

# Gunnedah Landfill

Location: Quia Road, Gunnedah NSW 2380      Environment Protection Licence Number: 5940

Activities: Waste disposal to land and waste processing

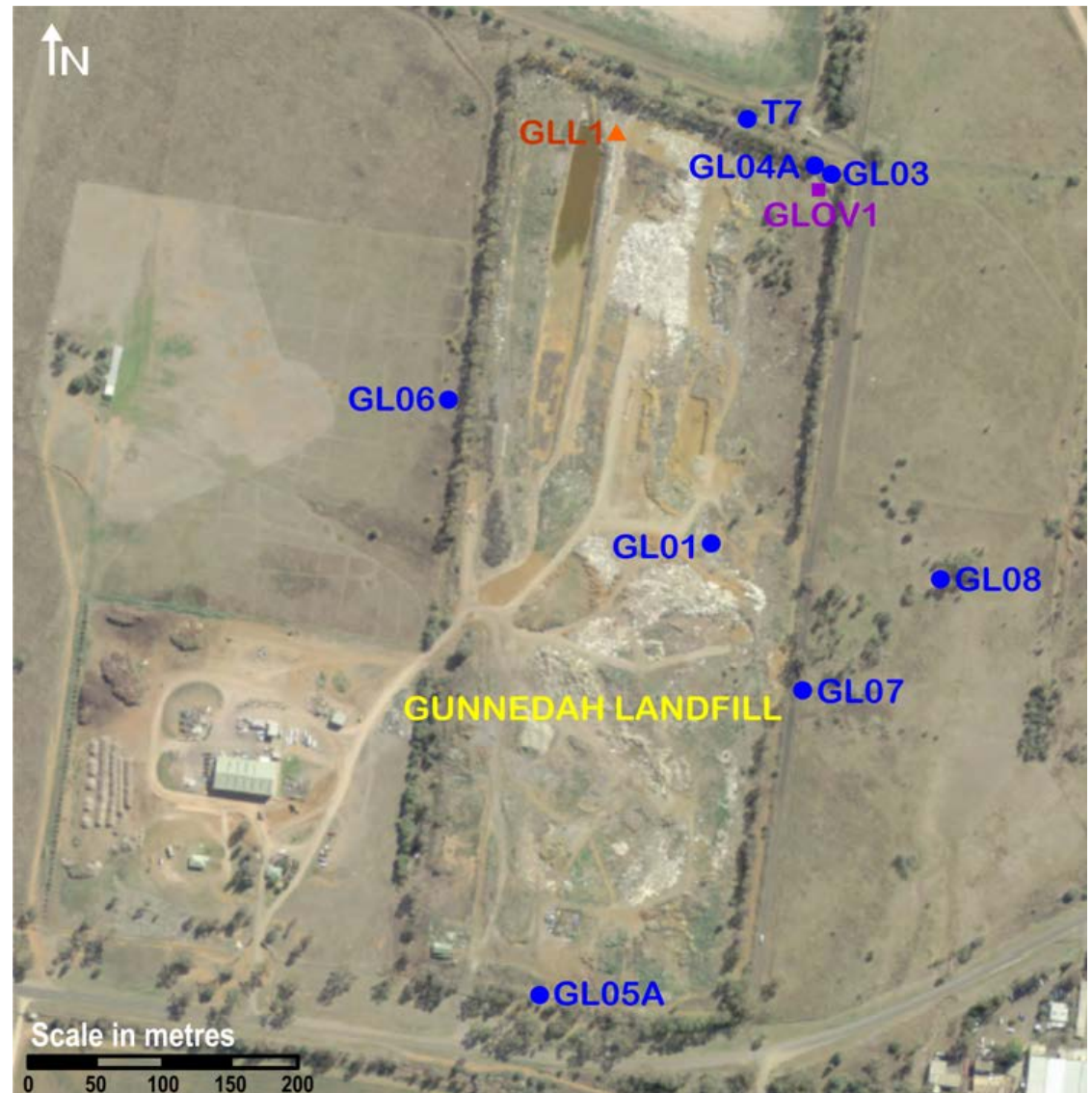
Licensee under Protection of Environment Operations Act 1997 (POEO Act): Gunnedah Shire Council, PO Box 63, Gunnedah NSW 2380

The internet link to Licence No. 5940 is <http://www.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=31956&SYSUID=1&LICID=5940>

Council is required to monitor groundwater, surface water, leachate and methane 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.

