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Review of SWECO PIC Assessment Report

Overview

This is a review of the report “*Assessment of the Gunns Limited Bell Bay Pulp Mill against the Environment Emission Limit Guidelines*” by SWECO PIC Oy and associated documentation⁽¹⁾. This review is limited, in the main, to factors affecting pulp mill effluent and emissions. The main findings are:

1. SWECO PIC make false and misleading statements, and omit significant issues required for assessment under the Pulp Mill Assessment Act 2007.
2. The report confirms the “deficiencies” identified by the RPDC in Gunns’ draft IIS and supplementary material.
3. The report and associated references support calculations, reported previously, demonstrating the likelihood of extensive pollution of the coastal and marine environment near the outfall of the proposed mill.
4. With respect to dioxin pollution, the Premier publicly stated that “this is a matter that SWECO PIC is looking at” (7.30 Report, 5th June 2007); the impact of dioxin is not addressed in the report.
5. SWECO PIC do not assess environmental impacts as required under the Pulp Mill Assessment Act 2007. In particular, they do not assess or qualify their assessment of the following sections of the Guidelines:
 - D.1.1—*for emissions to the marine environment, emission limits will be set at levels that can be achieved by using AMT, unless lower limits are required to protect recognised water quality objectives;*
 - D.1.2—*more stringent standards may be required to mitigate any deleterious environmental impacts identified during the environmental impact assessment for the proposed mill;*
 - D.1.3—*general measures for best practice environmental management;*
 - D.1.10(a)—*the discharge limits must be set at levels which will not prejudice the achievement of water quality objectives;*
 - D.1.11—*depending on the circumstances and characteristics of the receiving waters there may be justification for setting limits on other wastewater discharge parameters e.g. nutrients, pH, temperature and possibly flow;*

¹<http://www.justice.tas.gov.au/justice/pulpmillassessment>

- D.3.10—to retain a reserve capacity for airsheds, no point source activity should be permitted to emit a pollutant in a manner or quantity that, allowing for other reasonable emissions to the relevant airshed, would prejudice compliance with the National Environment Protection Measure for Air Quality (National Environment Protection Council 1998).
6. The capacity of the Tamar Valley airshed to cope with the increased pollution load from the mill is critical to determining the impact of the mill on human health and mortality. SWECO PIC do not say whether the mill complies with Section D.3.10. On the basis of this omission alone the report fails to meet the requirements of the Pulp Mill Assessment Act 2007.
 7. The report is deficient in that it does not address technical issues which would have been addressed under the RPDC assessment. In particular, it does not include an assessment of noise emissions, impacts on surface or estuarine waters, effects on flora and fauna, transport implications, construction impacts, and does not include impacts from off-site infrastructure developments such as the raw water supply pipeline or effluent pipeline.
 8. SWECO PIC abrogates its responsibility with respect to the impact of emissions on human health, society and the environment. This is in breach of its obligations under the *Code of Ethics* of FIDIC (The International Federation of Consulting Engineers) and the Swedish Partnership for Global Responsibility (Globalt Ansvar) to which SWECO AB, the parent company, is a signatory.
 9. Their report states: “*SWECO PIC has limited its work to checking the validity of the individual statements and data (numbers) in the DIIS [draft integrated impact statement] that have been identified as requiring special emphasis*”. In my opinion, based on the outcome of this review, SWECO PIC have been improperly selective with respect to the data they have reviewed and they have been negligent in checking and certifying the validity of critical assertions of the draft IIS.

False and Misleading Statements

Water Quality Objectives

In the Executive Summary SWECO PIC asserts “... *satisfactory information is provided to conclude that emissions are likely to meet the interim water quality objectives set by the Board of Environmental Management and Pollution Control at the edge of the interim mixing zone*”. This statement is demonstrably false.

SWECO PIC reference the review of Gunns' hydrodynamic modelling carried out by Patterson Britton Partners Pty Ltd commissioned by the Commonwealth Department of Environment and Water Resources⁽²⁾ and included with the reference material provided on the Tasmanian Government web site. This report calculates that the trigger value⁽³⁾ for chlorate of 0.008 mg/l may be exceeded in an area up to 100 km² around the outfall⁽⁴⁾ (possibly extending from Five Mile Bluff to Low Head and the Tamar Estuary). The hydrodynamic modelling is flawed: Patterson Britton state that the model appears to produce *“unrealistically high daily flushing and dispersion of pollutants in the vicinity of the outfall”*.

