size: 0.8em;"> X Test N No Determination Possible </div> Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type					
		29024544	MM2		0.00 - 0.00	500ml Plastic (ALE208)	GW				
		29024538	MM3		0.00 - 0.00	500ml Plastic (ALE208)	GW				
		29024524	MM6		0.00 - 0.00	500ml Plastic (ALE208)	GW				
		29024534	MM8		0.00 - 0.00	500ml Plastic (ALE208)	GW				
		29024541	MM9		0.00 - 0.00	500ml Plastic (ALE208)	GW				
		29024547	MM16		0.00 - 0.00	500ml Plastic (ALE208)	GW				
	29024530	MM20		0.00 - 0.00	H2SO4 (ALE244)	GW					
Ammonium Low	All	NDPs: 0 Tests: 7		X	X	X	X	X	X	X	X
Anions by Kone (w)	All	NDPs: 0 Tests: 7		X	X	X	X	X	X	X	X
pH Value	All	NDPs: 0 Tests: 7		X	X	X	X	X	X	X	X
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 7		X	X	X	X	X	X	X	X



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-75
Client Ref.: P21-222

Report Number: 713582
Location: Arthurstown Landfill

Superseded Report:

Results Legend			Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
M	mCERTS accredited.			Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.			28/11/2023	28/11/2023	28/11/2023	28/11/2023	28/11/2023	28/11/2023	28/11/2023
diss.filt	Dissolved / filtered sample.			30/11/2023	30/11/2023	30/11/2023	30/11/2023	30/11/2023	30/11/2023	30/11/2023
tot.unfilt	Total / unfiltered sample.			231130-75	231130-75	231130-75	231130-75	231130-75	231130-75	231130-75
*	Subcontracted - refer to subcontractor report for accreditation status.			29024544	29024538	29024524	29024534	29024541	29024547	
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
1-4*\$	@ Sample deviation (see appendix)									
Component	LOD/Units	Method								
Organic Carbon, Total	<3 mg/l	TM090	<3	5.68	<3	3.95	<3	<3	<3	
			◆ #	◆ #	◆ #	◆ #	◆ #	2 #	2 #	
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.021	0.96	0.039	4.07	0.018	0.019	0.019	
			#	#	#	#	#	2 #	2 #	
Chloride	<2 mg/l	TM184	11.1	60	11.3	3.9	11.7	13	13	
			#	#	#	#	#	#	#	
pH	<1 pH Units	TM256	7.81	7.27	7.67	7.59	7.65	7.61	7.61	
			#	#	#	#	#	#	#	
Conductivity @ 20 deg.C	<0.02 mS/cm	TM256	0.521	1.36	0.563	0.438	0.547	0.564	0.564	
			#	#	#	#	#	#	#	



CERTIFICATE OF ANALYSIS

SDG: 231130-75
 Client Ref.: P21-222

Report Number: 713582
 Location: Arthurstown Landfill

Superseded Report:

Results Legend		Customer Sample Ref.		MW20				
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery. (F) Trigger breach confirmed 1-4*\$@ Sample deviation (see appendix)		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.00 - 0.00 Ground Water (GW) 28/11/2023 30/11/2023 231130-75 29024530				
		Organic Carbon, Total	<3 mg/l	TM090	<3	◆ #		
		Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.052	#		
Chloride	<2 mg/l	TM184	21.7	#				
pH	<1 pH Units	TM256	7.12	#				
Conductivity @ 20 deg.C	<0.02 mS/cm	TM256	1.29	#				



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-75
Client Ref.: P21-222

Report Number: 713582
Location: Arthurstown Landfill

Superseded Report:

Table of Results - Appendix

Method No	Description
TM184	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM256	Determination of pH, EC, TDS and Alkalinity in Aqueous samples
TM090	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM099	Determination of Ammonium in Water Samples using the Kone Analyser

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-75
Client Ref.: P21-222

Report Number: 713582
Location: Arthurstown Landfill

Superseded Report:

Test Completion Dates

Lab Sample No(s)	29024544	29024538	29024524	29024534	29024541	29024547	29024530
Customer Sample Ref.	MW2	MW3	MW6	MW8	MW9	MW16	MW20
AGS Ref.							
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Ammonium Low	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023
Anions by Kone (w)	01-Dec-2023	01-Dec-2023	01-Dec-2023	01-Dec-2023	01-Dec-2023	01-Dec-2023	01-Dec-2023
pH Value	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023	05-Dec-2023
Total Organic and Inorganic Carbon	06-Dec-2023	06-Dec-2023	06-Dec-2023	07-Dec-2023	06-Dec-2023	07-Dec-2023	06-Dec-2023



