

Grafton Regional Landfill

Location: 704 Armidale Road, Elland NSW 2460 Environment Protection Licence Number: 7186 Activities: Waste disposal to land

The internet link to Licence No. 7186 is <https://apps.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=142454&SYSUID=1&LICID=7186>

Licensee under Protection of Environment Operations Act 1997 (POEO Act):

Clarence Valley Council, Locked Bag 23, Grafton NSW 2460

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 figure below, sampling locations are given historical names and colour coded according to the type of monitoring:

M = Monitoring well; SW = Surface water;
SP = Sedimentation Pond; LP = Leachate
pond; Gas = Gas flare.

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. 1	LP1 (leachate pond overflow)
EPA No. 2	SP1 (sedimentation pond overflow)
EPA No. 3	LP1 (leachate pond quality)
EPA No. 4	Surface methane
EPA No. 5	Building methane
EPA No. 6	M1 (groundwater monitoring well)
EPA No. 7	M2 (groundwater monitoring well)
EPA No. 8	M3 (groundwater monitoring well)
EPA No. 11	SWA (surface water monitoring)
EPA No. 12	SWB (surface water monitoring)
EPA No. 16	M7 (groundwater monitoring well)
EPA No. 17	M8 (groundwater monitoring well)
EPA No. 18	Gas1 (landfill gas flare)



Base map: Google 2017

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 the 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 Clarence Valley Council website.

Abbreviations in the tables are provided here in alphabetical order:

Alk = Alkalinity measured as mg/L CaCO₃ equivalent; As = Arsenic; B = Boron; BOD = Biochemical Oxygen Demand; Br = Bromide; Ca = Calcium; Cd = Cadmium; Cl = Chloride; Cr = Chromium; D = Depth to water from top of internal well PVC casing or depth of water in surface water column; DO = Dissolved Oxygen; EC = Electrical Conductivity also called conductivity; Eh = Redox Potential; Fe = Iron; K = Potassium; Mg = Magnesium; Mn = Manganese; Na = Sodium; NH₃ = Ammonia as a measure of ammonium ions; Ni = Nickel; NO_x = Nitrite + Nitrate; NTU = Nephelometric Turbidity Unit; Pb = Lead; S = Sulphur; SO₄ = Sulphate; SS = Total suspended solids; Temp = Temperature; TKN = Total Kjeldahl Nitrogen (organic nitrogen + ammonia); TN = Total Nitrogen; TOC = Total Organic Carbon; TP = Total Phosphorus; VOC = Volatile Organic Compounds; WL RL = water level converted to Reduced Level relative to mean sea level.

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, groundwater has particular characteristics that need to be taken into account so that false conclusions are not made. For example, groundwater may have naturally high salt levels due to the clay strata in which it resides. EC is an indicator of salt levels. The EC of the Grafton Regional Landfill groundwater is a case in point. The high EC levels (Table 1) in wells M2, M3, M7 and M8 are not due to landfill leachate. They were drilled through clay, and no other analytes indicate there is leachate contamination.

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_x) should be <5 mg/L.
- Iron and manganese above 10 mg/L are 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 VOC compounds are most likely to definitely indicate landfill leachate intrusion, 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 judicially 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: Through review of historical results from Year 1995 onwards, it can be said that Grafton Landfill leachate is not affecting groundwater or surface water.

