

Z0096704

25 July 2016

T&T Landfills Ltd
Happy Valley Road
WELLINGTON

Attention: Sophie Gray
Landfill Manager

Dear Sophie

Quarterly Stream Monitoring Results – July 2016

Stream surface water and groundwater quality monitoring at T&T Landfill is required by conditions 7 and 8 of discharge permit WGN070260 [26124] to be undertaken every three months. The sampling sites are:

- TTW - western gully stream (true right branch) at the northern end of the landfill
- TTE - eastern gully stream (true left branch) at the northern end of the landfill
- TTD - lower stream, 100 m downstream from the toe of the landfill
- TTG - groundwater bore 100 m downstream from the toe of the landfill
- OSU - Owhiro Stream upstream of the landfill tributary
- OSD - Owhiro Stream downstream of the landfill tributary

This report relates to routine quarterly monitoring undertaken in July 2016 (Laboratory report attached).

Surface water monitoring results

Stream conditions were inspected at each of the stream sampling sites and the following observations made:

- Stream flow was moderate at TTD (downstream) site and was slightly cloudy. The streambed showed an orange/brown precipitate and foam was present in several locations around the sampling site.
- At the TTW site, west branch of the stream, water was clear and the stream bed was clean. The channel was mostly free of macrophytes. No periphyton was visible on the bed.
- At the TTE site, east branch of the stream, water was clear and the stream bed was clean. The channel was mostly free of macrophytes. No periphyton was visible on the bed.
- At the OSU site, water in the Owhiro Stream was clear and the streambed was clean. A light cover of periphyton was visible on the bed.
- At the OSD site, water in the Owhiro Stream was slightly cloudy. The streambed showed an orange/brown precipitate and a small amount of foam was present in several locations around the sampling site. Periphyton was visible on the bed.

Condition 8 of the resource consent requires that the contaminant contribution from the landfill (the difference between the contaminant concentrations upstream and downstream of the landfill) be compared against specified tolerance limits. The contaminant contribution for T&T Landfill is calculated by subtracting the mean of TTW and TTE from TTD. Should any tolerance limit be exceeded, *and* where that result also exceeds ANZECC (2000) Guidelines for Ecosystem Protection 90% trigger value, further sampling is required to be undertaken.

During the July 2016 sampling round the upper tolerance limits for Conductivity, Alkalinity, COD, Total Ammoniacal-Nitrogen, Iron, Chromium and Manganese were exceeded. ANZECC (2000) trigger values were also exceeded for Total Ammoniacal-Nitrogen (refer Tables 1 and 2). As Total Ammoniacal-Nitrogen exceeds both the upper tolerance limits and ANZECC (2000) trigger values at TTD an additional sampling round will

be undertaken within one month of results received (received: 15/07/2016) and re-reported against consent conditions.

Table 1: July 2016 Contaminant Contribution and Upper Control Limits

Parameter	Results				Lower Tolerance Limit (LTL)	Upper Tolerance Limit (UCL)
	07/07/2016	28/04/2016	29/01/2016	26/11/2015		
pH	-0.4	-0.4	-0.4	-0.2	-0.4	0.4
Electrical Conductivity	76.350	40.05	42.85	38.7		72.4
Alkalinity	323	197	215.5	221.5		226
Total suspended solids	17.5	9.5	38	17.5		31.7
COD	27	0	11	10		21
Total Hardness	411	191.5	198	190		465
Ammoniacal Nitrogen	2.69	0.605	0.545	0.705		0.346
Iron	8382	4083	17764	9618.5		2748
Manganese	2299	1546	1835	7796		1461
Lead	0.585	0.16	0.45	0.26		5.9
Copper	0.345	-0.175	-0.165	0.085		4.0
Zinc	14.425	2.525	5.375	4.025		130
Arsenic	3.350	1.7	4.8	2.8		13
Chromium	1.705	0.34	0.61	0.33		1