Locations of the sampling points are shown on the adjacent figure. Historical names are used: GL = Gunnedah Landfill; OV = Overflow; GL01-GL08 refers to groundwater monitoring wells; L = Leachate; T = Tannery well. Corresponding Environment Protection Authority (EPA) Identification Numbers detailed as per the order in the Licence are provided below. A few EPA ID numbers are missing due to changes since initial licensing of the landfill.

EPA No. 1	GLOV1 (surface water overflow)
EPA No. 4	GLL1 (leachate in sump which drains cell)
EPA No. 5	Surface methane monitoring
EPA No. 6	GL01 (groundwater monitoring well)
EPA No. 8	GL03 (groundwater monitoring well)
EPA No. 9	GL04 (groundwater monitoring well)
EPA No. 10	GL05 (groundwater monitoring well)
EPA No. 11	GL06 (groundwater monitoring well)
EPA No. 12	GL07 (groundwater monitoring well)
EPA No. 13	T7 previously NWL7 (groundwater monitoring well)
EPA No. 14	GL08 (groundwater monitoring well)



Base map: Gunnedah Shire Council 2012

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 the following tables according to chemical grouping to assist chemical review. [Analytes are listed on the licence in alphabetical order.] They include 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 Gunnedah Shire Council website.

Abbreviations made in the tables are provided here in alphabetical order:

Alk = Alkalinity measured as mg/L CaCO<sub>3</sub> equivalent; Cl = Chloride; Cr = Chromium; D = Depth to groundwater from top of internal well PVC casing; DO = Dissolved Oxygen; EC = Electrical Conductivity also called conductivity; Eh = Redox Potential; Fe = Iron; Mn = Manganese; ND = Nil Detected; NH<sub>3</sub> = Ammonia as a measure of ammonium ions; NO<sub>x</sub> = Nitrite + Nitrate; NR = Not required; OC & OP = Organochlorine and Organophosphorus; RL = water level converted to Reduced Level relative to mean sea level; 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.

Measures:

mg/L = milligram per litre (equivalent to ppm); μS/cm = microSiemens per centimetre; mV = millivolts; °C= degrees Celsius; ppm = parts per million; < = less than.

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 Gunnedah Landfill groundwater is a case in point. Its high EC levels (Table 1) are not due to landfill leachate because they were these concentrations before any solid waste was accepted at the Gunnedah Landfill. They are due to the clay strata.

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. 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 have increased due to leaching of iron and manganese from the soil after excessive rainfall or flood water infiltration.
- Organic analytes such as Benzene, Toluene, Ethylbenzene, Xylene (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 monitoring results: Nitrate in on-site wells GL01 and GL03 is too high. Surface water has not discharged from the evapotranspiration basin. Leachate in the sump is saline and high in ammonium ions.

Table 1a: Groundwater quality & depth (GL01, GL03)

Frequency required by licence		DO	EC	pH	Eh	Temp	D	RL	Alk
Measure		mg/L	µS/cm	1-14	mV	°C	m	m	mg/L
<b>GL01 6 monthly</b>									
31/01/13		0.16	6100	6.61	+153	26.1	0.02	276.31	317
18/06/13		0.34	5663	6.50	+120	23.1	0.17	276.16	613
04/12/13		0.18	5248	6.50	+206	27.7	0.64	275.69	633
09/07/14		0.20	5580	6.56	+168	23.6	0.47	275.86	607
30/11/14		0.15	5435	6.59	+142	27.4	0.97	275.36	593
20/06/15		0.60	5338	6.72	+246	24.4	0.36	275.97	600
06/12/15		0.37	5483	6.69	+130	27.5	0.97	275.36	547
16/06/16		0.31	5480	6.59	+179	26.1	1.16	275.17	613
31/01/17		0.16	5590	6.77	+91	28.7	0.92	275.41	593
<b>GL03 3 monthly</b>									
31/01/13		0.48	5350	6.60	+120	29.3	0.87	271.79	713
16/04/13		0.51	5106	6.56	+91	22.8	0.78	271.88	645
18/06/13		0.65	5238	6.41	+151	16.5	0.96	271.70	640
23/09/13		1.29	5095	6.71	+150	17.6	0.89	271.77	647
04/12/13		0.95	4528	6.62	+191	22.3	1.10	271.56	733
12/03/14		0.74	4395	6.67	+109	22.7	1.30	271.36	620
09/07/14		0.63	4810	6.72	+137	16.8	0.86	271.80	625
17/09/14		0.86	4605	6.71	+131	19.1	0.94	271.72	620
30/11/14		2.39	3614	6.55	+104	22.3	1.27	271.39	609
09/03/15		0.93	4838	6.71	+84	22.6	1.27	271.39	667
20/06/15		0.94	4553	6.86	+135	19.0	0.95	271.71	627
16/09/15		1.83	4543	6.89	+217	20.5	0.87	271.79	627
07/12/15		1.75	4910	6.72	+157	26.3	1.23	271.43	630
08/03/16		0.34	4333	6.80	+96	23.2	1.40	271.26	600
17/06/16		0.76	4530	6.81	+102	19.7	1.42	271.24	613
22/09/16		0.51	4335	6.83	+118	19.7	0.76	271.90	610
31/01/17		0.68	4563	6.85	+87	25.7	1.20	271.46	567
12/04/17		0.68	4460	6.45	+190	21.2	1.27	271.39	633