Table 1: Groundwater quality & depth

Frequency required by licence		DO	EC	pH	Eh	Temp	Alk	D	WL	RL
Measure		mg/L	µS/cm	1-14	mV	°C	mg/L	m		m
M1	6 monthly									
04/02/20		0.40	4010	7.36	-145	21.8	1190	17.25	69.75	
18/03/20								17.68	69.32	
27/06/20		0.45	4553	7.30	-117	18.6	1640	17.41	69.59	
17/09/20								17.66	69.34	
25/01/21		1.56	4208	7.22	-89	25.1	900	17.14	69.86	
14/04/21								15.37	71.63	
17/06/21		0.38	1818	6.91	-143	23.2	240	16.63	70.37	
16/09/21								17.49	69.51	
29/01/22		0.52	552	6.87	-216	23.5	203	16.22	70.78	
24/03/22								15.56	71.44	
18/06/22		0.45	523	6.52	-204	21.0	83	16.63	70.37	
27/09/22								14.80	72.20	
26/01/23		0.73	394	6.95	-214	21.0	87	16.82	70.18	
23/03/23								17.65	69.35	
26/06/23		6.39	1008	7.18	-83	20.5	307	16.82	70.18	
07/09/23								18.09	68.91	
21/11/23		2.59	1533	7.29	-145	22.7	587	17.39	69.61	
M2	6 monthly									
04/02/20		9.33	5323	7.98	+79	21.4	973	10.73	62.91	
18/03/20								11.02	62.62	
27/06/20		0.46	6163	7.06	+49	20.2	1160	10.96	62.68	
17/09/20								10.87	62.77	
25/01/21		0.66	6003	7.05	-58	22.4	1093	10.63	63.01	
14/04/21								10.21	63.43	
17/06/21		0.42	2393	6.95	+30	22.6	147	10.57	63.07	
16/09/21								10.17	63.47	
29/01/22		0.77	969	6.64	-82	24.0	133	9.38	64.26	
24/03/22								10.10	63.54	
18/06/22		2.64	2187	6.93	-183	22.9	540	9.44	64.20	
27/09/22								5.46	68.18	
26/01/23		1.03	1401	6.97	+39	21.2	183	7.94	65.70	
23/03/23								8.77	64.87	
27/06/23		8.57	1435	7.56	-191	20.0	180	9.16	64.48	
07/09/23								10.92	62.72	
20/11/23		2.66	2851	7.20	-165	21.9	460	10.04	63.60	

Received from laboratory	Accessible on Council website by	Mn	Fe	Pb	NH ₃	NO _x	TKN	TN	TOC
		mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L
M1									
19/02/20	10/03/20	0.283	1.73	<0.001	0.54	<0.01	1.2	1.2	14
06/07/20	24/07/20	0.294	1.28	<0.001	0.67	<0.01	1.4	1.4	8
05/02/21	25/02/21	0.301	1.05	<0.001	0.53	0.01	1.4	1.4	21
02/07/21	22/07/21	0.118	1.82	<0.001	0.24	<0.01	1.4	1.4	25
14/02/22	04/03/22	0.076	1.83	<0.001	0.31	<0.01	2.7	2.7	34
30/06/22	20/07/22	0.091	1.60	<0.001	0.23	<0.01	2.0	2.0	30
06/02/23	27/02/23	0.065	2.05	0.002	0.41	<0.01	1.9	1.9	30
11/07/23	31/07/23	0.079	1.17	0.001	0.58	<0.01	3.0	3.0	24
05/12/23	27/12/23	0.139	0.89	<0.001	0.56	<0.01	1.7	1.7	25
M2									
19/02/20	10/03/20	0.427	0.24	0.003	0.06	0.26	0.4	0.7	6
06/07/20	24/07/20	0.384	0.06	0.001	0.05	0.08	0.2	0.3	<5
05/02/21	25/02/21	0.404	0.10	0.001	0.03	0.18	0.3	0.5	16
02/07/21	22/07/21	0.205	0.35	0.002	0.08	0.05	2.9	3.0	36
14/02/22	04/03/22	0.415	1.26	0.005	0.16	<0.01	5.4	5.4	44
30/06/22	20/07/22	0.383	0.76	<0.001	0.10	0.07	2.0	2.1	37
06/02/23	27/02/23	0.122	1.26	0.003	0.03	0.13	2.9	3.0	38
11/07/23	31/07/23	0.418	1.43	0.002	0.10	0.06	5.2	5.3	34
05/12/23	27/12/23	0.584	0.76	<0.001	0.08	0.03	3.2	3.2	39

Table 1 continued: Groundwater quality & depth

Frequency required by licence		DO	EC	pH	Eh	Temp	Alk	D	WL	RL
Measure		mg/L	µS/cm	1-14	mV	°C	mg/L	m		m
M3	6 monthly									
03/02/20		0.35	6793	6.23	-18	25.7	1200	8.81	60.52	
18/03/20								8.83	60.50	
26/06/20		1.64	7150	6.98	-41	21.5	1220	8.76	60.57	
17/09/20								8.71	60.62	
26/01/21		0.19	6625	6.80	-50	24.1	1200	8.68	60.65	
14/04/21								8.60	60.73	
18/06/21		0.46	6800	6.82	-73	23.5	1210	8.47	60.86	
16/09/21								8.37	60.96	
29/01/22		0.83	6558	6.78	-142	24.6	1420	8.17	61.16	
24/03/22								8.35	60.98	
17/06/22		0.43	7945	6.84	-193	23.4	1300	7.67	61.66	
27/09/22								7.66	61.67	
26/01/23		0.58	6075	6.71	-62	24.1	1293	8.32	61.01	
23/03/23								8.40	60.93	
27/06/23		0.76	5775	6.68	-148	21.0	1187	8.64	60.69	
07/09/23								8.83	60.50	
20/11/23		6.54	5745	6.92	-61	22.1	1187	8.87	60.46	