Table 2: July 2016 Quarterly Monitoring Results and ANZECC (2000) trigger values

Parameter	Unit	ANZECC guidelines*	TTD	TTE	TTW	OSU	OSD
pH	pH	NA (6-9)	7.3	7.7	7.7	7.6	7.8
Conductivity	µS/m	NA	107.2	32.5	29.2	33	93.7
Alkalinity	g/m ³ CaCO ₃	NA	370	49	45	48	310
Total suspended solids	g/m ³	NA	19	< 3	< 3	< 3	27
COD	g/m ³	NA	30	< 6	< 6	< 6	26
Total Hardness	g/m ³ CaCO ₃	NA	470	61	57	63	390
Ammoniacal Nitrogen	g/m ³	1.430 (2.34)	2.7	0.014	< 0.010	< 0.010	1.6
Total Iron	g/m ³	NA	8.4	< 0.021	0.025	< 0.021	8.1
Total Manganese	g/m ³	2.500	2.3	0.00094	0.00111	0.00154	2
Total Lead	g/m ³	0.0056 (0.011)	0.00064	< 0.00011	< 0.00011	0.00012	0.0026
Total Copper	g/m ³	0.0018 (0.0028)	0.00061	< 0.00053	< 0.00053	0.00196	0.035
Total Zinc	g/m ³	0.015 (0.027)	0.0166	0.0038	< 0.0011	0.0192	0.025
Total Arsenic	g/m ³	0.042	0.0039	< 0.0011	< 0.0011	< 0.0011	0.0037
Total Chromium	g/m ³	0.006	0.00179	< 0.00053	< 0.00053	< 0.00053	0.00158

* ANZECC (2000) Guidelines for Ecosystem Protection 90% default trigger value (Table 3.4.1); values in brackets are guidelines adjusted to site specific factors (ie. pH = 7.6 and hardness = 50 g/m³ CaCO₃).

Groundwater monitoring results

The groundwater monitoring bore showed elevated levels of iron and manganese but the concentrations of metals appear to be relatively stable over the last three quarters (Table 3).

Table 3: Groundwater monitoring results

Parameter	Unit	TTG Results			
		07/07/2016	28/04/2016	29/01/2016	26/11/2015
pH	pH	6.6	6.5	6.8	7
Chloride	g/m ³	83	82	87	88
Conductivity	µS/m	46.1	46.6	47	47.5
Nitrate Nitrogen	g/m ³	1.185	2	1.69	1.97
Ammoniacal Nitrogen	g/m ³	0.021	0.005	0.021	0.005
Total Lead	g/m ³	0.049	0.025	0.044	0.032
Total Zinc	g/m ³	0.143	0.079	0.122	0.095
Total Iron	g/m ³	28	15.1	24	17.1
Total Manganese	g/m ³	1.99	1.05	2.3	1.85
Total Copper	g/m ³	0.024	0.0141	0.02	0.015

Conclusion

The water quality monitoring results for the second quarter of 2016 indicate that contaminant levels in the tributary below the landfill were not within an acceptable range. Additional sampling is required pursuant to condition 8 of the consent.

The next round of routine quarterly testing is due by the end of September 2016.

Yours sincerely,



David Cameron
Senior Environmental Scientist
MWH New Zealand Limited

Encl.: Lab Report

Copy to: Ian Leary (Spencer Holmes)



ANALYSIS REPORT

Client:	MWH New Zealand Limited	Lab No:	1612724	SPV1
Contact:	Kristin Stokes C/- MWH New Zealand Limited PO Box 9624 Wellington 6141	Date Registered:	08-Jul-2016	
		Date Reported:	15-Jul-2016	
		Quote No:	37978	
		Order No:		
		Client Reference:		
		Submitted By:	Kristin Stokes	

Sample Type: Aqueous

Sample Name:		TTG 07-Jul-2016	TTE 07-Jul-2016	TTW 07-Jul-2016	TTD 07-Jul-2016	OSU 07-Jul-2016
Lab Number:		1612724.1	1612724.2	1612724.3	1612724.4	1612724.5
pH	pH Units	7.0	7.7	7.7	7.3	7.6
Total Alkalinity	g/m ³ as CaCO ₃	-	49	45	370	48
Total Hardness	g/m ³ as CaCO ₃	-	61	57	470	63
Electrical Conductivity (EC)	mS/m	47.5	32.5	29.2	107.2	33.0
Total Suspended Solids	g/m ³	-	< 3	< 3	19	< 3
Total Arsenic	g/m ³	0.0056	< 0.0011	< 0.0011	0.0039	< 0.0011
Dissolved Calcium	g/m ³	-	13.4	12.5	150	14.2
Total Chromium	g/m ³	0.0141	< 0.00053	< 0.00053	0.00179	< 0.00053
Total Copper	g/m ³	0.0150	< 0.00053	< 0.00053	0.00061	0.00196
Total Iron	g/m ³	17.1	< 0.021	0.025	8.4	< 0.021
Total Lead	g/m ³	0.032	< 0.00011	< 0.00011	0.00064	0.00012
Dissolved Magnesium	g/m ³	-	6.6	6.2	22	6.7
Total Manganese	g/m ³	1.85	0.00094	0.00111	2.3	0.00154
Total Zinc	g/m ³	0.095	0.0038	< 0.0011	0.0166	0.0192
Chloride	g/m ³	88	-	-	-	-
Total Ammoniacal-N	g/m ³	< 0.010	0.014	< 0.010	2.7	< 0.010
Nitrite-N	g/m ³	< 0.002	-	-	-	-
Nitrate-N	g/m ³	1.97	-	-	-	-
Nitrate-N + Nitrite-N	g/m ³	1.98	-	-	-	-
Chemical Oxygen Demand (COD)	g O ₂ /m ³	-	< 6	< 6	30	< 6