CERTIFICATE OF ANALYSIS

SDG: 231130-75
Client Ref: P21-222

Report Number: 713582
Location: Arthurstown Landfill

Superseded Report:

Appendix

General

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

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

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

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

7. Results relate only to the items tested.

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

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

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

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

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury

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

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

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

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

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

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

19. Sample Deviations

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

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

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

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

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

Visual Estimation Of Fibre Content

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

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

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

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



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Fehily Timoney
Unit 3/4
Northwood House
Northwood Crescent
Northwood
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Dublin
DO9 X899

Attention: Sean Foley

CERTIFICATE OF ANALYSIS

Date of report Generation: 05 January 2024
Customer: Fehily Timoney
Sample Delivery Group (SDG): 231130-76
Your Reference: P21-222
Location: Arthurstown Landfill
Report No: 716382
Order Number: Z4216

This report has been revised and directly supersedes 716377 in its entirety.

We received 2 samples on Thursday November 30, 2023 and 2 of these samples were scheduled for analysis which was completed on Thursday December 07, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

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

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

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

Approved By:

Sonia McWhan
Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
29024556	PW3		0.00 - 0.00	28/11/2023
29024562	PW5		0.00 - 0.00	28/11/2023

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



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

Results Legend <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;">X Test</div> <div style="display: flex; align-items: center;">N No Determination Possible</div> </div> Sample Types - S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type	
		29024556			0.00 - 0.00	Vial (ALE297)	GW
			PW3			HNO3 Filtered (ALE204)	GW
						500ml Plastic (ALE208)	GW
						0.5l glass bottle (ALE227)	GW
						Vial (ALE297)	GW
Ammonium Low	All	NDPs: 0 Tests: 2			X	X	
Anions by Kone (w)	All	NDPs: 0 Tests: 2			X	X	
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 2			X	X	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 2			X	X	
Dissolved Oxygen by Probe	All	NDPs: 0 Tests: 2			X	X	
Fluoride	All	NDPs: 0 Tests: 2			X	X	
Mercury Dissolved	All	NDPs: 0 Tests: 2			X	X	
Pesticides (Suite I) by GCMS	All	NDPs: 0 Tests: 2			X	X	
Pesticides (Suite II) by GCMS	All	NDPs: 0 Tests: 2			X	X	
pH Value	All	NDPs: 0 Tests: 2			X	X	
Phenols by HPLC (W)	All	NDPs: 0 Tests: 2			X	X	
Phosphate by Kone (w)	All	NDPs: 0 Tests: 2			X	X	
SVOC MS (W) - Aqueous	All	NDPs: 0 Tests: 2			X	X	
Total Organic and Inorganic Carbon	All	NDPs: 0 Tests: 2			X	X	
VOC MS (W)	All	NDPs: 0 Tests: 2				X	



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

Results Legend		Customer Sample Ref.	PW3	PW5			
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4*\$@Sample deviation (see appendix)		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 28/11/2023	0.00 - 0.00 Ground Water (GW) 28/11/2023			
Component	LOD/Units	Method					
Oxygen, dissolved	<0.3 mg/l	TM046	9.31	10.6			
Organic Carbon, Total	<3 mg/l	TM090	<3	<3			
Ammoniacal Nitrogen as N (low level)	<0.01 mg/l	TM099	0.012	0.014			
Fluoride	<0.5 mg/l	TM104	<0.5	<0.5			
Boron (diss.filt)	<10 µg/l	TM152	<10	<10			
Cadmium (diss.filt)	<0.08 µg/l	TM152	<0.08	<0.08			
Chromium (diss.filt)	<1 µg/l	TM152	<1	<1			
Copper (diss.filt)	<0.3 µg/l	TM152	11	5.84			
Lead (diss.filt)	<0.2 µg/l	TM152	0.212	0.223			
Manganese (diss.filt)	<3 µg/l	TM152	<3	4.8			
Nickel (diss.filt)	<0.4 µg/l	TM152	<0.4	<0.4			
Zinc (diss.filt)	<1 µg/l	TM152	5.6	5.22			
Sodium (Dis.Filt)	<0.076 mg/l	TM152	6.58	19.1			
Magnesium (Dis.Filt)	<0.036 mg/l	TM152	7.18	9.91			
Potassium (Dis.Filt)	<0.2 mg/l	TM152	0.537	1.38			
Calcium (Dis.Filt)	<0.2 mg/l	TM152	139	141			
Iron (Dis.Filt)	<0.019 mg/l	TM152	<0.019	<0.019			
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01	<0.01			
Phosphate (Ortho as PO4)	<0.05 mg/l	TM184	<0.05	0.111			
Sulphate	<2 mg/l	TM184	8.6	18.2			
Chloride	<2 mg/l	TM184	12.3	30.1			
Total Oxidised Nitrogen as N	<0.1 mg/l	TM184	0.954	5			
Cyanide, Total	<0.05 mg/l	TM227	<0.05	<0.05			
pH	<1 pH Units	TM256	7.92	7.53			
Conductivity @ 20 deg.C	<0.02 mS/cm	TM256	0.65	0.748			
Alkalinity, Total as CaCO3	<3 mg/l	TM256	371	361			
Phenol	<0.002 mg/l	TM259	<0.002	<0.002			
Cresols	<0.006 mg/l	TM259	<0.006	<0.006			
Xylenols	<0.008 mg/l	TM259	<0.008	<0.008			
Phenols, Total Detected monohydric	<0.016 mg/l	TM259	<0.016	<0.016			
Trifluralin	<0.01 µg/l	TM343	<0.01	<0.01			
alpha-HCH	<0.01 µg/l	TM343	<0.01	<0.01			
gamma-HCH (Lindane)	<0.01 µg/l	TM343	<0.01	<0.01			



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

Results Legend		Customer Sample Ref.	PW3	PW5			
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4@ Sample deviation (see appendix)		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 28/11/2023	0.00 - 0.00 Ground Water (GW) 28/11/2023			
Component	LOD/Units	Method					
Heptachlor	<0.01 µg/l	TM343	<0.01	<0.01			
Aldrin	<0.01 µg/l	TM343	<0.01	<0.01			
beta-HCH	<0.01 µg/l	TM343	<0.01	<0.01			
Isodrin	<0.01 µg/l	TM343	<0.01	<0.01			
delta-HCH	<0.01 µg/l	TM343	<0.01	<0.01			
Heptachlor epoxide	<0.01 µg/l	TM343	<0.01	<0.01			
o,p'-DDE	<0.01 µg/l	TM343	<0.01	<0.01			
Endosulphan I	<0.01 µg/l	TM343	<0.01	<0.01			
trans-Chlordane	<0.01 µg/l	TM343	<0.01	<0.01			
cis-Chlordane	<0.01 µg/l	TM343	<0.01	<0.01			
p,p'-DDE	<0.01 µg/l	TM343	<0.01	<0.01			
Dieldrin	<0.01 µg/l	TM343	<0.01	<0.01			
o,p'-DDD (TDE)	<0.01 µg/l	TM343	<0.01	<0.01			
Endrin	<0.01 µg/l	TM343	<0.01	<0.01			
o,p'-DDT	<0.01 µg/l	TM343	<0.01	<0.01			
p,p'-DDD (TDE)	<0.01 µg/l	TM343	<0.01	<0.01			
Endosulphan II	<0.02 µg/l	TM343	<0.02	<0.02			
p,p'-DDT	<0.01 µg/l	TM343	<0.01	<0.01			
o,p'-Methoxychlor	<0.01 µg/l	TM343	<0.01	<0.01			
p,p'-Methoxychlor	<0.01 µg/l	TM343	<0.01	<0.01			
Endosulphan Sulphate	<0.02 µg/l	TM343	<0.02	<0.02			
Permethrin I	<0.01 µg/l	TM343	<0.01	<0.01			
Permethrin II	<0.01 µg/l	TM343	<0.01	<0.01			
1,3,5-Trichlorobenzene	<0.01 µg/l	TM344	<0.01	<0.01			
Hexachlorobutadiene	<0.01 µg/l	TM344	<0.01	<0.01			
1,2,4-Trichlorobenzene	<0.01 µg/l	TM344	<0.01	<0.01			
1,2,3-Trichlorobenzene	<0.01 µg/l	TM344	<0.01	<0.01			
Dichlorvos	<0.01 µg/l	TM344	<0.01	<0.01			
Dichlobenil	<0.01 µg/l	TM344	<0.01	<0.01			
Mevinphos	<0.01 µg/l	TM344	<0.01	<0.01			
Tecnazene	<0.01 µg/l	TM344	<0.01	<0.01			
Hexachlorobenzene	<0.01 µg/l	TM344	<0.01	<0.01			
Demeton-S-methyl	<0.01 µg/l	TM344	<0.01	<0.01			