Received from laboratory	Accessible on Council website by	Mn	Fe	Pb	NH ₃	NO _x	TKN	TN	TOC
		mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L
M3									
19/02/20	10/03/20	0.179	0.47	<0.001	0.01	<0.01	0.1	0.1	<5
06/07/20	24/07/20	0.163	0.34	<0.001	0.02	<0.01	0.1	0.1	<5
05/02/21	25/02/21	0.171	0.42	<0.001	0.02	<0.01	0.2	0.2	23
02/07/21	22/07/21	0.183	0.51	<0.001	0.03	<0.01	<0.1	<0.1	10
14/02/22	04/03/22	0.170	0.43	<0.001	0.12	<0.01	0.1	0.1	8
30/06/22	20/07/22	0.748	0.82	<0.001	<0.01	0.01	0.1	0.1	21
06/02/23	27/02/23	0.301	0.41	<0.001	0.02	<0.01	<0.1	<0.1	13
11/07/23	31/07/23	0.259	0.64	<0.001	0.06	0.01	0.1	0.1	4
05/12/23	27/12/23	0.228	0.38	<0.001	0.08	0.06	0.2	0.3	15

Table 1 continued: Groundwater quality & depth

Frequency required by licence	DO	EC	pH	Eh	Temp	Alk	D	WL	RL
Measure	mg/L	µS/cm	1-14	mV	°C	mg/L	m	m	m
M7 6 monthly									
04/02/20	4.42	13318	6.99	-96	22.0	513	11.86	56.52	
18/03/20							12.29	56.09	
26/06/20	0.41	13848	6.97	-87	20.8	553	12.24	56.14	
17/09/20							12.20	56.18	
26/01/21	0.63	13105	6.84	-76	25.5	507	12.17	56.21	
14/04/21							11.88	56.50	
18/06/21	0.76	12738	6.86	-86	23.9	553	11.97	56.41	
16/09/21							12.55	55.83	
30/01/22	0.56	12318	6.72	-121	22.2	553	11.87	56.51	
24/03/22							11.83	56.55	
16/06/22	0.57	12048	6.75	-71	22.0	547	11.70	56.68	
27/09/22							11.59	56.79	
26/01/23	0.57	10998	6.71	-43	24.6	520	11.46	56.92	
23/03/23							11.42	56.96	
26/06/23	2.09	10673	6.72	-50	21.2	540	11.32	57.06	
07/09/23							11.68	56.70	
20/11/23	0.59	9480	6.88	-112	21.6	547	11.84	56.54	
M8 6 monthly									
03/02/20	0.30	12823	6.29	-14	24.7	987	7.09	53.53	
18/03/20							6.63	53.99	
26/06/20	0.64	13390	6.79	-135	22.2	827	6.46	54.16	
17/09/20							6.47	54.15	
26/01/21	0.40	12875	6.69	-70	23.9	867	6.38	54.24	
14/04/21							6.09	54.53	
18/06/21	0.34	12968	6.71	-126	23.5	860	6.17	54.45	
16/09/21							6.34	54.28	
30/01/22	0.68	12115	6.74	-175	23.3	840	5.99	54.63	
24/03/22							5.72	54.90	
17/06/22	0.57	11470	6.77	-178	23.9	840	5.62	55.00	
27/09/22							5.42	55.20	
26/01/23	0.54	11265	6.62	-148	23.3	800	6.08	54.54	
23/03/23							6.07	54.55	
27/06/23	0.62	10340	6.56	+16	20.9	933	5.72	54.90	
07/09/23							6.22	54.40	
20/11/23	5.05	9754	6.76	+7	22.1	827	6.44	54.18	