Sample Name:		OSD 07-Jul-2016			
Lab Number:		1612724.6			
pH	pH Units	7.8	-	-	-
Total Alkalinity	g/m ³ as CaCO ₃	310	-	-	-
Total Hardness	g/m ³ as CaCO ₃	390	-	-	-
Electrical Conductivity (EC)	mS/m	93.7	-	-	-
Total Suspended Solids	g/m ³	27	-	-	-
Total Arsenic	g/m ³	0.0037	-	-	-
Dissolved Calcium	g/m ³	126	-	-	-
Total Chromium	g/m ³	0.00158	-	-	-
Total Copper	g/m ³	0.035	-	-	-
Total Iron	g/m ³	8.1	-	-	-
Total Lead	g/m ³	0.0026	-	-	-
Dissolved Magnesium	g/m ³	19.1	-	-	-
Total Manganese	g/m ³	2.0	-	-	-
Total Zinc	g/m ³	0.025	-	-	-
Total Ammoniacal-N	g/m ³	1.6	-	-	-
Chemical Oxygen Demand (COD)	g O ₂ /m ³	26	-	-	-



Sample Type: Aqueous

Sample Name:	OSD 07-Jul-2016 11:00 am			
Lab Number:	1612724.6			

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-6
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22 nd ed. 2012 (modified).	-	1-6
pH	pH meter. APHA 4500-H+ B 22 nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field.	0.1 pH Units	1-6
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22 nd ed. 2012.	1.0 g/m ³ as CaCO ₃	2-6
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22 nd ed. 2012.	1.0 g/m ³ as CaCO ₃	2-6
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22 nd ed. 2012.	0.1 mS/m	1-6
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22 nd ed. 2012.	3 g/m ³	2-6
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22 nd ed. 2012.	-	2-6
Total Arsenic	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012 / US EPA 200.8.	0.0011 g/m ³	1-6
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012.	0.05 g/m ³	2-6
Total Chromium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012 / US EPA 200.8.	0.00053 g/m ³	1-6
Total Copper	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012 / US EPA 200.8.	0.00053 g/m ³	1-6
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012.	0.021 g/m ³	1-6
Total Lead	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012 / US EPA 200.8.	0.00011 g/m ³	1-6
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012.	0.02 g/m ³	2-6
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012 / US EPA 200.8.	0.00053 g/m ³	1-6
Total Zinc	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22 nd ed. 2012 / US EPA 200.8.	0.0011 g/m ³	1-6
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl ⁻ E (modified from continuous flow analysis) 22 nd ed. 2012.	0.5 g/m ³	1
Total Ammoniacal-N	Filtered sample. Phenol/hypochlorite colorimetry. Discrete Analyser. (NH ₄ -N = NH ₄ ⁺ -N + NH ₃ -N). APHA 4500-NH ₃ F (modified from manual analysis) 22 nd ed. 2012.	0.010 g/m ³	1-6
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₂ ⁻ I 22 nd ed. 2012 (modified).	0.002 g/m ³	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO ₂ N. In-House.	0.0010 g/m ³	1
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ ⁻ I 22 nd ed. 2012 (modified).	0.002 g/m ³	1
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22 nd ed. 2012.	6 g O ₂ /m ³	2-6

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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A handwritten signature in blue ink that reads "Carole Rodgers-Carroll". The signature is written in a cursive style with a large, looped initial 'C'.

Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental