Bell Bay Pulp Mill Draft Integrated Impact Statement

Erratum 15th September 2006

Toxikos Human Health Risk Assessment

Toxikos are the consultants that have prepared material included in the draft IIS, namely, the Human Health Risk Assessment.

A notice of the erratum from Toxikos Toxicology Consultants is provided below.

The erratum is self-explanatory.

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Les Baker,
Gunns Ltd.,
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15th September 2006

Gunn' Bell Bay Pulp Mill
Review of Toxikos Human Health Risk Assessment

Dear Les,

We enclose an errata to the reports prepared by Toxikos Pty Ltd, Toxicology Consultants contained in Volume 10 of the draft Integrated Impact Statement.

In the process of reviewing material and preparing for the forth coming hearing, I discovered an error at page 172 of the Human Health Risk Assessment at Appendix 22 of Volume 10.

In calculating the levels of dioxins bioaccumulated in fish, our analysis relied upon the figure 0.074 pg TEQ/L – provided to us in a table prepared by Jaakko Poyry. The use of this figure was incorrect. The correct figure also appears in that table prepared by Jaakko Poyry and is 3.376 pg TEQ/L. We have described this error as an error of transcription.

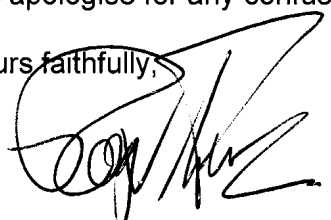
In determining the appropriate level of dioxins, the RPDC has set an emission limit of 10 pg/L for 2,3,7,8- TCDD and 30 pg/L for 2,3,7,8-TCDF in the effluent. Together these equal a total of 13 pg TEQ/L.

The level of dioxins in effluent is 3.376 TEQ/L, which is 74% below the emission level set by the RPDC.

We prepared a brief statement to this effect dated 28th August 2006 which was supplied to Gunns on 29th August 2006, a copy of which is attached. We have prepared this letter to further explain the nature of the error and the effect of it on our analysis.

We apologise for any confusion or inconvenience that this may have caused.

Yours faithfully,



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Erratum to Toxikos Reports:

- **HHRA – pulp mill effluent (TR081205-RJF, July 2006)**
- **Comment on effluent & seal impact (TC300106-JF, July 2006)**
- **HHRA – pulp mill air emissions (TR100106-RJF, July 2006)**

Prepared by: Roger Drew, PhD, DABT
John Frangos M App. Sc. (Toxicol.)

Toxikos Document TE250806-RJF1
28th August 2006

During an internal review of the report entitled **"*Human Health Risk Assessment - Bell Bay Pulp Mill Effluent*" (Toxikos Report Number TR081205-RJF July 2006)** Toxikos identified a calculation error. In the report the concentration of dioxin in finished effluent is incorrectly recorded as 0.074 pg/L. In fact, the estimated effluent concentration for dioxin is 3.376 pg/L. The effluent concentration for dioxins was provided by the mill designer Jaako Poyry and is presented on page 172 (row 23) of the report. The error was a transcription mistake from the information provided by Jaako Poyry into the calculations undertaken by Toxikos.

The estimate of dioxin concentration in discharged effluent is used in the risk assessment to calculate a water column concentration at the edge of the dilution zone DZ100 (1 in 100 mass dilution) and, at equilibrium with this water concentration, the corresponding sediment concentration. An empirically derived sediment bioaccumulation factor for 2,3,7,8 –dioxin in Australian marine waters was then applied to determine steady state concentrations of dioxin in flathead fish. These calculations have been rerun and the fish dioxin concentrations change from 0.00018 pg TEQ/g fish in the original calculations to 0.0083 pg/g fish for the new calculations. Estimated steady state levels in fish remain below analytical reporting limits. That is, a change in dioxin levels in fish is unlikely to be seen.

The recalculations have no impact on the conclusions of any of the Toxikos reports.

The calculated fish concentrations are used in the human health risk assessment reports for discharge of effluent (Report TR081205-RJF) and emissions to air (Report TR100106-RJF) and in the commentary of effluent discharge on seals (Report TC300106-JF). Although the transcription error does not alter the conclusions of the Toxikos reports reproduced in the draft IIS, this erratum note has been prepared to assist readers identify specific changes in the reports.