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Validated

 SDG: 231130-76
 Client Ref.: P21-222

 Report Number: 716382
 Location: Arthurstown Landfill

Superseded Report: 716377

#	Results Legend	Customer Sample Ref.	PW3	PW5				
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-4	@ Sample deviation (see appendix)							
		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 28/11/2023	0.00 - 0.00 Ground Water (GW) 28/11/2023				
			30/11/2023 231130-76 29024556	30/11/2023 231130-76 29024562				
Component	LOD/Units	Method						
Phorate	<0.01 µg/l	TM344	<0.01	<0.01				
Diazinon	<0.01 µg/l	TM344	<0.01	<0.01				
Triallate	<0.01 µg/l	TM344	<0.01	<0.01				
Atrazine	<0.01 µg/l	TM344	<0.01	<0.01				
Simazine	<0.01 µg/l	TM344	<0.01	<0.01				
Disulfoton	<0.01 µg/l	TM344	<0.01	<0.01				
Propetamphos	<0.01 µg/l	TM344	<0.01	<0.01				
Chlorpyrifos-methyl	<0.01 µg/l	TM344	<0.01	<0.01				
Dimethoate	<0.01 µg/l	TM344	<0.01	<0.01				
Pirimiphos-methyl	<0.01 µg/l	TM344	<0.01	<0.01				
Fenchlorophos	<0.01 µg/l	TM344	<0.01	<0.01				
Chlorpyrifos	<0.01 µg/l	TM344	<0.01	<0.01				
Methyl Parathion	<0.01 µg/l	TM344	<0.01	<0.01				
Malathion	<0.01 µg/l	TM344	<0.01	<0.01				
Fenthion	<0.01 µg/l	TM344	<0.01	<0.01				
Fenitrothion	<0.01 µg/l	TM344	<0.01	<0.01				
Triadimefon	<0.01 µg/l	TM344	<0.01	<0.01				
Pendimethalin	<0.01 µg/l	TM344	<0.01	<0.01				
Parathion	<0.01 µg/l	TM344	<0.01	<0.01				
Chlorfenvinphos	<0.01 µg/l	TM344	<0.01	<0.01				
trans-Chlordane	<0.01 µg/l	TM344	<0.01	<0.01				
cis-Chlordane	<0.01 µg/l	TM344	<0.01	<0.01				
Ethion	<0.01 µg/l	TM344	<0.01	<0.01				
Carbophenothion	<0.01 µg/l	TM344	<0.01	<0.01				
Triazophos	<0.01 µg/l	TM344	<0.02	<0.02				
Phosalone	<0.01 µg/l	TM344	<0.01	<0.01				
Azinphos methyl	<0.02 µg/l	TM344	<0.02	<0.02				
Azinphos ethyl	<0.02 µg/l	TM344	<0.02	<0.02				



CERTIFICATE OF ANALYSIS

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SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

SVOC MS (W) - Aqueous

Results Legend		Customer Sample Ref.	PW3	PW5			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00	0.00 - 0.00			
M	mCERTS accredited.		Ground Water (GW)	Ground Water (GW)			
aq	Aqueous / settled sample.		28/11/2023	28/11/2023			
diss.filt	Dissolved / filtered sample.		30/11/2023	30/11/2023			
tot.unfilt	Total / unfiltered sample.		231130-76	231130-76			
	* Subcontracted - refer to subcontractor report for accreditation status.		29024566	29024566			
	** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery						
	(F) Trigger breach confirmed						
	1-4*\$@Sample deviation (see appendix)						
Component	LOD/Units		Method				
1,2,4-Trichlorobenzene (aq)	<1 µg/l	TM176	<1	<1	#	#	
1,2-Dichlorobenzene (aq)	<1 µg/l	TM176	<1	<1	#	#	
1,3-Dichlorobenzene (aq)	<1 µg/l	TM176	<1	<1	#	#	
1,4-Dichlorobenzene (aq)	<1 µg/l	TM176	<1	<1	#	#	
2,4,5-Trichlorophenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
2,4,6-Trichlorophenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
2,4-Dichlorophenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
2,4-Dimethylphenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
2,4-Dinitrotoluene (aq)	<1 µg/l	TM176	<1	<1	#	#	
2,6-Dinitrotoluene (aq)	<1 µg/l	TM176	<1	<1	#	#	
2-Chloronaphthalene (aq)	<1 µg/l	TM176	<1	<1	#	#	
2-Chlorophenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
2-Methylnaphthalene (aq)	<1 µg/l	TM176	<1	<1	#	#	
2-Methylphenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
2-Nitroaniline (aq)	<1 µg/l	TM176	<1	<1	#	#	
2-Nitrophenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
3-Nitroaniline (aq)	<1 µg/l	TM176	<1	<1	#	#	
4-Bromophenylphenylether (aq)	<1 µg/l	TM176	<1	<1	#	#	
4-Chloro-3-methylphenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
4-Chloroaniline (aq)	<1 µg/l	TM176	<1	<1	#	#	
4-Chlorophenylphenylether (aq)	<1 µg/l	TM176	<1	<1	#	#	
4-Methylphenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
4-Nitroaniline (aq)	<1 µg/l	TM176	<1	<1	#	#	
4-Nitrophenol (aq)	<1 µg/l	TM176	<1	<1	#	#	
Azobenzene (aq)	<1 µg/l	TM176	<1	<1	#	#	
Acenaphthylene (aq)	<1 µg/l	TM176	<1	<1	#	#	
Acenaphthene (aq)	<1 µg/l	TM176	<1	<1	#	#	
Anthracene (aq)	<1 µg/l	TM176	<1	<1	#	#	
bis(2-Chloroethyl)ether (aq)	<1 µg/l	TM176	<1	<1	#	#	
bis(2-Chloroethoxy)methane (aq)	<1 µg/l	TM176	<1	<1	#	#	
bis(2-Ethylhexyl) phthalate (aq)	<2 µg/l	TM176	<2	<2	#	#	
Butylbenzyl phthalate (aq)	<1 µg/l	TM176	<1	<1	#	#	
Benzo(a)anthracene (aq)	<1 µg/l	TM176	<1	<1	#	#	



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

SVOC MS (W) - Aqueous

Results Legend	Customer Sample Ref.	PW3	PW5			
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4*@ Sample deviation (see appendix)	Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 28/11/2023	0.00 - 0.00 Ground Water (GW) 28/11/2023			
Component	LOD/Units	Method				
Benzo(b)fluoranthene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Benzo(k)fluoranthene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Benzo(a)pyrene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Benzo(g,h,i)perylene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Carbazole (aq)	<1 µg/l	TM176	<1 #	<1 #		
Chrysene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Dibenzofuran (aq)	<1 µg/l	TM176	<1 #	<1 #		
n-Dibutyl phthalate (aq)	<1 µg/l	TM176	<1 #	<1 #		
Diethyl phthalate (aq)	<1 µg/l	TM176	<1 #	<1 #		
Dibenzo(a,h)anthracene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Dimethyl phthalate (aq)	<1 µg/l	TM176	<1 #	<1 #		
n-Dioctyl phthalate (aq)	<5 µg/l	TM176	<5 #	<5 #		
Fluoranthene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Fluorene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Hexachlorobenzene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Hexachlorobutadiene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Pentachlorophenol (aq)	<1 µg/l	TM176	<1	<1		
Phenol (aq)	<1 µg/l	TM176	<1	<1		
n-Nitroso-n-dipropylamine (aq)	<1 µg/l	TM176	<1 #	<1 #		
Hexachloroethane (aq)	<1 µg/l	TM176	<1 #	<1 #		
Nitrobenzene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Naphthalene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Isophorone (aq)	<1 µg/l	TM176	<1 #	<1 #		
Hexachlorocyclopentadiene (aq)	<1 µg/l	TM176	<1	<1		
Phenanthrene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Indeno(1,2,3-cd)pyrene (aq)	<1 µg/l	TM176	<1 #	<1 #		
Pyrene (aq)	<1 µg/l	TM176	<1 #	<1 #		



CERTIFICATE OF ANALYSIS

Validated

SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

VOC MS (W)

Results Legend			Customer Sample Ref.		PW3	PW5			
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 28/11/2023	0.00 - 0.00 Ground Water (GW) 28/11/2023				
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
1-4*\$	Sample deviation (see appendix)								
Component	LOD/Units	Method							
Dibromofluoromethane**	%	TM208		105	105				
Toluene-d8**	%	TM208		98.9	97.7				
4-Bromofluorobenzene**	%	TM208		99.1	101				
Dichlorodifluoromethane	<1 µg/l	TM208		<1	<1	#	#		
Chloromethane	<1 µg/l	TM208		<1	<1	#	#		
Vinyl chloride	<1 µg/l	TM208		<1	<1	#	#		
Bromomethane	<1 µg/l	TM208		<1	<1	#	#		
Chloroethane	<1 µg/l	TM208		<1	<1	#	#		
Trichlorofluoromethane	<1 µg/l	TM208		<1	<1	#	#		
1,1-Dichloroethene	<1 µg/l	TM208		<1	<1	#	#		
Carbon disulphide	<1 µg/l	TM208		<1	<1	#	#		
Dichloromethane	<3 µg/l	TM208		<3	<3	#	#		
Methyl tertiary butyl ether (MTBE)	<1 µg/l	TM208		<1	<1	#	#		
trans-1,2-Dichloroethene	<1 µg/l	TM208		<1	<1	#	#		
1,1-Dichloroethane	<1 µg/l	TM208		<1	<1	#	#		
cis-1,2-Dichloroethene	<1 µg/l	TM208		<1	<1	#	#		
2,2-Dichloropropane	<1 µg/l	TM208		<1	<1				
Bromochloromethane	<1 µg/l	TM208		<1	<1	#	#		
Chloroform	<1 µg/l	TM208		<1	<1	#	#		
1,1,1-Trichloroethane	<1 µg/l	TM208		<1	<1	#	#		
1,1-Dichloropropene	<1 µg/l	TM208		<1	<1	#	#		
Carbontetrachloride	<1 µg/l	TM208		<1	<1	#	#		
1,2-Dichloroethane	<1 µg/l	TM208		<1	<1	#	#		
Benzene	<1 µg/l	TM208		<1	<1	#	#		
Trichloroethene	<1 µg/l	TM208		<1	<1	#	#		
1,2-Dichloropropane	<1 µg/l	TM208		<1	<1	#	#		
Dibromomethane	<1 µg/l	TM208		<1	<1	#	#		
Bromodichloromethane	<1 µg/l	TM208		<1	<1	#	#		
cis-1,3-Dichloropropene	<1 µg/l	TM208		<1	<1	#	#		
Toluene	<1 µg/l	TM208		<1	<1	#	#		
trans-1,3-Dichloropropene	<1 µg/l	TM208		<1	<1	#	#		
1,1,2-Trichloroethane	<1 µg/l	TM208		<1	<1	#	#		
1,3-Dichloropropane	<1 µg/l	TM208		<1	<1	#	#		



CERTIFICATE OF ANALYSIS

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SDG: 231130-76
Client Ref.: P21-222

Report Number: 716382
Location: Arthurstown Landfill

Superseded Report: 716377

VOC MS (W)