Received from laboratory	Accessible on Council website by	Mn	Fe	Pb	NH ₃	NO _x	TKN	TN	TOC
		mg/L	mg/L	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L
M7									
19/02/20	10/03/20	0.146	3.16	<0.001	1.60	<0.01	1.6	1.6	5
06/07/20	24/07/20	0.139	3.35	0.001	1.45	<0.01	1.4	1.4	<5
05/02/21	25/02/21	0.132	2.95	0.001	1.42	<0.01	1.4	1.4	5
02/07/21	22/07/21	0.141	3.53	0.002	1.42	0.01	1.3	1.3	4
14/02/22	04/03/22	0.126	2.71	0.002	1.37	<0.01	1.6	1.6	3
30/06/22	20/07/22	0.152	3.36	0.002	1.18	<0.01	0.8	0.8	3
06/02/23	27/02/23	0.137	3.27	0.001	1.30	<0.01	1.7	1.7	7
11/07/23	31/07/23	0.134	3.05	0.002	1.26	0.02	1.4	1.4	3
05/12/23	27/12/23	0.136	2.96	0.001	1.45	<0.01	1.6	1.6	12
M8									
19/02/20	10/03/20	0.402	3.75	0.001	0.22	0.02	0.2	0.2	6
06/07/20	24/07/20	0.452	2.68	<0.001	0.27	0.01	<0.5	<0.5	59
05/02/21	25/02/21	0.453	2.58	0.001	0.18	<0.01	<0.5	<0.5	13
02/07/21	22/07/21	0.475	2.60	<0.001	0.28	<0.01	<0.5	<0.5	5
14/02/22	04/03/22	0.431	2.50	<0.001	0.26	<0.01	<0.5	<0.5	4
30/06/22	20/07/22	0.550	2.89	<0.001	0.23	<0.01	<0.5	<0.5	11
06/02/23	27/02/23	0.547	3.24	0.001	0.29	<0.01	0.7	0.7	2
11/07/23	31/07/23	0.468	3.30	<0.001	0.25	<0.01	<0.5	<0.5	2
05/12/23	27/12/23	0.446	2.54	<0.001	0.44	0.02	0.3	0.3	12

Table 2: Surface water quality

Frequency required by licence	DO	EC	pH	Eh	Temp	Alk	Received from laboratory	Accessible on Council website by	SS	Turbidity	Mn	NH ₃	NO _x	TKN	TN	TOC	BOD	
Measure	mg/L	µS/cm	1-14	mV	°C	mg/L			mg/L	NTU	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L	
SWA 6 monthly							SWA											NR
04/02/20	1.07	152	6.26	+71	24.2	18	19/02/20	10/03/20	48	60.8	0.458	0.10	<0.01	3.1	3.1	42		
27/06/20	1.62	73	6.49	+91	12.7	20	06/07/20	24/07/20	9	45.0	0.076	<0.001	0.44	<0.01	1.6	14		
26/01/21	8.58	100	7.81	+41	30.7	14	05/02/21	25/02/21	12	62.3	0.073	<0.01	<0.01	2.6	2.6	24		
18/06/21	7.50	114	7.85	+22	17.1	15	02/07/21	22/07/21	10	120.0	0.040	0.56	0.13	1.8	1.9	12		
29/01/22	7.24	126	7.13	-12	29.4	30	14/02/22	04/03/22	19	64.6	0.104	0.02	<0.01	1.8	1.8	19		
18/06/22	5.56	97	5.96	+220	10.8	9	30/06/22	20/07/22	29	87.3	0.042	0.13	0.02	1.6	1.6	19		
27/01/23	5.79	163	7.07	+8	24.4	27	06/02/23	27/02/23	42	61.4	0.108	<0.01	<0.01	1.5	1.5	16		
28/06/23	11.14	109	6.98	+91	11.8	23	11/07/23	31/07/23	5	23.4	0.005	0.02	<0.01	0.6	0.6	9		
20/11/23	10.06	145	8.10	-12	23.7	23	05/12/23	27/12/23	14	14.3	0.006	<0.01	<0.01	1.1	1.1	16		
SWB 6 monthly							SWB											NR
03/02/20	3.11	377	6.68	+116	33.2	50	19/02/20	10/03/20	20	25.8	0.367	0.11	<0.01	3.3	3.3	40		
26/06/20	3.07	703	7.05	+204	16.8	80	06/07/20	24/07/20	22	26.1	0.262	0.14	0.01	2.2	2.2	15		
26/01/21	1.21	631	6.82	-61	26.1	193	05/02/21	25/02/21	43	56.1	0.474	0.03	<0.01	3.3	3.3	22		
18/06/21	5.92	585	6.62	+125	15.3	117	02/07/21	22/07/21	11	8.1	0.086	0.24	0.02	1.8	1.8	24		
30/01/22	2.51	508	8.33	-70	24.8	133	14/02/22	04/03/22	147	34.5	0.194	0.02	<0.01	1.2	1.2	16		
17/06/22	3.92	433	7.22	-117	17.0	93	30/06/22	20/07/22	10	12.6	0.166	0.05	<0.01	1.3	1.3	21		
26/01/23	3.73	1163	7.20	+65	26.8	220	06/02/23	27/02/23	24	21.6	0.838	0.19	<0.01	3.4	3.4	26		
28/06/23	5.13	757	6.19	+125	11.0	37	11/07/23	31/07/23	72	133.0	1.580	0.42	<0.01	2.2	2.2	8		
20/11/23	10.75	903	7.60	+112	23.6	180	05/12/23	27/12/23	30	15.7	0.120	0.03	<0.01	1.7	1.7	15		