An overview commentary and table of specific changes for each of the affected Toxikos reports follows.

Human Health Risk Assessment- Bell Bay Pulp Mill Effluent
Toxikos Report: TR081205-RJF, July 2006

This report includes an assessment of the likelihood of dioxin related health impacts for people who may eat fish caught near the effluent outfall. For a 'high-end' fish consumer who gets all the fish they eat from around the outfall, their increase dioxin intake over background remains very small. Previously their total intake of dioxins from background plus fish caught at the outfall was estimated to be 15.79 pg/kg bw/mth, in the recalculations this becomes 15.98 pg/kg bw/mth and remains at approximately 23% of the tolerable monthly intake (70 pg/kg bw/mth) established by Australian Health Authorities. The majority, approximately 99% of the dioxin intake is not associated with fish from the outfall.

Specific changes to report TC081205-JF:

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
Executive Summary Pg 7 / para3 / line 4	0.074 pg TEQ/L	3.4 pg TEQ/L
Executive Summary Pg 7 / para 3 / line 5	..is significantly below ….	…is below…
Executive Summary Pg 9 / para 2 / line 3	…0.18 pg TEQ/kg fish.	…8.3 pg TEQ/kg fish
Executive Summary Pg 9 / para 2 / line 5	..0.004 pg TEQ/kg bw/mth	…0.19 pg TEQ/kg bw/mth
Executive Summary Pg 9 / para 2 / line 5	…0.025%...	…1.2%...
Executive Summary Pg 9 / para 3 / line 7	..0.004 pg TEQ/kg bw/mth	…0.19 pg TEQ/kg bw/mth
Section 6.3.3 Pg 67 / para 4 / line 1	0.074 pg TEQ/L	3.4 pg TEQ/L
Section 6.3.3 Pg 67 / para 5 / line 2	0.00074 pg TEQ/L	0.034 pg TEQ/L
Section 6.3.5.5 Pg 76 Text box	..= 0.18 pg TEQ/kg fish.	..= 8.3 pg TEQ/kg fish.
Section 6.3.5.5/ para 2 / line 6/ Pg 76	…0.18 pg TEQ/kg fish (i.e. 0.00018 pg TEQ/g).	…8.3 pg TEQ/kg fish (i.e. 0.0083 pg TEQ/g).
Section 6.3.5.6 Pg 77 / Equation 3 / line 7	..= 0.18 pg TEQ/kg fish.	..= 8.3 pg TEQ/kg fish.
Section 6.3.5.6 Pg 77 / para 2 / line 6	…0.18 pg TEQ/kg fish.	…8.3 pg TEQ/kg fish.
Section 6.3.5.6 Pg 77 / para 2 / line 9	…0.023 kg fish/kg bw/mth).	…0.19 pg TEQ/kg bw/mth).
Section 6.3.5.6 Pg 77 / para 4 (Eqn	…0.18 pg TEQ/kg fish.	…8.3 pg TEQ/kg fish.

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
3)/ line 3		
Section 6.3.5.6 Pg 77 / para 4 (Eqn 3) / line 5	..0.004 pg TEQ/kg bw/mth	…0.19 pg TEQ/kg bw/mth
Section 6.3.5.6 Pg 78 / Table 6.2 / Column 4	**Dioxin Intake** **pg TEQ/kg bw/month [d]** **Avg** **95%** **Max** 0.002 0.004 **0.004** 0.002 0.004 **0.004** 0.002 0.004 **0.004**	**Dioxin Intake** **pg TEQ/kg bw/month [d]** **Avg** **95%** **Max** 0.11 0.17 **0.19** 0.11 0.17 **0.19** 0.11 0.17 **0.19**
Table 6.2 footnote d	….0.18 pg TEQ/kg…	….8.3 pg TEQ/kg…
Section 6.3.5.7 Pg 78 / Table 6.3 / Column 2	**Incremental dioxin intake [a]** (pg TEQ/kg bw/mth) **95%** 0.002 0.004 **0.004** 0.002 0.004 **0.004**	**Incremental dioxin intake [a]** (pg TEQ/kg bw/mth) **95%** 0.11 0.17 0.19 0.11 0.17 0.19
Section 6.3.5.7 Pg78/para1/line 4	….0.05%....	….3%.....
Section 6.3.5.7 Pg 78 / Table 6.3 / Column 4	**Total Intake [c]** (pg TEQ/kg bw/mth)	**Total Intake [c]** (pg TEQ/kg bw/mth)