Received from laboratory	Accessible on Council website by	SO <sub>4</sub>	Cl	Cr	Mn	Fe	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	OC/OP Pesticides
		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>GL01</b>												Annually
13/02/13	28/02/13	455	1400	<0.001	<0.001	<0.05	0.04	22.80	0.7	23.5	<1	NR
28/06/13	12/07/13	402	1280	0.002	<0.001	<0.05	0.05	21.30	2.5	23.8	<1	ND
16/12/13	23/12/13	349	1270	<0.001	<0.001	<0.05	0.04	22.00	1.9	23.9	34	NR
17/07/14	06/08/14	365	1360	<0.001	<0.001	<0.05	0.02	21.60	2.2	23.8	35	ND
12/12/14	24/12/14	346	1080	0.032	0.011	<0.05	0.02	19.30	1.8	21.1	4	NR
14/07/15	28/07/15	408	1350	<0.001	<0.001	<0.05	0.76	18.50	2.1	20.6	8	ND
17/12/15	08/01/16	362	1160	<0.001	<0.001	<0.05	<0.01	18.50	3.8	22.3	<5	NR
13/07/16	02/08/16	376	1240	<0.001	<0.001	<0.05	0.03	22.10	3.9	26.0	5	ND
09/02/17	01/03/17	379	1260	<0.001	0.002	<0.05	0.58	22.8	2.0	24.8	8	ND
<b>GL03</b>												Annually
13/02/13	28/02/13	391	1210	<0.001	0.086	0.08	0.04	21.3	0.9	22.2	<1	NR
26/04/13	17/05/13	376	1070	<0.001	0.091	0.14	0.05	19.8	2.3	22.1	<1	NR
28/06/13	12/07/13	352	1070	0.001	0.116	0.15	0.04	20.0	2.4	22.4	2	ND
30/09/13	10/10/13	342	1110	<0.001	0.096	0.14	0.04	20.6	1.4	22.0	64	NR
16/12/13	23/12/13	319	1070	<0.001	0.100	<0.05	0.04	22.0	2.3	24.3	44	NR
19/03/14	07/04/14	332	1130	<0.001	0.100	<0.05	0.04	18.5	1.6	20.1	<1	NR
17/07/14	06/08/14	324	1100	<0.001	0.078	<0.05	0.03	20.6	2.6	23.2	16	ND
29/09/14	14/10/14	306	1020	<0.001	0.082	<0.05	0.03	18.8	1.3	20.1	9	NR
12/12/14	24/12/14	312	928	<0.001	0.083	<0.05	0.02	18.6	1.9	20.5	<1	NR
19/03/15	10/04/15	325	1040	<0.001	0.067	<0.05	0.04	18.7	2.7	21.4	5	NR
14/07/15	28/07/15	352	1080	<0.001	0.068	<0.05	0.03	17.7	2.0	19.7	7	ND
25/09/15	15/10/15	312	1010	<0.001	0.066	<0.05	0.02	20.3	1.4	21.7	<5	NR
17/12/15	08/01/16	339	989	<0.001	0.452	0.26	0.07	14.6	2.0	16.6	<1	NR
17/03/16	08/04/16	285	994	<0.001	0.078	<0.05	0.22	18.7	3.6	22.3	<5	NR
13/07/16	02/08/16	305	967	<0.001	0.080	<0.05	<0.01	19.2	3.2	22.4	<1	ND
05/10/16	24/10/16	304	878	<0.001	0.062	<0.05	0.02	16.7	0.2	16.9	17	NR
09/02/17	01/03/17	295	960	<0.001	0.051	<0.05	0.06	17.9	1.9	19.8	3	ND
27/04/17	11/05/17	291	1020	<0.001	0.061	<0.05	0.07	16.6	2.3	18.9	16	NR

Table 1b: Groundwater quality & depth (GL04A, GL05A, GL06)

Frequency required by licence									Received from laboratory	Accessible on Council website by	SO <sub>4</sub>	Cl	Cr	Mn	Fe	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	OC/OP Pesticides
Measure	mg/L	µS/cm	1-14	mV	°C	m	m	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
<b>GL04A</b> 6 monthly									<b>GL04A</b> Annually												
31/01/13	3.17	5640	6.22	+133	27.1	1.91	271.00	70	13/02/13	28/02/13	82	1470	0.002	0.074	0.11	0.08	117	1	118	18	ND
19/06/13	1.83	4662	6.60	-36	17.0	2.80	270.11	440	28/06/13	12/07/13	49	1210	0.003	0.680	0.56	0.08	13.6	2.9	16.5	<1	NR
12/03/14	0.92	5590	6.70	-109	24.5	3.10	269.81	93	19/03/14	07/04/14	<10	1560	0.002	8.690	11.9	0.58	0.02	3.9	3.9	202	ND
09/07/14	0.91	4303	6.87	+244	15.3	2.26	270.65	477	17/07/14	06/08/14	23	1180	<0.001	0.756	0.07	0.02	1.24	0.8	2.0	18	ND
01/12/14	DRY										DRY										
09/03/15	DRY										DRY										
20/06/15	3.78	4495	7.02	+75	18.4	2.24	270.67	500	14/07/15	28/07/15	33	1350	<0.001	2.09	<0.05	0.02	0.38	0.8	1.2	<1	ND
17/06/16	DRY										DRY										
22/09/16	1.84	2107	6.46	+101	17.5	0.81	272.1	67	05/10/16	24/10/16	66	566	<0.001	0.025	<0.05	<0.01	0.16	0.8	1.0	10	ND
31/01/17	DRY										DRY										
12/04/17	1.58	16180	6.54	-210	22.5	3.10	269.81	1200	27/04/17	11/05/17	75	5310	0.003	9.64	3.08	1.72	0.10	4.8	4.9	64	ND
<b>GL05A</b> 6 monthly									<b>GL05A</b> Annually												
31/01/13	0.45	4483	7.00	-118	22.9	2.66	278.73	694	13/02/13	28/02/13	179	887	<0.001	3.930	1.44	0.04	0.01	0.4	0.4	4	ND
19/06/13	0.60	4258	6.97	-255	19.0	2.47	278.92	1000	28/06/13	12/07/13	116	836	0.001	0.860	2.01	0.06	<0.01	0.3	0.3	5	NR
04/12/13	0.25	4245	6.87	+77	23.4	2.69	278.70	1133	16/12/13	23/12/13	129	833	<0.001	0.955	1.04	0.06	<0.01	0.4	0.4	52	ND
08/07/14	0.25	4003	7.09	-102	22.1	2.64	278.75	969	17/07/14	06/08/14	127	745	<0.001	0.715	0.22	0.03	0.01	1.0	1.0	20	ND
01/12/14	2.15	3839	7.01	-29	23.0	2.96	278.43	1000	12/12/14	24/12/14	155	624	<0.001	0.792	<0.05	0.02	0.01	0.4	0.4	10	ND
20/06/15	1.11	3580	7.13	+12	21.1	3.03	278.36	947	14/07/15	28/07/15	136	608	<0.001	0.305	0.05	0.02	0.02	0.2	0.2	19	NR
06/12/15	0.56	3480	7.09	-105	23.9	3.26	278.13	940	17/12/15	08/01/16	136	510	<0.001	1.46	<0.05	0.06	0.03	0.3	0.3	<1	ND
17/06/16	0.48	4473	6.95	-80	22.3	3.50	277.89	1087	13/07/16	02/08/16	138	827	<0.001	1.56	0.38	0.13	0.02	1.1	1.1	13	ND
31/01/17	0.28	4473	7.08	-158	25.1	3.52	277.87	1020	09/02/17	01/03/17	146	835	<0.001	1.24	0.34	0.27	0.02	0.7	0.7	13	ND
<b>GL06</b> 6 monthly									<b>GL06</b> Annually												
31/01/13	0.21	14750	6.75	+19	22.2	2.96	274.03	1000	13/02/13	28/02/13	43	4880	0.004	0.954	0.6	0.08	<0.01	3.2	3.2	47	NR
18/06/13	0.42	16312	6.50	+69	20.5	2.93	274.06	1100	28/06/13	12/07/13	46	5670	0.005	1.36	0.72	0.08	<0.01	4.2	4.2	46	ND
04/12/13	0.22	15078	6.63	+20	22.7	3.02	273.97	1173	16/12/13	23/12/13	70	5750	0.003	3.05	0.60	0.13	<0.01	4.4	4.4	136	NR
08/07/14	0.16	18393	6.61	+10	21.5	2.91	274.08	1147	17/07/14	06/08/14	52	6640	0.003	3.57	0.62	0.10	<0.01	3.6	3.6	12	ND
01/12/14	0.08	18240	6.63	+28	21.5	3.16	273.83	1150	12/12/14	24/12/14	54	5950	0.002	4.72	0.36	0.10	0.01	1.3	1.3	86	NR
20/06/15	0.36	19458	6.69	+94	21.0	2.84	274.15	1235	14/07/15	28/07/15	85	7020	0.002	5.41	0.28	0.13	<0.01	4.5	4.5	63	ND
06/12/15	0.32	20960	6.55	+60	21.5	3.12	273.87	1250	17/12/15	08/01/16	59	6940	0.001	7.26	0.38	0.20	0.01	5.5	5.5	57	NR
17/06/16	0.39	20583	6.54	+45	21.5	3.46	273.53	1280	13/07/16	02/08/16	60	7230	0.003	9.93	0.29	0.17	<0.01	5.8	5.8	100	ND
31/01/17	0.39	20583	6.62	+15	23.7	3.25	273.74	1227	09/02/17	01/03/17	60	7010	0.003	10.10	0.33	0.27	<0.01	6.7	6.7	36	ND

