MWH

BUILDING A BETTER WORLD

Z0096704

14 October 2016

T&T Landfills Ltd
Happy Valley Road
WELLINGTON

Attention: **Sophie Gray**
Landfill Manager

Dear Sophie

Quarterly Stream Monitoring Results – September 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 September 2016 (Laboratory report attached). It also comments on two additional monitoring rounds which were undertaken in August and September which were triggered by high ammonia during the July quarterly sampling.

Surface water monitoring results

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

- Stream flow was moderately high at TTD (downstream) site and appeared 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 and a strong odour was present. 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.

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During the September 2016 sampling round the upper tolerance limits for conductivity, alkalinity, COD, total hardness, total ammoniacal-nitrogen, iron, chromium and manganese were exceeded. The lower limit for pH was also exceeded. ANZECC (2000) trigger values were exceeded for total ammoniacal-nitrogen, manganese, copper and zinc (refer Tables 1 and 2). As total ammoniacal-nitrogen and manganese exceed 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: 06/10/2016) and a second additional round will be conducted one month later.

Table 1: September 2016 Contaminant Contribution and Upper Control Limits

Parameter	Results				Lower Tolerance Limit (LTL)	Upper Tolerance Limit (UCL)
	27/09/2016	07/07/2016	28/04/2016	29/01/2016		
pH	**-0.45**	-0.4	-0.4	-0.4	-0.4	0.4
Electrical Conductivity	**138.8**	**76.350**	40.05	42.85		72.4
Alkalinity	**398.5**	**323**	197	215.5		226
Total suspended solids	23.5	17.5	9.5	**38**		31.7
COD	**53**	**27**	0	11		21
Total Hardness	**731.5**	411	191.5	198		465
Ammoniacal Nitrogen	**5.995**	**2.69**	**0.605**	**0.545**		0.346
Iron	**8181**	**8382**	**4083**	**17764**		2748
Manganese	**3199**	**2299**	**1546**	**1835**		1461
Lead	3.145	0.585	0.16	0.45		5.9
Copper	3.535	0.345	-0.175	-0.165		4.0
Zinc	58.625	14.425	2.525	5.375		130
Arsenic	5.45	3.350	1.7	4.8		13
Chromium	**2.7125**	**1.705**	0.34	0.61		1

Table 2: September 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	7.8	7.7	7.7	7.6
Conductivity	µS/m	NA	167.5	29.7	27.7	29.8	150.5
Alkalinity	g/m^3CaCO_3	NA	440	44	39	40	390
Total suspended solids	g/m^3	NA	25	<3	<3	<3	18
COD	g/m^3	NA	56	<6	<6	<6	56
Total Hardness	g/m^3CaCO_3	NA	780	50	47	53	690
Ammoniacal Nitrogen	g/m^3	1.430 (2.34)	**6**	<0.010	<0.010	<0.010	**5.1**
Total Iron	g/m^3	NA	8.2	0.028	<0.021	0.089	5.5
Total Manganese	g/m^3	2.500	**3.2**	0.003	0.000065	0.0045	**2.7**
Total Lead	g/m^3	0.0056 (0.011)	0.0032	<0.00011	<0.00011	0.00054	0.0029
Total Copper	g/m^3	0.0018 (0.0028)	**0.0038**	<0.00053	<0.00053	**0.0027**	**0.0038**
Total Zinc	g/m^3	0.015 (0.027)	**0.061**	0.0042	<0.0011	**0.023**	**0.056**
Total Arsenic	g/m^3	0.042	0.006	<0.0011	<0.0011	<0.0011	0.0043
Total Chromium	g/m^3	0.006	0.0034	0.00111	<0.00053	<0.00053	0.003

* 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/m^3 $CaCO_3$.

Groundwater monitoring results

The groundwater monitoring bore results were similar to those recorded over the last three quarters (Table 3).

Table 3: Groundwater monitoring results

Parameter	Unit	TTG Results			
		27/09/2016	07/07/2016	28/04/2016	29/01/2016
pH	pH	6.7	6.6	6.5	6.8
Chloride	g/m^3	86	83	82	87
Conductivity	µS/m	46.6	46.1	46.6	47
Nitrate Nitrogen	g/m^3	1.63	1.185	2	1.69
Ammoniacal Nitrogen	g/m^3	0.005	0.021	0.005	0.021
Total Lead	g/m^3	0.035	0.049	0.025	0.044
Total Zinc	g/m^3	0.115	0.143	0.079	0.122
Total Iron	g/m^3	21	28	15.1	24
Total Manganese	g/m^3	1.5	1.99	1.05	2.3
Total Copper	g/m^3	0.0177	0.024	0.0141	0.02

Additional monitoring (August and September 2016)

During the last quarterly monitoring round on the 25 July 2016, ammoniacal-nitrogen exceeded both the upper tolerance limit and ANZECC (2000) trigger values at TTD. Consequently, as required by condition 8 of the discharge permit, additional sampling rounds were undertaken in August and September. The results of all three monitoring rounds are summarised in Table 4.

Table 4: Results of additional monitoring post July 2016 compared with ANZECC (2000) TVs

Determinand	ANZECC (2000) 90% TV	7 July 2016	3 Aug 2016 (A1)	6 Sept 2016 (A2)	Mean of A1 and A2	Adaptive Management action required?
pH	n.s.	7.3	7.4	7.2	7.3	no
Electrical conductivity	n.s.	107.2	84.1	91.8	87.9	no
Alkalinity	n.s.	370	290	300	295	no
Total suspended solids	n.s.	19	15	12	13.5	no
COD	n.s.	30	14	23	18.5	no
Total Hardness	n.s.	470	300	340	320	no
Total ammoniacal N	1.430 (2.34)	2.7	1.6	1.8	1.7	**yes (no)**
Iron	n.s.	8.4	0.03	<0.02	0.02	no
Manganese	2.5	2.3	1.52	1.94	1.73	no
Lead	0.0056	0.00064	<0.00010	<0.00010	<0.0001	no
Copper	0.0018	0.00061	<0.0005	<0.0005	<0.0005	no
Zinc	0.015	0.0166	0.0029	0.0037	0.0033	no
Chromium	0.006	0.0039	0.0005	0.0006	0.00055	no
Arsenic	0.042	0.00179	<0.001	<0.001	<0.001	no

* 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/m^3 $CaCO_3$.

Both of the additional samples from TTD exceeded the ammonia trigger value, indicating that adaptive management action may be required to reduce the risk of ammonia toxicity. However, when the ammonia guideline is adjusted for the site specific factors in accordance with Table 3.4.1 of ANZECC (2000), the trigger value for site TTD increases to 2.34 g/m^3 due to a generally lower pH and consequently lower toxicity of ammonia at this site (maximum pH at TTD of 7.6).

Adjustment of the ammonia trigger value for site specific factors results in adaptive management actions not being required.

Conclusion

The water quality monitoring results for the third quarter of 2016 indicate that contaminant levels in the tributary below the landfill were not within an acceptable range. Two additional sample collections are required pursuant to condition 8 of the consent (in October and November).

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

Yours sincerely,

David Cameron
Senior Environmental Scientist
MWH New Zealand Limited

Encl.: Lab Report

Copy to: Ian Leary (Spencer Holmes)