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
	LB **UB** **3.89** **15.79** **7.22** **37.93**	**LB** **UB** **4.0** **15.98** **7.33** **37.93**
Section 6.3.5.8 Pg 79 / para 1/line 13	…(>99%)	…(~99%)
Section 6.3.5.8 Pg 79 / para 2 / line 3	…0.074 pg TEQ/L	…3.376 pg TEQ/L
Section 6.3.5.8 Pg 79 / para 2 / line 4	…is also significantly below…	…is also below…
Section 6.3.5.8 Pg 80 / para 2 / line 11	…15.81 pg TEQ/kg/mth	…15.98 pg TEQ/kg/mth
Section 6.3.5.8 Pg 80 / para 2 / line 12	…0.2%....	…1%.....
Section 6.3.5.8 Pg 81 / Table 6.4 / Column 1	As per main text: EC: 0.074 pg TEQ/L [c] FC: 54 g/person/d [d] OC: 0.32% [g] EC: 0.074 pg TEQ/L [c] FC: 54 g/person/d [d] OC: 0.048% [h] EC: 10 pg TEQ/L [e] FC: 54 g/person/d OC: 0.32% EC: 10 pg TEQ/L FC: 100 g/person/d [f] OC: 0.32%	As per main text: EC: 3.376 pg TEQ/L [c] FC: 54 g/person/d [d] OC: 0.32% [g] EC: 3.376 pg TEQ/L [c] FC: 54 g/person/d [d] OC: 0.048% [h] EC: 10 pg TEQ/L [e] FC: 54 g/person/d OC: 0.32% EC: 10 pg TEQ/L FC: 100 g/person/d [f] OC: 0.32%

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
Section 6.3.5.8 Pg 81 / Table 6.4 / Column 2	**Max incremental dioxin intake from fish** (pg /kg bw /mth) **0.004** (from Table 6.2) [0.03% background] **0.028** [0.2% background] **0.57** [3.6% background] **1** [6.3% background]	**Max incremental dioxin intake from fish** (pg /kg bw /mth) **0.19** (from Table 6.2) [1.2% background] **1.28** [8.1% background] **0.57** [3.6% background] **1** [6.3% background]
Section 6.3.5.8 Pg 81 / Table 6.4 / Column 4	**Max total intake** [b] (pg/kg bw /mth) **15.79** (from Table 6.3) [23% TMI] **15.82** [23% TMI] **16.36** [23% TMI] **16.79** [24% TMI]	**Max total intake** [b] (pg/kg bw /mth) **15.98** (from Table 6.3) [23% TMI] **17.07** [24% TMI] **16.36** [23% TMI] **16.79** [24% TMI]
Section 6.4 / Pg 82 / para 4 / line 4	…to be substantially below…	…to be below…
Section 6.4 / Pg 82 / para 4 / line 6	…dioxins by fish was tiny…	…dioxins by fish was small…
Appendix 5/Pg 196/ Table A5.4 / row 1	0.35 TEQ/kg	29 pg TEQ/kg
Appendix 5 / Pg 196 / Table A5.4 / row 3	…0.00074 pg TEQ/L…	…0.03376 pg TEQ/L
Appendix 5 / Pg 198 / line 22	=[1 x 0.00074 x 292,000…	=[1 x 0.03376 x 292,000…
Appendix 5 / Pg 198 / line 23	= 0.64 pg/kg	= 29 pg TEQ/ kg sediment
Appendix 5 / Pg 203 / line 4	= 0.64 pg/kg x 0.02…	= 29 pg/kg x 0.02…
Appendix 5 / Pg 203	= 0.18 pg/kg	= 8.3 pg TEQ/kg fish

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
/ line 5		

Comment on Bell Bay effluent and potential impact on nearby seal colonies.
Toxikos document: TC300106-JF, July 2006

This 'seal' report provides a qualitative rationale indicating the viability of the Tenth Island Australian fur seal colony is not threatened by the discharged effluent. The argument is compelling because dioxin levels in fish do not demonstrably change after the mill becomes operational and dioxins do not biomagnify through the marine food chain to seals. After correcting the calculations of dioxin concentrations in fish the arguments and conclusions still stand.