Table 1c: Groundwater quality & depth (GL07)

Frequency required by licence		DO	EC	pH	Eh	Temp	D	RL	Alk	Received from laboratory	Accessible on Council website by	SO <sub>4</sub>	Cl	Cr	Mn	Fe	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	OC/OP Pesticides
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
GL07 6 monthly		GL07										Annually										
31/01/13		0.15	12000	6.59	+22	26.5	0.76	275.61	1067	13/02/13	28/02/13	14	3900	0.002	1.40	0.48	0.54	0.16	1.5	1.7	3	NR
16/04/13		0.44	11705	6.48	+63	23.3	1.05	275.32	1067	26/04/13	17/05/13	<1	3770	0.002	1.37	0.56	0.67	0.01	1.3	1.3	<1	NR
19/06/13		0.44	11605	6.50	+15	17.7	0.79	275.58	1044	28/06/13	12/07/13	9	3880	0.001	1.29	0.38	0.64	0.06	1.6	1.7	8	ND
23/09/13		0.26	12343	6.61	+64	20.1	0.82	275.55	1031	30/09/13	10/10/13	6	4400	<0.001	1.24	0.62	0.70	<0.01	1.5	1.5	132	NR
04/12/13		0.33	10905	6.57	0	25.3	0.91	275.46	1031	16/12/13	23/12/13	5	3830	<0.001	1.46	0.86	0.68	<0.01	1.4	1.4	68	NR
11/03/14		0.70	10900	6.52	-23	27.3	0.90	275.47	947	19/03/14	07/04/14	16	4310	<0.001	1.74	1.45	0.52	0.10	1.4	1.5	12	NR
08/07/14		0.59	12305	6.74	+492	18.2	0.82	275.55	967	17/07/14	06/08/14	6	4220	<0.001	1.26	0.57	0.58	0.01	1.2	1.2	38	ND
17/09/14		0.52	12382	6.59	+19	18.9	0.96	275.41	1020	29/09/14	14/10/14	<1	4310	<0.001	1.63	0.56	0.55	<0.01	1.1	1.1	22	NR
01/12/14		0.31	12873	6.62	+30	26.1	1.15	275.22	1000	12/12/14	24/12/14	5	4090	<0.001	1.39	0.54	0.56	0.09	1.2	1.3	5	NR
09/03/15		0.38	13735	6.44	-2	27.1	1.11	275.26	867	19/03/15	10/04/15	16	4800	<0.001	2.68	0.84	0.59	0.05	1.1	1.2	27	NR
19/06/15		0.34	14828	6.78	+125	18.7	0.62	275.75	880	14/07/15	28/07/15	20	5280	<0.001	6.83	0.09	0.41	0.03	1.4	1.4	12	ND
16/09/15		0.27	13293	6.74	+34	20.0	0.89	275.48	969	25/09/15	15/10/15	9	4670	<0.001	1.96	0.59	0.49	0.03	1.7	1.7	18	NR
05/12/15		0.53	13582	6.61	+28	25.9	1.15	275.22	887	17/12/15	08/01/16	16	4620	<0.001	1.81	0.60	0.62	0.09	1.8	1.9	5	NR
08/03/16		0.34	14270	6.60	+1	28.2	1.30	275.07	893	17/03/16	08/04/16	18	4940	<0.001	3.14	0.88	0.61	0.02	2.2	2.2	14	NR
17/06/16		0.46	19935	6.58	+108	19.9	0.99	275.38	735	13/07/16	02/08/16	25	7120	<0.001	24.0	0.09	0.78	0.02	3.7	3.7	43	ND
22/09/16		0.31	15543	6.62	+62	18.9	0.67	275.70	953	05/10/16	24/10/16	7	5000	<0.001	8.73	0.11	0.50	0.01	2.0	2.0	28	NR
01/02/17		0.26	16635	6.52	-15	28.9	0.96	275.41	909	09/02/17	01/03/17	13	5740	<0.001	8.26	1.14	0.74	0.09	2.8	2.9	45	ND
12/04/17		0.29	17715	6.33	+34	25.0	1.06	275.31	850	27/04/17	11/05/17	23	6020	<0.001	16.6	0.44	1.15	<0.01	3.7	3.7	47	NR

Table 1d: Groundwater quality & depth (GL08, T7)