Table 2 continued: Surface water quality

Frequency required by licence	DO	EC	pH	Eh	Temp	Alk	Received from laboratory	Accessible on Council website by	SS	Turbidity	Mn	NH ₃	NO _x	TKN	TN	TOC	BOD		
Measure	mg/L	µS/cm	1-14	mV	°C	mg/L			mg/L	NTU	mg/L	mg/L as N	mg/L as N	mg/L as N	mg/L	mg/L	mg/L		
SP1	6 monthly							SP1											
04/02/20	6.38	356	7.47	+180	29.9	29	19/02/20	10/03/20	9	71.3	0.021	0.13	1.54	1.6	3.1	13	7		
05/05/20	11.04	709	9.14	+160	22.1	207	14/05/20	03/06/20	19	25.6	0.049	0.84	0.12	4.0	4.1	17	7		
27/06/20	8.69	762	8.09	+20	20.5	83	06/07/20	24/07/20	22	50.9	0.030	0.31	0.91	3.1	4.0	13	7		
26/01/21	9.44	678	8.58	-9	31.4	160	05/02/21	25/02/21	33	120.8	0.022	0.20	<0.01	2.2	2.2	17	5		
18/04/21	7.24	547	7.21	+171	26.7	143	29/04/21	20/05/21	120	122.0	0.211	0.58	0.02	3.9	3.9	14	4		
18/06/21	7.57	593	7.48	+37	18.8	143	02/07/21	22/07/21	65	145.0	0.171	0.34	0.01	2.2	2.2	17	6		
09/10/21	8.51	796	7.14	+74	22.3	150	18/10/21	05/11/21	29	36.8	0.012	0.18	<0.01	2.7	2.7	20	5		
30/01/22	8.85	732	8.57	-19	33.1	217	14/02/22	04/03/22	40	56.8	0.173	0.03	<0.01	2.3	2.3	18	8		
27/04/22	9.63	513	6.92	+82	20.3	140	05/05/22	25/05/22	24	41.7	0.054	0.65	0.31	3.3	3.6	23	6		
17/06/22	7.78	590	8.19	-66	21.0	153	30/06/22	20/07/22	25	69.6	0.125	0.98	0.17	3.1	3.3	15	4		
26/01/23	7.17	765	8.21	+106	24.8	80	06/02/23	27/02/23	231	1178.0	0.010	0.08	1.86	2.0	3.9	8	6		
17/03/23	6.53	569	7.37	-18	31.3	83	29/03/23	21/04/23	144	417.0	0.005	0.02	2.06	1.4	3.5	6	2		
28/06/23	10.31	660	7.61	+75	12.5	83	11/07/23	31/07/23	22	384.0	0.006	0.06	2.17	1.6	3.8	5	3		
04/09/23	10.14	616	8.73	+147	21.8	110	12/09/23	03/10/23	18	77.4	0.003	0.02	1.43	0.8	2.2	7	<2		
20/11/23	8.37	793	8.82	+2	23.7	157	05/12/23	27/12/23	38	147.7	0.002	0.06	<0.01	1.2	1.2	8	2		
11/03/24	8.31	617	7.63	+149	28.9	117	19/03/24	10/04/24	39	108.0	0.007	0.04	0.03	1.1	1.1	9	2		

Table 3: Surface water quality tests at SP1(sedimentation pond) for discharge review – turbidity versus suspended solids (SS)

SP1	Frequency required by licence	pH	Turbidity	Received from laboratory	Accessible on Council website by	SS
Measure		1-14	NTU			mg/L
Daily for discharge						
03/02/20		7.63	65.5		10/03/20	
04/02/20		7.47	71.3	19/02/20	10/03/20	9
10/02/20	OVERFLOW	7.41	380		10/03/20	
10/02/20	OVERFLOW (LAB)	7.78	NT	19/02/20	10/03/20	164
14/02/20	OVERFLOW	7.28	189		10/03/20	
17/02/20	OVERFLOW	7.66	90.6		10/03/20	
17/02/20	OVERFLOW (LAB)	7.93	Not tested	27/02/20	10/03/20	88
19/02/20		7.49	80		10/03/20	
20/02/20		7.52	78		10/03/20	
21/02/20		7.51	71		10/03/20	
24/02/20		7.51	65.1		10/03/20	
24/02/20		7.63	Not tested	09/03/20	10/03/20	73
25/02/20		7.44	59.6		10/03/20	
14/04/20		8.00	78.0		03/06/20	
05/05/20		9.14	25.6	14/05/20	03/06/20	19
23/06/20		7.63	79.9		24/07/20	
27/06/20		8.08	50.9	06/07/20	24/07/20	22
29/06/20					25/02/21	
27/07/20		8.23	42.7		25/02/21	
23/12/20		7.78	71.7		25/02/21	
24/12/20					25/02/21	
25/12/20					25/02/21	
05/01/21	RELEASE	6.57	78.3		25/02/21	
06/01/21	RELEASE	9.23	78.0		20/05/21	
18/01/21	RELEASE	9.04	73.0		20/05/21	
19/01/21	RELEASE	8.59	65.3		20/05/21	
26/01/21		8.58	120.8	05/02/21	25/02/21	33
22/03/21		7.50	86.3	29/04/21	20/05/21	46
27/03/21		7.75	90.3		20/05/21	
28/03/21	RELEASE	7.96	74.3		20/05/21	
29/03/21	RELEASE	7.40	68.3		20/05/21	
09/04/21	RELEASE	8.11	72.3		20/05/21	
18/04/21		7.21	122.0	29/04/21	20/05/21	120
27/05/21		8.78	51.9		22/07/21	
18/06/21		7.48	145.0	02/07/21	22/07/21	65
24/09/21	RELEASE	7.24	77.4		05/11/21	
09/10/21		7.14	36.8	18/10/21	05/11/21	29
25/10/21	RELEASE	7.26	55.3		04/03/22	
15/11/21	RELEASE	8.35	79.3		04/03/22	
06/12/21		6.94	97.6		04/03/22	
07/12/21	RELEASE	8.18	79.2		04/03/22	
13/12/21		7.84	103		04/03/22	
14/12/21	RELEASE	7.90	80		04/03/22	
17/12/21		8.44	84.5		04/03/22	