Specific changes to report TC300106-JF:

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
Section 4.3.1/Pg 19/ para 1/ line 4	….0.074 pg/L….	…..3.376 pg/L….
Section 4.3.1/Pg 19/ para 1/ line 8	……are 175 times…	….are 3.8 times…
Section 4.3.1 / pg 19/ footnote 11/ line 3	Analytical detection limits for dioxins in effluent range from 0.3 – 9 pg TCDD/L (Shariff et al. 1996) to up to 10 pg TCDD/L (ALS Environmental 2005). Thus the concentration of dioxins in the discharged effluent will be 4 – 135 times lower than the analytical detection limit. It is noted Australian Laboratories tend to have higher dioxin quantitation limits, therefore, in round numbers the amount of dioxin in effluent will be about two orders of magnitude less than the ability of the laboratory techniques likely to be used to monitor this parameter in effluent.	In 163 samples from 17 mills in the US, Canada and Sweden where chlorine dioxide had completely replaced elemental chloride in the first stage of bleaching, 2,3,7,8-TCDD was not found in mill effluent at analytical detection limits of 0.3-9 pg TCDD/L (Shariff et al. 1996). The analytical technique recommended by the RPDC (2005) has a reporting limit of 10 pg TCDD/L for pulp effluent (US EPA 1994).
Section 4.3.1/Pg 20/para 1/ line 1 (Point of clarification not arising from effluent dioxin error).	…and biomagnification, dioxins do not.	…….and biomagnification by marine mammals, dioxins do not.
Section 4.3.1/Pg 20/para 1/ line 4 (Point of clarification not arising from effluent dioxin error).	…to bioaccumulation of …	… to bioaccumulation and biomagnification of…
Section 4.3.3 / pg 23 / para 1 / line 10	… to be 0.00018 pg TEQ/g,…	…to be 0.0083 pg TEQ/g, …

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
Section 4.3.3 / pg 23 / para 3 / line 12	…incremental increases were 100 -1000 times higher…	…incremental increases were 12 - 410 times higher…
Section 4.3.4/Pg 24/footnote 15/last line. (Correction of a study description not related to effluent dioxin error).	…..and one marine mammal.	…and one marine bird.

Human Health Risk and Toxicological Assessment of Bell Bay Pulp Air Emissions
Toxikos Report: TR100106-RJF, July 2006

In the air emissions risk assessment, assumptions were made regarding the contribution that direct inhalation of air borne dioxin from mill emissions made to a person's overall exposure to dioxins. This was used, together with estimates of air dioxin concentrations due to mill emissions, to calculate the total dioxin intake; i.e. intake that included the upper bound estimate of background + incremental increases from food due to dioxin deposition from air + direct inhalation. This was 15.81 pg TEQ/kg/mth. On the assumption that such a person may also be a high end fish consumer and ate fish caught at the outfall, the incremental increase in dioxin intake of 0.004 pg TEQ/kg/mth from these fish were added to the total intake. This incremental increase value for fish was brought forward from the effluent risk assessment (TR081205-RJF). The recalculations arising from reconciliation of the transcription error show the incremental increase is 0.19 pg TEQ/kg/mth, and the estimated maximum intake therefore 16 pg TEQ/kg/mth. This new total remains at approximately 23% of the tolerable monthly intake, and hence the conclusion of little likelihood of health effects arising from dioxin in air emissions from the mill is still appropriate.

Specific changes to report T100106-RJF:

Section / Page No / Paragraph / Line	Corrected From:	Corrected To:
Page 8/paragraph 2/ line 6	More than 99% …	Approximately 99%....
Section 9.8/Pg 90/ paragraph 3/line 3	…..0.004 pg TEQ/kg body weight/month (Toxikos 2006).	…..0.19 pg TEQ/kg body weight/month (Toxikos 2006).
Section 9.8/Pg 90/ paragraph 4/ Equation line	15.81 pgTEQ/kg/mth + 0.004 pgTEQ/kg/mth = 15.81 pgTEQ/kg/mth	15.81 pgTEQ/kg/mth + 0.19 pgTEQ/kg/mth = 16 pgTEQ/kg/mth
Section 9.9/Pg 91/ paragraph 1/ line 6	More than 99% …	Approximately 99%....