Frequency required by licence									Received from laboratory	Accessible on Council website by	SO <sub>4</sub>	Cl	Cr	Mn	Fe	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	OC/OP Pesticides	
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	
<b>GL08 3 monthly</b>									<b>GL08</b>													Annually
31/01/13	0.45	5700	6.70	-77	28.2	1.29	273.326	900	13/02/13	28/02/13	346	1320	<0.001	0.708	13.0	1.68	0.02	1.7	1.7	5	NR	
16/04/13	2.50	5808	6.76	-74	23.0	1.13	273.486	900	26/04/13	17/05/13	332	1170	<0.001	0.598	6.89	1.56	<0.01	1.6	1.6	<1	NR	
19/06/13	0.73	5698	6.55	-87	16.8	1.30	273.316	867	28/06/13	12/07/13	333	1170	<0.001	0.606	14.10	1.85	<0.01	1.9	1.9	4	ND	
23/09/13	1.06	5533	6.87	-79	21.4	1.12	273.496	831	30/09/13	10/10/13	314	1160	<0.001	0.682	6.48	1.18	<0.01	1.2	1.2	77	NR	
04/12/13	1.21	4865	6.93	-101	24.9	1.34	273.276	840	16/12/13	23/12/13	312	1150	<0.001	0.736	7.01	1.10	<0.01	1.0	1.0	45	NR	
11/03/14	0.86	4870	6.95	-120	26.0	1.55	273.066	867	19/03/14	07/04/14	248	1260	<0.001	0.641	8.23	0.95	<0.01	1.0	1.0	<1	NR	
08/07/14	1.16	5488	7.14	-90	18.7	1.20	273.416	820	17/07/14	06/08/14	302	1260	<0.001	0.607	10.90	0.81	<0.01	0.9	0.9	21	ND	
17/09/14	1.05	5241	7.01	-110	20.3	1.10	273.516	840	29/09/14	14/10/14	281	1150	<0.001	0.621	11.7	0.86	<0.01	0.9	0.9	6	NR	
01/12/14	2.39	5313	6.88	-122	26.8	1.30	273.316	839	12/12/14	24/12/14	287	1040	<0.001	0.557	10.1	0.83	<0.01	0.9	0.9	10	NR	
09/03/15	0.86	5553	6.91	-135	27.6	1.46	273.156	840	19/03/15	10/04/15	318	1230	<0.001	0.513	10.5	0.86	0.02	0.9	0.9	3	NR	
21/06/15	1.69	5350	7.03	-49	18.1	1.24	273.376	827	14/07/15	28/07/15	348	1280	<0.001	0.548	8.56	0.01	<0.01	0.9	0.9	7	ND	
16/09/15	0.64	5368	6.94	-75	22.2	1.03	273.586	847	25/09/15	15/10/15	323	1140	<0.001	0.527	11.2	0.73	0.02	1.0	1.0	<5	NR	
05/12/15	1.91	5195	6.86	-59	23.2	1.33	273.286	820	17/12/15	08/01/16	304	1130	<0.001	0.540	10.0	0.75	0.08	1.0	1.1	6	NR	
