

Toxikos reply to DEWR request for additional information – TC200707-J

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Toxikos Comment TC200707-J

Query

““Could Gunns provide the published scientific references to support their assertion that chloroacetic acids are at most 5% of the total organic acids?”

Reply

The basis of the claim in the Toxikos report (Appendix 1 page 287) titled “Marine Impact Assessment – Bell Bay Pulp Mill Effluent” (Toxikos reference number TR101006-RJF) that the chloroacetic acids were at most 5% of the total organic acids in the final effluent was made based on personal communication with Pöyry. Thus the question was deferred to Pöyry. In response Pöyry have prepared a stoichiometric mass balance for the Bell Bay pulp mill in order to estimate the concentration of chloroacetic acids in the final effluent (Pöyry 2007). The mass balance is reproduced below:

1. AOX-Balance in Final Effluent		
1.1 FE-AOX, kg R-Cl/ADt		0.148
R-Cl in High MW Fraction, kg Cl/ADt		0.138
High MW DOM, kg/ADt	5.77	
Carbon-%	60	
[C]/ADt	0.289	
[C]:[Cl]-Ratio	74.1	
1.2 R-Cl in Low MW Fraction, kg R-Cl/ADt		0.0094
[Cl]/ADt		0.000266
2. Low MW R-Ox, g Cl/ADt		9.4
3. Low MW DOM, g/ADt		230
4. Average Cl-% in Low MW DOM, %		4.1
5. Total Amount of Low MW Organic Acids, g/ADt		97.0
6. Chloride in Low MW Organic Acids, g Cl/ADt		3.98
7. Maximum Theoretical Amount of Cl-HAc in Final Effluent, g Cl-HAc/ADt		4.8
Maximum Amount of HAc in FE, % of Total Acids	75	
Average Cl-% in chloroacetic acids, %	62.6	
*/ Cl-HAc, %	5	
Cl2-HAc, %	20	
Cl3-HAc, %	75	
8. Maximum Theoretical Cl-HAc Concentration in Final Effluent, micro-g/l		237
9. Maximum Theoretical Percentage of Cl-HAc of Total Low MW Aliphatic Acids, %		4.92

Using the stoichiometric mass balance calculation Pöyry estimate the maximum theoretical concentration of total chlorinated acetic acids to be 237 µg/L (4.9% of the total low molecular weight aliphatic acids). Table 1 compares the information provided in the Marine Impact assessment and the Pöyry. mass balance and it also assesses the impact of the new data on the conclusions of the Marine Impact Assessment. It is evident that the quotient for monochloroacetic acid and the overall conclusions remain unchanged.

Table 1 – Comparison of Toxikos and Pöyry chloroacetic acetic acid estimates

	Maximum theoretical concentration in DV ₁₀₀ µg/L (i.e. final effluent concentration ÷100)		Adopted Guideline Value (EGV) µg/L	Quotient (DV ₁₀₀ ÷EGV) Unitless ratio	
	Toxikos	Pöyry		Toxikos	Pöyry
Concentration of total chlorinated acetic acids	2.25	2.37	Not available	N App	N App
Concentration of monochloroacetic acid	0.74	0.12	0.58	1.3	0.20
Concentration of dichloroacetic acid	0.74	0.47	Not available	N App	N App
Concentration of trichloroacetic acid	0.74	1.78	3	0.25	0.59

The slight differences in the concentration of chlorinated acetic acids between the Toxikos Marine Impact Assessment report and the Pöyry mass balance do not change the conclusions of the Marine Impact Assessment (page 67):

“Reasons why an impact as a result of MCAA at the outfall site is considered unlikely include:

- *Monochloroacetic acid is readily biodegradable. In biodegradation studies with activated sludge MCAA is readily degraded (60-70%) within a time window of 10-14 days and effectively all is degraded within 28 days. It is expected that greater than 99% will be removed during biological treatment. In a recent review, the removal rate in both industrial wastewater treatment plants and municipal sewerage treatment plants was found to be 99.9% (European Commission 2005).*
- *The estimated concentration of monochloroacetic acid in the effluent was estimated from a prediction by Jaakko Poyry that total organic acids, with the plant operating at maximum capacity, would be 4,500 µg/L and less than 5% of this would be comprised of chloroacetic acids (JP 2006b). Toxikos has assumed the 5% total chloroacetic acids and that 33% may be mono chloroacetic acid. It is likely the actual concentration will be less than that estimated.*
- *The quotient (1.3) for monochloroacetic acid is only marginally above unity (1.0), given that environmental guideline values are conservatively developed it is not expected that such small increase above the guideline will significantly impact marine species. The assessment has been conducted for the DV₁₀₀ receiving water however the near field hydrodynamic modelling (summarised in Section 5) indicates the volume of receiving water at this effluent dilution is quite small. “*

References

Pöyry (2007). Chlorinated Acetic Acids in the Final Effluent of Bell Bay Pulp Mill Technical report for Gunns Limited Bell Bay Pulp Mill Project Tasmania. Ref. No 16B0104