

# Armidale Solid Waste Landfill Facility

Location: 108 Long Swamp Road, Armidale NSW 2350 Environment Protection Licence Number: 5860 Activities: Waste disposal to land and waste processing  
 The internet link to Licence No. 5860 is <https://apps.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=137211&SYSUID=1&LICID=5860>

Licensee under Protection of Environment Operations Act 1997 (POEO Act):  
 Armidale Regional Council, PO Box 75A, Armidale NSW 2350

Council is required to monitor methane, groundwater, surface water and leachate at various sampling points. This document details recent results. To meet its obligation under Section 66 (6) of the POEO Act, a link to the current version of this document is available on Council's website.

On the adjacent figure, sampling locations are given historical names and colour coded according to the type of monitoring: L = Long Swamp; S = Surface water; O = Overflow; W = Well; L = Leachate; GW = Groundwater; and EX = Extension. Corresponding Environment Protection Authority (EPA) Identification Numbers detailed on the Licence are provided below. A few EPA ID numbers are missing due to changes since initial licensing of the landfill.

- EPA No. 2 LSO1 (surface water + leachate overflow)
- EPA No. 4 LSO2 (surface water + leachate overflow)
- EPA No. 5 Annual leachate volume discharge to utilisation area (Pump 1)
- EPA No. 6 LSO3 (surface water + leachate overflow)
- EPA No. 7 LSO4 (surface water + leachate overflow)
- EPA No. 8 LW1 (groundwater monitoring well)
- EPA No. 9 LW2 (groundwater monitoring well)
- EPA No. 10 LW3 (groundwater monitoring well)
- EPA No. 12 LS2 (surface water + leachate)
- EPA No. 13 LS3 (surface water + leachate)
- EPA No. 14 LS4 (surface water + leachate)
- EPA No. 15 LS5 (farmer's dam)
- EPA No. 16 LL1 (leachate)
- EPA No. 17 Surface methane
- EPA No. 18 Building methane
- EPA No. 19 LL2 (leachate)
- EPA No. 20 LSO5 (surface water + leachate overflow)
- EPA No. 21 SWEX-01 (surface water)
- EPA No. 22 Annual leachate volume transfer from landfill extension ponds
- EPA No. 23 GWEX-01 (groundwater monitoring well)
- EPA No. 24 GWEX-02 (groundwater monitoring well)
- EPA No. 25 GWEX-03 (groundwater monitoring well)



Monitoring results for the last four years are presented on following pages – as required in the EPA publishing requirements.

**Water quality analytes** are organised in tables on following pages according to chemical grouping to assist chemical review. [Analytes are listed on the licence in alphabetical order.] They include analytes for groundwater, surface water and landfill leachate.

The left hand table provides the field test results. The field tests are conducted on the same date that a sample is collected.

The right hand table provides analytical results from the NATA registered laboratory. The date the laboratory issued the results is first, followed by the date by which results were placed on the Armidale Regional Council website.

Abbreviations in the tables are provided here in alphabetical order:

Alk = Alkalinity measured as mg/L CaCO<sub>3</sub> equivalent; BTEX = Benzene, Toluene, Ethylbenzene, Xylene; Ca = Calcium; Cl = Chloride; D = Depth to water from top of internal well PVC casing; DO = Dissolved Oxygen; EC = Electrical Conductivity also called conductivity; Eh = Redox Potential; Fe = Iron; Hg = Mercury; K = Potassium; Mg = Magnesium; Mn = Manganese; Na = Sodium; ND = Nil detected; NH<sub>3</sub> = Ammonia as a measure of ammonium ions; NO<sub>x</sub> = Nitrite + Nitrate; NR = not required by licence; OC&OP = Organochlorine & Organophosphorus; WL RL = water level converted to Reduced Level relative to mean sea level; PAH = Polynuclear aromatic hydrocarbons; SO<sub>4</sub> = Sulphate; SS = Total suspended solids; Temp = Temperature; TKN = Total Kjeldahl Nitrogen (organic nitrogen + ammonia); TN = Total Nitrogen; TOC = Total Organic Carbon; VFR = Volumetric Flow Rate; Zn = Zinc.

Measures:

mg/L = milligram per litre (equivalent to ppm); µS/cm = micro Siemens per centimetre; mV = millivolts; °C= degrees Celsius; kL = kilolitres; ppm = parts per million.

Choice of water quality analytes:

Some analytes are tested because they give a general understanding of groundwater, surface water and leachate quality. Often the concentrations are greater in leachate than in groundwater and surface water. A simple comparison can tell us if landfill leachate may have escaped into groundwater or surface water. However, care is needed when reviewing these general results so that false conclusions are not made. The salt levels in groundwater are a case in point. EC is an indicator of salt levels. If the EC has previously been low, and then becomes at least three to four times higher, one would assume it is due to landfill leachate ingress into groundwater. The Long Swamp Road Landfill groundwater has relatively low EC (Table 1) except for well LW1. So landfill leachate intrusion may be indicated if the EC in other wells becomes a lot higher. (LW1 is an upgradient well contaminated with nitrogen compounds. Historical photos have revealed that it is not due to landfill leachate, but due to old night soil trenches that are close by.)

Other analytes give us more specific information about the possible presence of landfill leachate in groundwater and surface water. Even with these we must carefully consider if their increased concentrations are definitely due to landfill leachate and are not from some other source.

- Nitrogen compounds indicate biodegradation of the plant and animal waste in our solid waste. They may also be due to fertilizer use on nearby properties or old night soil trenches. A general rule of thumb is that total nitrogen (TKN + NO<sub>x</sub>) should be <5 mg/L.
- Iron and manganese above 10 mg/L is an indicator that landfill leachate may be present in groundwater. However, these groundwater analytes may increase due to leaching of iron and manganese from the soil after excessive rainfall or flood water infiltration.
- Organic analytes such as BTEX compounds are most likely to indicate landfill leachate, especially if they haven't been detected before.

So it is important to monitor on a regular basis to note any changes in water quality analyte concentrations and to judiciously review the results. Increases in groundwater and surface water analyte concentrations due to landfill leachate intrusion are often at least three to four times the previous concentrations.

Comments on water quality results: Wells (LW2, LW3, GWEX-02, GWEX-03) are downgradient of the landfill and are at most risk from landfill leachate ingress. There is no indication of contamination in these wells. The LS5 dam is also an environmental value to be protected. Its water quality results show no indication of landfill leachate ingress.

**Table 1a: Groundwater quality & depth**

Frequency required by licence		DO	EC	pH	Eh	Temp	D	WL	RL	Alk	Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	PAH	
Measure		mg/L	µS/cm	1-14	mV	°C	m	m		mg/L			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	
LW1 6 monthly												LW1												NR
19/05/20		0.07	2950	4.10	+371	17.2	3.35	1020.44	<1		27/05/20	16/06/20	427	0.322	0.258	0.08	<0.0001	0.04	215	32.5	248	<1		
14/10/20		1.58	2885	4.26	+431	16.8	2.94	1020.85	<1		22/10/20	11/11/20	443	0.403	0.130	0.07	0.0028	0.02	215	26.1	241	6		
22/05/21		0.29	3028	3.96	+406	18.0	2.53	1021.26	<1		01/06/21	22/06/21	434	0.431	0.232	0.10	0.0023	<0.01	250	18.2	268	8		
20/10/21		0.30	2925	3.97	+401	17.1	2.37	1021.42	<1		01/11/21	19/11/21	428	0.480	0.110	0.07	0.0036	0.04	211	<10.0	211	8		
20/04/22		0.15	2690	4.06	+239	18.9	1.94	1021.85	<1		03/05/22	19/05/22	434	0.451	0.132	0.09	0.0020	0.04	198	15.4	213	4		
12/10/22		0.30	2908	3.79	+419	17.5	1.88	1021.91	<1		24/10/22	11/11/22	430	0.480	0.136	0.07	<0.0001	<1.00	226	12.8	239	10		
28/03/23		0.16	3018	3.87	+397	19.4	1.72	1022.07	<1		06/04/23	01/05/23	458	0.426	0.176	0.08	0.0011	0.02	258	31.1	289	4		
08/09/23		1.02	2873	3.98	+407	16.3	2.12	1021.67	<1		22/09/23	06/10/23	426	0.413	0.238	0.09	0.0001	<0.01	264	22.7	287	2		
20/03/24		0.19	3058	3.96	+396	18.6	1.97	1021.82	<1		08/04/24	29/04/24	418	0.316	0.147	0.09	0.0004	0.03	221	46.0	267	4		
LW2 6 monthly												LW2												NR
20/05/20		0.54	563	6.77	+161	16.8	6.76	999.45	168		27/05/20	16/06/20	60	0.089	0.073	<0.05		0.12	0.020	0.2	0.2	<1		
13/10/20		0.67	539	6.70	+156	19.8	6.10	1000.11	170		22/10/20	11/11/20	60	0.100	0.141	<0.05		0.03	0.130	<0.1	0.1	2		
21/05/21		0.64	527	6.53	+139	20.1	5.12	1001.09	180		01/06/21	22/06/21	57	0.018	0.106	<0.05		<0.01	0.120	<0.1	0.1	3		
19/10/21		1.54	567	6.59	+79	19.4	4.16	1002.05	167		01/11/21	19/11/21	67	0.039	0.028	<0.05		<0.01	0.080	<0.1	<0.1	3		
18/04/22		0.96	518	6.89	+89	18.7	3.49	1002.72	167		29/04/22	19/05/22	60	0.027	0.126	<0.05		0.03	0.06	<0.1	<0.1	4		
12/10/22		1.38	535	6.58	+156	18.3	3.48	1002.73	167		24/10/22	11/11/22	63	0.011	0.110	<0.05		<0.01	0.09	0.2	0.3	4		
27/03/23		0.63	517	6.59	-29	20.5	3.34	1002.87	163		06/04/23	01/05/23	60	0.024	0.068	<0.05		0.03	0.08	<0.1	<0.1	<1		
08/09/23		0.98	509	6.68	+135	14.8	3.69	1002.52	167		22/09/23	06/10/23	57	0.026	0.011	<0.05		<0.01	0.13	<0.1	0.1	<1		
20/03/24		1.47	643	6.74	+136	21.5	4.31	1001.90	170		08/04/24	29/04/24	65	0.020	0.061	<0.05		0.03	0.09	<0.1	<0.1	3		
LW3 6 monthly												LW3												NR
20/05/20		0.14	528	6.48	+149	15.8	13.27	996.14	193		27/05/20	16/06/20	43	0.608	<0.005	<0.05		0.05	0.02	0.1	0.1	2		
13/10/20		0.11	511	6.34	+166	17.1	13.24	996.17	193		22/10/20	11/11/20	43	0.681	0.015	<0.05		0.03	0.02	<0.1	<0.1	3		
21/05/21		0.11	483	6.28	+79	16.6	12.83	996.58	207		01/06/21	22/06/21	31	0.603	0.010	0.31		0.10	<0.01	0.2	0.2	5		
19/10/21		0.25	528	6.29	+41	17.5	12.26	997.15	210		01/11/21	19/11/21	34	0.701	0.009	0.43		0.16	<0.01	0.1	0.1	5		
18/04/22		0.15	441	6.24	+23	18.8	11.58	997.83	207		29/04/22	19/05/22	24	0.615	0.021	0.48		0.13	<0.01	0.2	0.2	6		
12/10/22		0.09	462	6.26	+99	18.4	11.06	998.35	193		24/10/22	11/11/22	28	0.659	0.009	0.32		0.10	<0.01	0.2	0.2	5		
27/03/23		0.10	422	6.30	-14	19.2	10.72	998.69	197		06/04/23	01/05/23	16	0.561	0.014	0.60		0.17	<0.01	0.1	0.1	2		
08/09/23		0.24	440	6.32	+94	14.7	10.56	998.85	190		22/09/23	06/10/23	24	0.603	0.015	0.25		0.04	0.01	<0.1	<0.1	<1		
20/03/24		0.08	420	6.32	+65	18.6	10.68	998.73	193		08/04/24	29/04/24	15	0.512	0.007	0.44		0.11	<0.01	0.1	0.1	5		

Table 1b: Groundwater quality & depth

Frequency required by licence	DO	EC	pH	Eh	Temp	D	WL	RL	Alk
Measure	mg/L	µS/cm	1-14	mV	°C	m	m	mg/L	
<b>GWEX-01</b> 6 monthly									
19/05/20	0.22	572	4.65	+558	17.2	6.26	1017.73	1	
13/10/20	0.39	570	4.54	+466	18.1	6.00	1017.99	1	
22/05/21	0.33	569	4.48	+552	17.4	5.35	1018.64	<1	
20/10/21	0.37	580	4.63	+571	16.8	5.03	1018.96	1	
20/04/22	0.27	576	4.54	+367	16.8	4.32	1019.67	2	
12/10/22	0.38	588	4.56	+572	15.8	4.11	1019.88	3	
28/03/23	0.30	544	4.59	+498	17.6	4.16	1019.83	1	
08/09/23	0.58	523	4.68	+571	16.1	4.59	1019.40	1	
22/03/24	0.29	515	4.72	+533	17.2	4.64	1019.35	1	
<b>GWEX-02</b> 3 monthly									
25/02/20	0.35	348	5.87	+140	18.6	16.59	990.86	107	
19/05/20	0.26	558	6.14	+350	16.7	16.36	991.09	120	
01/09/20	0.29	350	6.15	+179	17.6	16.23	991.22	107	
13/10/20	0.32	353	6.19	+154	17.4	16.17	991.28	110	
17/02/21	0.31	346	5.98	+191	16.7	15.83	991.62	110	
22/05/21	0.36	359	5.99	+195	17.9	15.24	992.21	109	
11/08/21	0.34	362	6.03	+159	17.2	14.83	992.62	109	
20/10/21	0.39	347	6.03	+138	17.0	14.19	993.26	103	
14/01/22	0.54	344	6.10	+171	17.4	13.28	994.17	110	
20/04/22	0.39	352	6.01	+154	17.1	12.70	994.75	110	
28/06/22	0.40	347	6.12	+143	15.6	12.67	994.78	107	
13/10/22	NO 4 WHEEL DRIVE ACCESS								
13/12/22	0.31	349	6.04	+181	16.5	11.55	995.90	100	
27/03/23	0.32	339	6.02	+148	18.7	12.32	995.13	97	
06/07/23	0.38	352	5.98	+160	15.5	12.69	994.76	98	
07/09/23	0.27	333	5.97	+199	17.6	12.99	994.46	96	
27/11/23	0.35	342	6.05	+162	18.6	13.38	994.07	103	
22/03/24	0.33	372	6.07	+198	16.7	13.78	993.67	103	
28/06/24	0.39	346	6.12	+158	16.3	13.55	993.90	100	

Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	PAH
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L
<b>GWEX-01</b>												Annually
27/05/20	16/06/20	180	0.039	0.033	<0.05	0.0024	0.02	0.01	<0.1	<0.1	2	ND
22/10/20	11/11/20	188	0.042	0.197	<0.05	0.0019	0.01	0.03	<0.1	<0.1	3	NR
01/06/21	22/06/21	184	0.042	0.025	<0.05	0.0018	0.01	0.03	<0.1	<0.1	6	ND
01/11/21	19/11/21	180	0.041	0.023	<0.05	0.0018	<0.01	0.06	<0.1	<0.1	<1	NR
03/05/22	19/05/22	193	0.038	0.025	<0.05	0.0014	<0.01	0.02	<0.1	<0.1	4	ND
24/10/22	11/11/22	171	0.043	0.166	<0.05	0.0010	<0.01	0.04	<0.1	<0.1	4	NR
06/04/23	01/05/23	168	0.036	0.028	<0.05	0.0007	0.03	0.02	<0.1	<0.1	2	ND
22/09/23	06/10/23	156	0.036	0.135	<0.05	0.0007	<0.01	0.02	<0.1	<0.1	1	NR
08/04/24	29/04/24	165	0.036	0.029	<0.05	0.0005	0.01	<0.01	0.2	0.2	3	ND
<b>GWEX-02</b>												Annually
05/03/20	25/03/20	45	<0.001	<0.005	<0.05	<0.0001	0.02	0.13	<0.1	0.1	5	NR
27/05/20	16/06/20	25	<0.001	<0.005	<0.05	<0.0001	<0.01	0.12	<0.1	0.1	2	ND
15/09/20	05/10/20	26	<0.001	<0.005	<0.05	<0.0001	0.02	0.14	<0.1	0.1	6	NR
22/10/20	11/11/20	27	<0.001	<0.005	<0.05	<0.0001	<0.01	0.13	<0.1	0.1	3	NR
02/03/21	22/03/21	28	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	8	NR
01/06/21	22/06/21	28	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	4	ND
20/08/21	09/09/21	28	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	<1	NR
01/11/21	19/11/21	27	<0.001	0.006	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	4	NR
27/01/22	16/02/22	29	<0.001	<0.005	<0.05	<0.0001	<0.01	0.16	<0.1	0.2	<1	NR
03/05/22	19/05/22	31	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	5	ND
11/07/22	29/07/22	24	<0.001	<0.005	<0.05	<0.0001	0.01	0.14	0.1	0.2	4	NR
30/12/22	23/01/23	28	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	2	NR
06/04/23	01/05/23	26	<0.001	<0.005	<0.05	<0.0001	0.02	0.16	<0.1	0.2	<1	ND
14/07/23	03/08/23	23	<0.001	<0.005	<0.05	<0.0001	0.03	0.15	<0.1	0.2	<1	NR
15/09/23	06/10/23	33	<0.001	<0.005	<0.05	<0.0001	<0.01	0.14	<0.1	0.1	<1	NR
06/12/23	28/12/23	28	<0.001	<0.005	<0.05	<0.0001	0.03	0.15	<0.1	0.2	<1	NR
08/04/24	29/04/24	31	<0.001	<0.005	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	4	ND
11/07/24	31/07/24	32	<0.001	<0.005	<0.05	<0.0001	0.04	0.16	<0.1	0.2	2	ND

Table 1c: Groundwater quality & depth

Frequency required by licence	DO	EC	pH	Eh	Temp	D	WL	RL	Alk
Measure	mg/L	µS/cm	1-14	mV	°C	m	m		mg/L
<b>GWEX-03</b>	3 monthly								
25/02/20	0.38	833	6.42	+120	19.5	13.03	991.15	283	
19/05/20	0.19	848	6.55	+247	17.2	12.72	991.46	282	
01/09/20	0.32	832	6.57	+161	17.4	12.47	991.71	293	
13/10/20	0.21	797	6.52	+157	19.2	12.42	991.76	287	
17/02/21	0.19	828	6.44	+146	17.1	11.99	992.19	287	
21/05/21	0.28	825	6.24	+148	17.0	11.29	992.89	293	
11/08/21	0.22	849	6.43	+143	16.2	10.76	993.42	290	
20/10/21	0.28	811	6.49	+78	17.5	10.05	994.13	287	
14/01/22	0.19	824	6.53	-74	18.1	9.25	994.93	293	
20/04/22	0.13	840	6.52	-103	18.0	8.67	995.51	307	
28/06/22	0.30	832	6.26	+130	15.0	8.50	995.68	293	
13/10/22	0.43	833	6.39	+157	15.7	7.89	996.29	270	
13/12/22	0.48	813	6.41	+188	16.0	7.69	996.49	273	
27/03/23	0.23	809	6.34	-285	18.4	8.38	995.80	277	
06/07/23	0.09	828	6.35	-219	15.1	8.70	995.48	273	
08/09/23	0.15	806	6.37	-52	16.1	9.07	995.11	270	
27/11/23	0.19	746	6.42	+114	19.7	9.52	994.66	273	
20/03/24	0.32	840	6.38	+142	17.0	9.92	994.26	270	
28/06/24	0.26	825	6.45	+120	16.0	9.67	994.51	267	

Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	PAH
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L
<b>GWEX-03</b>												Annually
05/03/20	25/03/20	108	0.001	<0.005	<0.05	<0.0001	0.04	0.09	<0.1	<0.1	<1	NR
27/05/20	16/06/20	111	<0.001	<0.005	<0.05	<0.0001	0.03	0.08	0.1	0.2	4	ND
15/09/20	05/10/20	110	0.001	0.005	<0.05	<0.0001	0.02	0.09	<0.1	<0.1	9	NR
22/10/20	11/11/20	113	<0.001	0.005	<0.05	<0.0001	0.01	0.08	<0.1	<0.1	3	NR
02/03/21	22/03/21	110	<0.001	<0.005	<0.05	<0.0001	<0.01	0.08	<0.1	<0.1	8	NR
01/06/21	22/06/21	108	<0.001	<0.005	<0.05	<0.0001	<0.01	0.08	<0.1	<0.1	9	ND
20/08/21	09/09/21	114	<0.001	0.006	<0.05	<0.0001	<0.01	0.10	<0.1	0.1	<1	NR
01/11/21	19/11/21	109	0.001	0.005	<0.05	<0.0001	<0.01	0.09	<0.1	<0.1	5	NR
27/01/22	16/02/22	118	0.012	0.007	0.06	<0.0001	0.02	0.09	<0.1	<0.1	4	NR
03/05/22	19/05/22	125	0.008	0.006	<0.05	<0.0001	0.02	0.08	0.1	0.2	6	ND
11/07/22	29/07/22	117	0.004	0.006	<0.05	<0.0001	<0.01	0.15	0.2	0.4	7	NR
24/10/22	11/11/22	112	0.002	0.010	<0.05	<0.0001	<0.01	0.17	0.3	0.5	8	NR
30/12/22	23/01/23	124	0.001	0.006	<0.05	<0.0001	<0.01	0.15	0.2	0.4	2	NR
06/04/23	01/05/23	119	0.073	<0.005	1.67	<0.0001	0.43	0.20	0.6	0.8	3	ND
14/07/23	03/08/23	112	0.022	0.009	0.69	<0.0001	0.10	0.06	0.2	0.3	3	NR
22/09/23	06/10/23	119	0.004	0.008	0.17	<0.0001	0.01	0.09	<0.1	<0.1	<1	NR
06/12/23	28/12/23	119	0.002	0.008	<0.05	<0.0001	0.03	0.10	<0.1	0.1	2	NR
08/04/24	29/04/24	123	0.002	0.006	<0.05	<0.0001	0.02	0.12	<0.1	0.1	8	ND
11/07/24	31/07/24	124	0.001	0.008	<0.05	<0.0001	<0.01	0.15	<0.1	0.2	2	ND

Table 2: Surface water quality

Frequency required by licence		DO	EC	pH	Eh	Temp	Alk	Received from laboratory	Accessible on Council website by	SS	SO <sub>4</sub>	Cl	Ca	Mg	Na	K	Mn	Zn	Fe	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	Phenols	
Measure		mg/L	µS/cm	1-14	mV	°C	mg/L			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	
<b>LS5</b>	6 monthly							<b>LS5</b>		NR	NR	NR	NR	NR	NR	NR				NR					NR	
20/05/20		15.52	269	9.51	+128	16.5	60	27/05/20	16/06/20	<5							0.014	<0.005	0.36		<0.01	0.8	0.8	11		
14/10/20		9.37	279	8.74	+247	16.6	67	22/10/20	11/11/20	9							0.052	<0.005	0.49		<0.01	0.9	0.9	14		
24/05/21		9.78	269	6.85	+163	13.4	87	01/06/21	22/06/21	<5							0.026	0.008	0.25		<0.01	1.2	1.2	14		
20/10/21		6.62	257	6.78	+58	16.4	53	01/11/21	19/11/21	28							0.078	<0.005	0.42		0.01	1.4	1.4	13		
20/04/22		11.01	570	7.25	+114	18.0	147	03/05/22	19/05/22	<5							0.013	<0.005	0.16		<0.01	3.8	3.8	20		
13/10/22		11.60	426	8.10	+182	20.2	113	24/10/22	11/11/22	22							0.129	<0.005	0.41		<0.01	1.8	1.8	22		
28/03/23		7.28	268	6.78	+221	24.1	120	06/04/23	01/05/23	46							0.384	0.005	0.46		<0.01	2.4	2.4	18		
07/09/23		7.30	463	7.00	+214	15.8	67	15/09/23	06/10/23	238							0.759	<0.005	0.18		0.06	3.6	3.7	15		
22/03/24		9.14	430	7.17	+204	20.4	67	08/04/24	29/04/24	19							0.026	0.006	0.41		<0.01	1.3	1.3	11		
<b>SWEX-01</b>	3 monthly							<b>SWEX-01</b>																		
25/02/20	2.59 kL/day	4.41	242	6.98	+106	22.5	107	05/03/20	25/03/20	<5	11	6	28	8	9	9	0.084	<0.005	0.17	0.04	<0.01	0.7	0.7	6	<0.05	
19/05/20	dry																									
01/09/20	Flow hint	7.15	214	7.51	+180	16.6	80	15/09/20	05/10/20	<5	17	10	24	6	9	6	0.007	<0.005	0.19	0.24	<0.01	<0.5	<0.5	4	<0.05	
13/10/20	dry																									
17/02/21	Flow hint	4.14	331	6.74	+207	17.4	40	02/03/21	22/03/21	12	90	12	37	9	12	11	0.321	0.013	0.29	0.04	<0.01	1.3	1.3	14	<0.05	
24/05/21	Flow hint	3.31	278	6.37	+150	12.9	107	01/06/21	22/06/21	10	10	8	25	7	10	32	1.080	0.006	0.62	<0.01	<0.01	0.4	0.4	8	<0.05	
11/08/21	Flow hint	10.20	184	6.59	+137	11.1	67	20/08/21	09/09/21	<5	15	9	18	5	8	4	0.002	<0.005	<0.05	<0.01	<0.01	0.2	0.2	5	<0.05	
20/10/21	Flow hint	7.96	221	7.05	+163	18.3	90	01/11/21	19/11/21	<5	11	6	28	6	10	4	0.061	<0.005	0.52	0.02	0.01	0.5	0.5	8	<0.05	
14/01/22	Flow hint	3.13	256	6.45	+95	21.8	117	27/01/22	16/02/22	20	2	9	31	8	12	7	1.470	0.011	1.13	0.02	0.02	0.7	0.7	11	<0.05	
20/04/22	Flow hint	6.05	242	6.90	+125	19.8	110	03/05/22	19/05/22	11	1	10	25	7	12	7	0.957	0.008	0.36	<0.01	<0.01	0.8	0.8	10	<0.05	
28/06/22	Flow hint	4.47	205	6.15	+55	9.1	67	11/07/22	29/07/22	<5	17	12	20	6	11	5	0.521	0.015	2.15	0.02	0.01	0.5	0.5	5	<0.05	
13/10/22	51.8kL/day	10.19	289	7.11	+173	14.6	100	24/10/22	11/11/22	<5	7	20	27	9	25	10	0.037	0.008	0.13	<0.01	0.83	1.2	2.0	12	<0.05	
13/12/22	2.59kL/day	4.51	417	6.96	+228	19.4	47	30/12/22	23/01/23	6	84	22	31	11	22	13	0.136	0.013	0.06	0.14	3.00	1.7	4.7	9	<0.05	
27/03/23	Flow hint	4.57	175	6.46	+142	22.7	24	06/04/23	01/05/23	31	24	11	12	4	13	8	0.099	0.009	0.22	0.04	<0.01	1.4	1.4	10	<0.05	
06/07/23	Flow hint	4.91	223	6.66	+127	11.9	43	14/07/23	03/08/23	10	19	20	16	6	18	13	0.056	0.011	0.23	0.06	0.36	1.6	2.0	8	<0.05	
07/09/23	dry																									
27/11/23	2.52 kL/day	4.31	227	7.10	+205	21.9	90	06/12/23	28/12/23	<5	24	16	20	5	12	11	0.022	0.019	0.16	0.03	0.03	0.8	0.8	9	<0.05	
22/03/24	5.76kL/day	3.97	206	6.76	+167	16.2	47	08/04/24	29/04/24	12	10	10	17	5	11	9	0.050	0.012	0.17	0.04	<0.01	1.0	1.0	10	<0.05	
28/06/24	Flow hint	6.68	248	6.71	+121	8.7	113	11/07/24	31/07/24	5	11	19	24	8	17	9	0.056	<0.005	0.13	0.02	0.03	0.8	0.8	6	<0.05	