08/03/16	0.45	5088	6.87	-82	26.3	1.56	273.056	847	17/03/16	08/04/16	288	1230	<0.001	0.548	11.3	0.81	<0.01	1.1	1.1	<5	NR	
17/06/16	0.52	5388	6.90	-61	20.5	1.67	272.946	840	13/07/16	02/08/16	320	1160	<0.001	0.554	10.6	0.74	0.05	0.9	1.0	13	ND	
22/09/16	0.29	4763	8.03	-204	19.6	1.05	273.566	473	05/10/16	24/10/16	190	1050	<0.001	0.129	0.68	0.83	0.01	1.1	1.1	17	NR	
01/02/17	0.67	5370	6.80	-125	27.8	1.43	273.186	951	09/02/17	01/03/17	318	1180	<0.001	0.513	9.46	0.91	<0.01	1.0	1.0	23	ND	
12/04/17	1.27	5235	6.71	-83	24.0	1.56	273.056	900	27/04/17	11/05/17	307	1020	<0.001	0.519	10.1	0.88	0.02	0.9	0.9	16	NR	
<b>T7 6 monthly</b>									<b>T7</b>													Annually
31/01/13	0.45	5700	6.70	-77	28.2	2.77	270.09	900	13/02/13	28/02/13	346	1320	<0.001	0.708	13.0	1.68	0.02	1.7	1.7	5	NR	
19/06/13	0.73	13123	6.55	+451	20.8	2.77	270.09	917	28/06/13	12/07/13	189	4530	<0.001	0.212	0.15	0.06	8.60	0.6	9.2	<1	ND	
04/12/13	0.51	11590	6.60	+548	23.4	3.15	269.71	723	16/12/13	23/12/13	166	4350	<0.001	0.331	<0.05	0.10	7.90	0.4	8.3	49	NR	
08/07/14	1.48	13158	6.64	+564	20.4	1.53	271.33	673	17/07/14	06/08/14	207	4760	<0.001	0.033	<0.05	0.02	8.64	0.4	9.0	29	ND	
01/12/14	0.14	13023	6.60	+553	23.9	2.97	269.89	667	12/12/14	24/12/14	194	4220	<0.001	0.071	<0.05	0.01	8.71	0.7	9.4	12	NR	
19/06/15	1.45	12730	6.82	+580	20.5	1.80	271.06	640	14/07/15	28/07/15	213	4450	<0.001	0.063	<0.05	0.03	8.12	0.8	8.9	2	ND	
05/12/15	0.39	13063	6.63	+545	21.8	2.83	270.03	680	17/12/15	08/01/16	201	4130	<0.001	0.245	<0.05	0.03	8.40	0.5	8.9	9	NR	
17/06/16	0.39	12510	6.63	+522	21.0	3.00	269.86	738	13/07/16	02/08/16	217	4120	0.001	0.240	<0.05	<0.01	8.96	1.2	10.2	14	ND	
01/02/17	0.19	12013	6.71	+97	22.3	2.44	270.42	713	09/02/17	01/03/17	198	3960	<0.001	0.422	<0.05	0.09	8.44	1.3	9.7	11	ND	

Note: T7 RL water levels adjusted to 04/12/13 to reflect survey Dec 2013.