SP1	Frequency required by licence	pH	Turbidity	Received from laboratory	Accessible on Council website by	SS
Measure		1-14	NTU			mg/L
Daily for discharge						
20/12/21	RELEASE	8.75	75.31		04/03/22	
21/12/21	RELEASE	9.09	41.9		04/03/22	
23/12/21	RELEASE	8.15	67.8		04/03/22	
30/01/22		8.57	56.8	14/02/22	04/03/22	40
07/02/22	RELEASE	8.76	67.6		25/05/22	
08/02/22	RELEASE	8.74	61.2		25/05/22	
08/03/22	RELEASE	8.34	44.4		25/05/22	
10/03/22	RELEASE	7.18	43.1		25/05/22	
14/03/22	RELEASE	7.59	43.1		25/05/22	
31/03/22	RELEASE	5.43	76.5		25/05/22	
05/04/22	RELEASE	6.36	51.4		25/05/22	
07/04/22	RELEASE	7.94	56.4		25/05/22	
27/04/22		6.92	41.7	05/05/22	25/05/22	24
09/05/22	RELEASE	8.37	73.8		20/07/22	
10/05/22	RELEASE	8.45	64.6		20/07/22	
20/05/22	RELEASE	7.01	50		20/07/22	
23/05/22	RELEASE	8.36	57.4		20/07/22	
24/05/22		7.84	115.0		20/07/22	
30/05/22	RELEASE	8.45	64.6		20/07/22	
01/06/22		8.14	105.0		20/07/22	
03/06/22	RELEASE	8.25	76.3		20/07/22	
06/06/22	RELEASE	8.13	79.6		20/07/22	
17/06/22		8.19	69.6	30/06/22	20/07/22	25
04/07/22		7.71	107.0		27/02/23	
11/07/22	RELEASE	7.98	77.1		27/02/23	
12/07/22	RELEASE	8.04	77.9		27/02/23	
13/07/22	RELEASE	8.03	76.0		27/02/23	
27/07/22	RELEASE	8.17	77.5		27/02/23	
19/09/22	RELEASE	7.04	73.7		27/02/23	
10/10/22	RELEASE	7.64	79.2		27/02/23	
11/10/22	RELEASE	7.81	72.8		27/02/23	
12/10/22	RELEASE	7.88	68.4		27/02/23	
31/10/22	RELEASE	7.98	78.3		27/02/23	
26/01/23		8.21	1178.0	06/02/23	27/02/23	231
17/03/23		7.37	417.0	29/03/23	21/04/23	144
28/06/23		7.61	384.0	11/07/23	31/07/23	22
04/09/23		8.73	77.4	12/09/23	03/10/23	18
20/11/23		8.82	147.7	05/12/23	27/12/23	38
11/03/24		8.31	108.0	19/03/24	10/04/24	39

Table 4: Leachate quality – field analytes, and laboratory analytes (a)

Sampling date	Frequency required by licence	DO	EC	pH	Eh	Temp	Alk	Received from laboratory	Accessible on Council website by	SO ₄	Cl	Ca	Mg	Na	K	As	Cd	Cr	Ni	Pb	Mn	Fe
								mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LP1 (quality) 6 monthly		LP1 (quality)																				
04/02/20		0.05	1823	7.68	-214	24.8	480	19/02/20	10/03/20	4	302	78	30	249	39	0.008	<0.0001	0.011	0.015	0.002	1.46	0.54
27/06/20		9.80	2238	8.51	+48	16.7	920	06/07/20	24/07/20	35	388	64	44	331	55	0.009	<0.0001	0.011	0.019	<0.001	0.388	0.55
26/01/21		20.34	2530	8.79	+11	33.4	680	05/02/21	25/02/21	16	543	34	58	421	77	0.012	<0.0001	0.014	0.020	<0.001	0.197	0.68
18/06/21		14.22	3415	8.33	+35	20.0	1093	02/07/21	22/07/21	12	638	63	54	387	69	0.012	0.0001	0.016	0.026	0.002	0.380	0.43
30/01/22		6.54	3655	8.37	-8	29.0	1040	14/02/22	04/03/22	13	722	32	78	637	111	0.013	<0.0001	0.018	0.032	<0.001	0.318	0.27
16/06/22		18.11	3195	8.08	+30	20.0	1053	30/06/22	20/07/22	5	530	60	61	448	92	0.012	<0.0001	0.028	0.028	<0.001	0.420	0.59
27/01/23		4.88	5850	8.32	+21	25.2	1667	06/02/23	27/02/23	40	1220	49	122	1020	185	0.045	<0.0001	0.072	0.068	0.001	0.332	2.67
26/06/23		4.19	5590	8.25	-51	17.6	1720	11/07/23	31/07/23	58	1270	74	116	1010	174	0.030	<0.0001	0.073	0.064	0.001	0.798	1.42
21/11/23		7.42	5540	8.82	+9	26.0	1360	05/12/23	27/12/23	159	1310	52	125	1110	182	0.039	<0.0001	0.054	0.077	<0.001	0.310	1.31

Table 5: Leachate quality – laboratory analytes (b)

Sampling date	Frequency required by licence	NH ₃	NO _x	TKN	TN	TP	TOC	VOC compounds
LP1 (quality) 6 monthly								
04/02/20		14.1	0.10	22.4	22.5	0.33	96	2-Butanone (MEK) 0.1
27/06/20		23.5	0.11	40.9	41.0	0.47	58	nil detected
26/01/21		18.2	<0.01	28.7	28.7	0.34	87	nil detected
18/06/21		53.0	0.09	70.8	70.9	0.76	79	nil detected
30/01/22		23.0	0.11	36.9	37.0	0.26	114	nil detected
16/06/22		74.8	0.12	80.8	80.9	0.26	112	nil detected
27/01/23		84.3	<0.05	130.0	130.0	2.39	202	nil detected
26/06/23		116	0.05	135.0	1.035	3.14	191	nil detected
21/11/23		24.2	<0.01	69.4	69.4	3.30	238	nil detected

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.