Results Legend		Customer Sample Ref.	PW3	PW5			
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4@@ Sample deviation (see appendix)		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 0.00 Ground Water (GW) 28/11/2023	0.00 - 0.00 Ground Water (GW) 28/11/2023			
Component	LOD/Units	Method					
Tetrachloroethene	<1 µg/l	TM208	<1	<1	#	#	
Dibromochloromethane	<1 µg/l	TM208	<1	<1	#	#	
1,2-Dibromoethane	<1 µg/l	TM208	<1	<1	#	#	
Chlorobenzene	<1 µg/l	TM208	<1	<1	#	#	
1,1,1,2-Tetrachloroethane	<1 µg/l	TM208	<1	<1	#	#	
Ethylbenzene	<1 µg/l	TM208	<1	<1	#	#	
m,p-Xylene	<1 µg/l	TM208	<1	<1	#	#	
o-Xylene	<1 µg/l	TM208	<1	<1	#	#	
Styrene	<1 µg/l	TM208	<1	<1	#	#	
Bromoform	<1 µg/l	TM208	<1	<1	#	#	
Isopropylbenzene	<1 µg/l	TM208	<1	<1	#	#	
1,1,2,2-Tetrachloroethane	<1 µg/l	TM208	<1	<1	#	#	
1,2,3-Trichloropropane	<1 µg/l	TM208	<1	<1	#	#	
Bromobenzene	<1 µg/l	TM208	<1	<1	#	#	
Propylbenzene	<1 µg/l	TM208	<1	<1	#	#	
2-Chlorotoluene	<1 µg/l	TM208	<1	<1	#	#	
1,3,5-Trimethylbenzene	<1 µg/l	TM208	<1	<1	#	#	
4-Chlorotoluene	<1 µg/l	TM208	<1	<1	#	#	
tert-Butylbenzene	<1 µg/l	TM208	<1	<1	#	#	
1,2,4-Trimethylbenzene	<1 µg/l	TM208	<1	<1	#	#	
sec-Butylbenzene	<1 µg/l	TM208	<1	<1	#	#	
4-iso-Propyltoluene	<1 µg/l	TM208	<1	<1	#	#	
1,3-Dichlorobenzene	<1 µg/l	TM208	<1	<1	#	#	
1,4-Dichlorobenzene	<1 µg/l	TM208	<1	<1	#	#	
n-Butylbenzene	<1 µg/l	TM208	<1	<1	#	#	
1,2-Dichlorobenzene	<1 µg/l	TM208	<1	<1	#	#	
1,2-Dibromo-3-chloropropane	<1 µg/l	TM208	<1	<1	#	#	
1,2,4-Trichlorobenzene	<1 µg/l	TM208	<1	<1	#	#	
Hexachlorobutadiene	<1 µg/l	TM208	<1	<1	#	#	
tert-Amyl methyl ether (TAME)	<1 µg/l	TM208	<1	<1	#	#	
Naphthalene	<1 µg/l	TM208	<1	<1	#	#	
1,2,3-Trichlorobenzene	<1 µg/l	TM208	<1	<1	#	#	
1,3,5-Trichlorobenzene	<1 µg/l	TM208	<1	<1	#	#	



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Table of Results - Appendix

Method No	Description
TM046	Measurement of Dissolved Oxygen by Oxygen Meter
TM104	Determination of Fluoride using the Kone Analyser
TM183	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM344	Determination of selected pesticides (Suite II) by GCMS
TM090	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM099	Determination of Ammonium in Water Samples using the Kone Analyser
TM176	Determination of SVOCs in Water by GCMS
TM259	Determination of Phenols in Waters and Leachates by HPLC
TM343	Determination of Selected Pesticides (Suite I) in Liquids by GCMS
TM152	Analysis of Aqueous Samples by ICP-MS
TM208	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters
TM227	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate
TM256	Determination of pH, EC, TDS and Alkalinity in Aqueous samples

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



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Test Completion Dates

Lab Sample No(s)	29024556	29024562
Customer Sample Ref.	PW3	PW5
AGS Ref.		
Depth	0.00 - 0.00	0.00 - 0.00
Type	Ground Water	Ground Water

Ammonium Low	05-Dec-2023	05-Dec-2023
Anions by Kone (w)	04-Dec-2023	04-Dec-2023
Cyanide Comp/Free/Total/Thiocyanate	05-Dec-2023	05-Dec-2023
Dissolved Metals by ICP-MS	04-Dec-2023	04-Dec-2023
Dissolved Oxygen by Probe	01-Dec-2023	01-Dec-2023
Fluoride	01-Dec-2023	01-Dec-2023
Mercury Dissolved	07-Dec-2023	07-Dec-2023
Pesticides (Suite I) by GCMS	06-Dec-2023	06-Dec-2023
Pesticides (Suite II) by GCMS	05-Dec-2023	05-Dec-2023
pH Value	06-Dec-2023	06-Dec-2023
Phenols by HPLC (W)	04-Dec-2023	04-Dec-2023
Phosphate by Kone (w)	02-Dec-2023	01-Dec-2023
SVOC MS (W) - Aqueous	06-Dec-2023	06-Dec-2023
Total Organic and Inorganic Carbon	07-Dec-2023	06-Dec-2023
VOC MS (W)	04-Dec-2023	04-Dec-2023



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Appendix

General

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

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

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

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

7. Results relate only to the items tested.

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

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

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

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

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury

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

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

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

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

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

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

19. Sample Deviations

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

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

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

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

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

Visual Estimation Of Fibre Content

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

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

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

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



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