Table 2: Surface water quality (GLOV1 on overflow)

Frequency required by licence	DO	EC	pH	Eh	Temp	Alk
Measure	mg/L	µS/cm	1-14	mV	°C	mg/L
<b>GLOV1</b> overflow, then wkly						
no overflow						

Received from laboratory	Accessible on Council website by	SS	SO <sub>4</sub>	Cl	Mn	Fe	NH <sub>3</sub>	TKN	NO <sub>x</sub>	TN	TOC	OC/OP Pesticides
		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>GLOV1</b>												

Table 3: Leachate quality (GLL1)

Frequency required by licence	DO	EC	pH	Eh	Temp	Alk
Measure	mg/L	µS/cm	1-14	mV	°C	mg/L
<b>GLL1</b> 6 monthly						
01/02/13	2.89	2615	7.81	+111	24.7	96
19/06/13	0.80	17400	6.74	-117	17.7	693
04/12/13	1.13	14235	6.82	-113	25.3	1153
09/07/14	2.78	16520	6.95	-73	19.6	667
01/12/14	0.52	16674	6.90	-127	27.4	1133
20/06/15	4.06	17290	7.15	-88	19.3	1267
07/12/15	0.27	18665	6.85	-128	29.1	1900
18/06/16	0.76	18100	7.08	-136	19.6	2000
31/01/17	0.18	18805	7.35	-189	28.8	2067

Received from laboratory	Accessible on Council website by	SO <sub>4</sub>	Cl	Cr	Mn	Fe	NH <sub>3</sub>	NO <sub>x</sub>	TKN	TN	TOC	OC&OP Pesticides
		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>GLL1</b>												
13/02/13	28/02/13	46	639	0.006	0.278	1.25	3.13	13.70	6.6	20.3	26	ND
28/06/13	12/07/13	26	5730	0.035	9.92	27.3	180.0	<0.01	176.0	176.0	104	ND
16/12/13	23/12/13	9	4910	0.179	12.70	72.8	254.0	<0.01	241.0	241.0	188	ND
17/07/14	06/08/14	67	6080	0.018	16.20	29.3	108.0	<0.01	112.0	112.0	101	ND
12/12/14	24/12/14	<1	4970	0.112	8.98	35.4	402	0.01	468.0	468.0	202	ND
14/07/15	28/07/15	<1	5610	0.056	8.76	27.5	176.0	0.69	223.0	224.0	148	ND
17/12/15	08/01/16	<5	5350	0.143	7.64	37.3	407.0	0.02	466.0	466.0	144	ND
13/07/16	02/08/16	<10	5560	0.129	8.65	34.1	356.0	0.26	393.0	393.0	38	ND
09/02/17	01/03/17	2	5740	0.208	6.12	40.8	413.0	0.38	426.0	426.0	334	ND

**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 than none is escaping to air, and in buildings to assure against asphyxiation and explosion.

Comments on methane monitoring results: Methane is rarely detected at the Gunnedah Landfill or surrounds. When detected, remediation is promptly undertaken.

**Table 4: 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
Measure		ppm CH <sub>4</sub> in air	% CH <sub>4</sub> in air	% LEL	
3 monthly					
01/02/13	nil detected				28/02/13
16/04/13	nil detected				17/05/13
18/06/13	nil detected				12/07/13
23/09/13	no reportable detections at any sampling location				10/10/13
06/12/13	~150 m north of SE corner of landfill	570	0.057	1.14	23/12/13
12/03/14	no reportable detections at any sampling location				07/04/14
09/07/14	no reportable detections at any sampling location				06/08/14
17/09/14	no reportable detections at any sampling location				14/10/14
01/12/14	no reportable detections at any sampling location				24/12/14
09/03/15	no reportable detections at any sampling location				10/04/15
19,21/6/15	no reportable detections at any sampling location				28/07/15
16/09/15	no reportable detections at any sampling location				15/10/15
11/12/15	no reportable detections at any sampling location				08/01/16
08/03/16	no reportable detections at any sampling location				08/04/16
16/06/16	no reportable detections at any sampling location				02/08/16
22/09/16	no reportable detections at any sampling location				24/10/16
31/1&1/2/17	no reportable detections at any sampling location				01/03/17
12/04/17	no reportable detections at any sampling location				11/05/17

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