The Grafton Regional Landfill has been divided into a grid pattern by which to report surface methane detections.

Comments on methane monitoring results:
Methane is occasionally detected. **Hotspots** $\geq 3\%$ LEL and repeat hotspots are remediated with soil cover usually by the next day.

Note: Dark blue area not in use as landfill as yet.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z			
1																													
2																0	0											1011	
3																0	0	0	0									1010	
4																0	0	0	0	0								1009	
5																0	0	0	0	0								1008	
6																0	0	0	0	0								1007	
7																0	0	0	0	0	0	0						1006	
8									0	0	0	0	0	0	0	0	0	0	0	0	0	0						1005	
9			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					1004	
10			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				1003	
11				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				1002	
12					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1001
13					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1000
14					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	999
15					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	998
16					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	997
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	998	
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	999	
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1000	
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1001	
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1002	
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1003	
23																												1004	
	316	315	314	313	312	311	310	309	308	307	306	305	304	303	302	301	300	299	298	297	296	295	294	293	292	291	290		

Table 6: Methane detections (surface and building)

Frequency required by licence	Detection locations	Methane (CH ₄) by volume in air	Methane (CH ₄) by volume in air	Methane (CH ₄) as % LEL (Lower Explosive Limit)	Accessible on Council website by	Remediation
3 monthly		ppm CH ₄ in air	% CH ₄ in air	% LEL		
24/03/20	No readings above threshold				03/06/20	
22/06/20	No readings above threshold				24/07/20	
13/10/20	No readings above threshold				25/02/21	
23/12/20	No readings above threshold				25/02/21	
30/03/21	No readings above threshold				20/05/21	
03/06/21	No readings above threshold				22/07/21	
15/09/21	No readings above threshold				05/11/21	
15/12/22	No readings above threshold				04/03/22	
23/03/22	No readings above threshold				25/05/22	
07/06/22	No readings above threshold				20/07/22	
06/09/22	No readings above threshold				27/02/23	
20/12/22	No readings above threshold				27/02/23	
14/03/23	No readings above threshold				21/04/23	
06/06/23	No readings above threshold				31/07/23	
08/09/23	No readings above threshold				03/10/23	
13/12/23	No readings above threshold				06/02/24	

Note: 500 ppm CH₄ by volume in air = 0.05% CH₄ by volume in air = 1% LEL

Table 7: Monthly rainfall (from Grafton Regional Landfill weather station 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
January	365.7	03/06/20	172.5	20/05/21	135.4	25/05/22	123.2	21/04/23
February	710.4	03/06/20	214.5	20/05/21	832.9	25/05/22	51.0	21/04/23
March	171.0	03/06/20	518.0	20/05/21	244.6	25/05/22	117.8	21/04/23
April	69.5	24/07/20	133.3	22/07/21	127.8	20/07/22	106.0	31/07/23
May	4.4	24/07/20	63.5	22/07/21	70.4	20/07/22	50.8	31/07/23
June	93.2	24/07/20	16.1	22/07/21	5.4	20/07/22	13.0	31/07/23
July	58.7	25/02/21	56.1	05/11/21	65.2	27/02/23	12.0	03/10/23
August	48.4	25/02/21	53.1	05/11/21	28.0	27/02/23	9.0	03/10/23
September	23.0	25/02/21	45.1	05/11/21	169.2	27/02/23	0.6	06/02/24
October	62.6	25/02/21	188.9	04/03/22	105.8	27/02/23	1.6	06/02/24
November	16.3	25/02/21	277.9	04/03/22	38.0	27/02/23	179.8	06/02/24
December	492.5	25/02/21	190.6	04/03/22	50.6	27/02/23	122.6	06/02/24