Table 3a: Concentrated leachate quality – LL1 & LL2

Frequency required by licence		DO	EC	pH	Eh	Temp	Alk	Received from laboratory	Accessible on Council website by	Cl	Mn	Zn	Fe	Hg	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	PAH	OC&OP Pesticides	BTEX compounds		
Measure		mg/L	µS/cm	1-14	mV	°C	mg/L			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as n	mg/L	mg/L	mg/L	mg/L	mg/L		
<b>LL1</b> Annually																								
14/10/20		8.24	3330	7.91	+189	22.1	920	22/10/20	11/11/20	516	0.688	0.014	0.57	<0.0001	16.6	48.8	23.5	72.3	66			NR	ND	
19/10/21		3.63	3410	7.83	+68	21.7	1327	01/11/21	19/11/21	327	1.330	0.077	6.70	<0.0001	81.3	1.14	83.6	84.7	80				ND	
12/10/22		3.90	2448	7.56	+179	18.8	1160	24/10/22	11/11/22	225	0.928	0.028	6.33	<0.0001	53.0	0.48	73.2	73.7	74				ND	
07/09/23		3.73	3085	7.16	-63	19.3	1347	15/09/23	06/10/23	506	1.080	0.022	75.5	<0.0001	98.4	1.76	104.0	106.0	109				ND	
<b>LL2</b> 6 monthly																								
25/02/20		8.29	2497	8.29	+49	23.9	787	05/03/20	25/03/20	329	0.080	<0.005	0.51	<0.0001	75.9	4.47	85.9	90.4	37			Annually	Annually	Annually
01/09/20		6.85	3385	8.44	+112	20.1	1073	15/09/20	05/10/20	538	0.089	<0.005	0.35	<0.0001	70.8	5.99	80.8	86.8	67			NR	NR	NR
17/02/21		8.40	3740	8.41	+58	22.5	1267	02/03/21	22/03/21	574	0.073	<0.005	0.43	<0.0001	105.0	0.42	102.0	102.0	89			ND	ND	ND
11/08/21		15.24	3605	8.31	+97	14.8	1360	20/08/21	09/09/21	506	0.106	<0.005	0.75	<0.0001	123.0	1.34	132.0	133.0	86			ND	ND	ND
14/01/22		14.10	3695	7.99	-38	23.7	1400	27/01/22	16/02/22	467	0.101	<0.005	0.82	<0.0001	125.0	1.95	129.0	131.0	91			NR	NR	NR
28/06/22		12.69	3150	7.76	+63	9.6	1300	11/07/22	29/07/22	443	0.174	0.005	1.39	<0.0001	103.0	0.28	118.0	118.0	90			ND	ND	ND
13/12/22		17.04	3285	8.35	+154	19.9	1240	30/12/22	23/01/23	441	0.130	<0.005	1.33	<0.0001	126.0	0.94	125.0	126.0	89			NR	NR	NR
06/07/23		16.78	2591	8.63	-16	10.6	907	14/07/23	03/08/23	440	0.142	<0.005	1.17	<0.0001	28.4	0.06	47.4	47.5	75			ND	ND	ND
27/11/23		15.19	2555	8.94	+50	27.5	800	06/12/23	28/12/23	552	0.028	<0.005	0.43	<0.0001	4.18	1.32	15.5	16.8	80			NR	NR	NR
28/06/24		8.55	3040	8.13	+49	15.6	1067	11/07/24	31/07/24	464	0.166	<0.005	0.70	<0.0001	85.4	0.60	74.3	74.9	77			ND	ND	ND

Table 3b: Weaker leachate quality – LS2, LS3, LS4 – previously surface water

Frequency required by licence								Received Accessible															
DO	EC	pH	Eh	Temp	Alk	from laboratory	on Council website by	VFR	SS	Cl	Mn	Zn	Fe	Hg	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	PAH	OC&OP Pesticides	BTEX compounds	
<b>LS2 6 monthly</b>								<b>LS2</b>															
20/05/20	10.73	600	9.23	+123	17.8	67	27/05/20	16/06/20	NR	NR						0.04	1.0	1.0	7	NR	NR	NR	
14/10/20	9.71	765	9.76	+154	19.1	50	22/10/20	11/11/20			16	0.005	<0.005	0.37		0.01	0.5	0.5	8				
24/05/21	12.06	1033	8.78	+159	14.8	93	01/06/21	22/06/21			<5	0.014	0.005	0.08		0.02	2.4	2.4	23				
19/10/21	10.30	1247	8.41	+36	19.4	373	01/11/21	19/11/21			<5	0.024	<0.005	0.08		1.78	9.6	11.4	28				
18/04/22	9.50	1686	8.24	+40	21.7	467	29/04/22	19/05/22			5	0.008	0.007	<0.05		0.74	9.3	10.0	47				
13/10/22	7.38	1802	8.31	+128	16.8	500	24/10/22	11/11/22			<5	0.018	<0.005	0.57		3.33	19.1	22.4	45				
27/03/23	9.46	1840	9.09	+20	23.2	467	06/04/23	01/05/23			40	0.022	<0.005	0.12		<0.01	7.2	7.2	50				
07/09/23	10.03	1932	9.01	+161	16.4	507	15/09/23	06/10/23			8	0.019	<0.005	0.31		0.02	6.0	6.0	59				
22/03/24	10.43	2472	9.31	+221	21.6	533	08/04/24	29/04/24			32	0.017	<0.005	0.26		<0.01	6.6	6.6	60				
<b>LS3 6 monthly</b>								<b>LS3</b>															
25/02/20	7.23	1365	7.99	+70	23.4	207	05/03/20	25/03/20	NR	NR					0.72	6.93	5.0	11.9	31	NR	NR	NR	
14/10/20	10.09	1483	9.12	+186	18.2	160	22/10/20	11/11/20			<5	0.032	<0.005	0.06		0.10	<0.01	2.9	2.9	36			
24/05/21	6.66	1803	8.27	+168	14.2	487	01/06/21	22/06/21			<5	0.076	<0.005	0.20		3.49	2.06	10.1	12.2	55			
19/10/21	9.29	2079	8.36	+31	20.0	513	01/11/21	19/11/21			<5	0.060	0.006	0.10		8.67	7.19	13.6	20.8	53			
18/04/22	9.73	2096	8.27	+41	21.4	700	29/04/22	19/05/22			6	0.153	0.011	0.08		24.40	5.68	29.0	34.7	73			
12/10/22	6.05	1931	8.13	+147	18.7	587	24/10/22	11/11/22			6	0.128	0.010	0.57		15.0	7.19	25.9	33.1	58			
27/03/23	11.71	1831	9.16	+20	22.8	467	06/04/23	01/05/23			42	0.031	<0.005	0.27		0.08	<0.01	9.9	9.9	68			
07/09/23	7.31	1893	8.36	+163	16.5	493	15/09/23	06/10/23			15	0.029	<0.005	0.52		3.28	0.07	9.1	9.2	70			
22/03/24	10.95	2220	9.11	+197	21.6	487	08/04/24	29/04/24			64	0.050	0.007	1.30		0.07	<0.01	7.6	7.6	57			
<b>LS4 6 monthly</b>								<b>LS4</b>															
25/02/20	5.70	2023	8.16	+81	23.6	500	05/03/20	25/03/20	NR	NR					6.37	4.73	10.3	15.0	34	NR	NR	NR	
14/10/20	12.21	1998	8.53	+240	17.3	387	22/10/20	11/11/20			24	0.514	<0.005	0.39		0.80	0.18	5.9	6.1	54			
24/05/21	16.89	2290	8.52	+167	15.5	607	01/06/21	22/06/21			29	0.339	<0.005	0.52		9.00	0.62	19.1	19.7	75			
19/10/21	7.68	2533	8.26	+115	22.8	633	01/11/21	19/11/21			6	0.629	0.005	0.53		14.00	2.36	20.0	22.4	65			
18/04/22	4.24	2506	7.36	-24	24.0	840	29/04/22	19/05/22			<5	1.760	0.008	0.59		34.50	0.12	38.3	38.4	83			
12/10/22	5.49	2510	7.90	+112	21.8	787	24/10/22	11/11/22			8	1.080	<0.005	0.73		34.00	1.79	48.8	50.6	73			
27/03/23	18.36	2780	8.95	+32	26.3	600	06/04/23	01/05/23			49	0.115	<0.005	0.44		2.07	0.30	13.8	14.1	94			
07/09/23	4.27	2531	8.25	+231	18.6	613	15/09/23	06/10/23			11	0.237	<0.005	0.63		9.51	0.12	17.4	17.5	97			
22/03/24	22.52	3315	9.74	+140	21.6	520	08/04/24	29/04/24			129	0.092	0.006	0.32		0.10	<0.01	15.5	15.5	94			



**Table 3c: Leachate quality – overflows (LSO1, LSO2, LSO3, LSO4, LSO5)**

Frequency required by licence		pH	EC	Received from laboratory	Accessible on Council website by	VFR	SS	Alk	TOC	Cl	Mn	Zn	Fe	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	BTEX compounds	
Measure		1-14	µS/cm			kL/day	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as n	mg/L	mg/L	
<b>LSO1 overflow</b>																			
No overflow																			
<b>LSO2 overflow</b>																			
	05/08/16	7.99	1460			648	68	248	35	209	0.043	0.031	1.32	1.00	8.74	5.5	14.2		ND
	01/09/16	8.30	2030			5	100	560	55	299	0.09	0.011	1.17	0.09	<0.01	3.4	3.4		ND
	19/09/16	8.45	1660			108	38	354	96	231	0.06	0.019	0.25	1.93	5.78	5.7	11.5		ND
	31/03/17	7.26	1678			173	32	296	41	216	0.05	0.016	0.72	0.55	3.16	4.3	7.5		ND
<b>LSO3(downstream) If LSO1,2or5</b>																			
	05/08/16	7.77	1510				54	214	40	244	0.011	0.020	0.33	0.14	8.91	4.2	13.1		ND
	01/09/16	7.43	164				14	54	18	13	0.20	0.009	3.21	0.04	0.02	1.3	1.3		ND
	19/09/16	8.00	430				18	111	25	42	0.04	<0.005	1.80	0.08	0.22	1.6	1.8		ND
	31/03/17	6.71	181				34	54	15	9	0.10	0.009	3.86	0.01	<0.01	1.4	1.4		ND
<b>LSO4 (upstream) If LSO1,2or5</b>																			
	05/08/16	7.44	164				<5	49	14	13	0.009	0.012	1.56	0.01	<0.01	0.9	0.9		ND
	01/09/16	7.67	253				<5	97	18	21	0.03	0.007	0.45	0.02	0.01	1.1	1.1		ND
	19/09/16	7.92	213				16	73	22	18	0.04	<0.005	1.92	0.18	0.06	1.4	1.5		ND
	31/03/17	6.67	247				7	69	20	14	0.05	0.007	2.08	0.06	<0.01	1.4	1.4		ND
<b>LSO5 overflow</b>																			
No overflow																			

**Table 4: Leachate volume**

Month of discharge for irrigation	Year 2020 (kL)	Accessible on Council website by	Year 2021 (kL)	Accessible on Council website by	Year 2022 (kL)	Accessible on Council website by	Year 2023 (kL)	Accessible on Council website by	Year 2024 (kL)	Accessible on Council website by
January	136.8	25/03/20	216.0	22/03/21	453.6	19/05/22	208.8	01/05/23	151.2	29/04/24
February	180.0	25/03/20	280.8	22/03/21	3060.0	19/05/22	324.0	01/05/23	50.4	29/04/24
March	223.2	16/06/20	172.8	22/06/21	2016.0	19/05/22	129.6	01/05/23	86.4	29/04/24
April	372.0	16/06/20	187.2	22/06/21	532.8	19/05/22	79.2	06/10/23	86.4	31/07/24
May	136.8	16/06/20	259.2	22/06/21	374.4	29/07/22	93.6	06/10/23	86.4	31/07/24
June	100.1	05/10/20	93.6	09/09/21	345.6	29/07/22	79.2	06/10/23	79.2	31/07/24
July	101.5	05/10/20	108.0	19/11/21	259.2	11/11/22	115.2	06/10/23		
August	266.4	05/10/20	180.0	19/11/21	187.2	11/11/22	100.8	06/10/23		
September	64.8	11/11/20	165.6	19/11/21	957.6	11/11/22	100.8	29/04/24		
October	172.8	11/11/20	259.2	19/11/21	2534.6	11/11/22	144.0	29/04/24		
November	424.8	22/03/21	1483.2	16/02/22	727.2	23/01/23	79.2	29/04/24		
December	151.2	22/03/21	2044.8	16/02/22	1094.4	23/01/23	100.8	29/04/24		

**Methane** is a colourless, odourless gas that is flammable and explosive. It is generated approximately three months after the deposition of putrescible solid waste and once oxygen is depleted. Testing is conducted above ground surfaces to assure that none is escaping to air, and in buildings to assure against asphyxiation and explosion.

Comments on methane monitoring results: Methane is occasionally detected but remediated with soil cover usually by the next day.

**Table 5: Methane detections (surface or building)**

Frequency required by licence	Detection locations	Methane (CH <sub>4</sub> ) by volume in air	Methane (CH <sub>4</sub> ) by volume in air	Methane (CH <sub>4</sub> ) as % LEL (Lower Explosive Limit)	Accessible on Council website by	Remediation
Measure		ppm CH <sub>4</sub> in air	% CH <sub>4</sub> in air	% LEL		
3 monthly						
20/02/20	Nil methane detected				25/03/20	
19/05/20	Nil methane detected				16/06/20	
09/09/20	Nil methane detected				05/10/20	
15/10/20	Nil methane detected				11/11/20	
17/02/21	Nil methane detected				22/03/21	
21&25/05/21	Nil methane detected				22/06/21	
09/08/21	On ground outside Vent 4, Fig 1	4,750	0.475	9.5	09/09/21	
20/10/21	Nil methane detected				19/11/21	
14/01/22	Nil methane detected				16/02/22	
25/04/22	Nil methane detected				19/05/22	
28/6&1/7/22	Nil methane detected				29/07/22	
12/10/22	Nil methane detected				11/11/22	
13/12/22	Nil methane detected				23/01/23	
27&28/03/23	Nil methane detected				01/05/23	
12/07/23	Nil methane detected				03/08/23	
18/09/23	Nil methane detected				06/10/23	
27/11/23	Nil methane detected				28/12/23	
02/04/24	Nil methane detected				29/04/24	
28/06/24	Nil methane detected				31/07/24	

Note: 500 ppm CH<sub>4</sub> by volume in air = 0.05% CH<sub>4</sub> by volume in air = 1% LEL

**Table 6: Monthly rainfall (from daily rainfall)**

Landfill rain gauge Daily rainfall summarised here as monthly rainfall	Year 2020 (mm)	Accessible on Council website	Year 2021 (mm)	Accessible on Council website	Year 2022 (mm)	Accessible on Council website	Year 2023 (mm)	Accessible on Council website by	Year 2024 (mm)	Accessible on Council website
January	171.0	25/03/20	31.0	22/03/21	89.0	19/05/22	38.0	01/05/23	58.0	29/04/24
February	165.0	25/03/20	133.0	22/03/21	88.8	19/05/22	47.0	01/05/23	73.0	29/04/24
March	54.0	16/06/20	131.0	22/06/21	191.0	19/05/22	157.0	01/05/23	58.0	29/04/24
April	44.0	16/06/20	22.0	22/06/21	29.0	19/05/22	26.0	06/10/23	113.0	31/07/24
May	35.0	16/06/20	15.0	22/06/21	42.0	29/07/22	13.0	06/10/23	90.0	31/07/24
June	34.0	05/10/20	32.0	09/09/21	10.0	29/07/22	27.0	06/10/23	37.0	31/07/24
July	41.0	05/10/20	42.0	09/09/21	72.0	11/11/22	15.0	06/10/23		
August	43.0	05/10/20	65.0	19/11/21	69.0	11/11/22	9.2	06/10/23		
September	32.0	11/11/20	44.0	19/11/21	114.0	11/11/22	1.2	29/04/24		
October	102.0	11/11/20	78.0	19/11/21	125.0	11/11/22	39.0	29/04/24		
November	18.0	22/03/21	200.0	16/02/22	44.0	23/01/23	109.0	29/04/24		
December	238.0	22/03/21	134.0	16/02/22	46.0	23/01/23	111.0	29/04/24		