The volume of water contained in the area of likely contamination greatly exceeds the volume of any possible mixing zone (which generally lie between 50m and 500m from the discharge point). Section 20.3(b) of the State Policy on Water Quality Management 1997 states: *“The mixing zone must be as small as practical ... and either alone or in combination with other mixing zones, should not occupy a significant proportion of the receiving waters designated for any given protected environmental value”*⁽⁵⁾.

SWECO PIC's conclusion, that *“satisfactory information”* was provided, constitutes a gross misrepresentation of the facts. The report states that the dilution maps generated by the hydrodynamic model were *“considered by the [Tasmanian Government] Board of Environmental Management and Pollution Control in determining an interim mixing zone”*. It is highly improper for SWECO PIC as consulting engineers to rely on the Board's determination of a mixing zone when they knew that the hydrodynamic modelling (on which the determination was based) was seriously flawed.

Chlorine Content in Bleach

In the section on Bleached Chemical Preparation (p40) SWECO PIC state, with respect to the proposed integrated chlorine dioxide plant (IDP), *“producing ClO₂ with low chlorine content by the proposed method is thus considered technically achievable”*. This statement is unsupported; there is no evidence showing that sufficiently low chlorine levels can be achieved.

²Patterson Britton and Partners Pty Ltd, *Review of Documents Re: Hydrodynamic Modelling of Effluent from Proposed Offshore Effluent Outfall for Gunns Pulp Mill, Tasmania*, 30 March 2007.

³Expert witness statement of Dr Véronique Catherine Louise Lévy, *Water Quality Assessment Report for Bell Bay Pulp Mill Draft IIS*, January 2007.

⁴Patterson Britton, p4.

⁵Lévy, Appendix A.

SWECO PIC themselves state that *“there is no public documentation to support that these three plants [existing IDP plants] are consistently producing ClO₂ solution of the low chlorine content indicated for the proposed IDP plant”*. Moreover, Gunns’ own expert⁽⁶⁾ states that the Quebec chorite plant, which is the basis for Gunns proposed IDP plant, fails to meet the required residual chlorine concentrations.

Beca-Amec, the technical advisors to the RPDC, have stated *“until proof is provided that the type of IDP proposed is able to consistently achieve over extended periods of operation and under various operating scenarios (including start-up and upset conditions) low Cl₂ contamination of the ClO₂ solution, it is recommended ... that the low-chlorine IDP be considered to be an emerging technology, not AMT”*.⁽⁷⁾

It is therefore entirely speculative of SWECO PIC to say *“provided that processes to reduce entrained chlorine in the chlorine dioxide solution to acceptable levels are applied, then this is considered an acceptable technology”*. There is no evidence that such processes are technically or economically feasible.

Acute and Chronic Toxicity

The RPDC Guidelines state that the effect of acute toxicity in 100% effluent should be less than 50% (D.1.14 Table 6). SWECO PIC falsely certifies that this Guideline has been met. They fail to acknowledge the Ecotox analysis⁽⁸⁾ which states *“significant acute effects were observed in the 45 and 50% treatment for the Microtox and sea urchin fertilisation tests, respectively”*.

Given the substantial area of the 1/100 dilution zone inferred from the Patterson Britton report, the failure to meet chronic and sub-lethal toxicity tests could lead to sub-lethal but nevertheless widespread toxic impacts on local scallop and rock lobster populations: *“... of the sub-lethal and chronic tests performed, ... the sea urchin and doughboy scallop larval development tests exhibited EC50 estimates of 53.0 ... and 47.4 %, respectively”*⁽⁹⁾; and, *“the 48-h EC50 of the sample (the estimate of the concentration of effluent inducing 50% abnormalities) to the doughboy scallop was 37.3% sample”*⁽¹⁰⁾. SWECO PIC do not acknowledge this issue.

Dioxin

SWECO PIC assert that the estimated discharges of 2,3,7,8 TCDD (dioxin) and 2,3,7,8 TCDF (furan) will meet the Guidelines; this is despite the fact that the proposed

⁶Expert witness statement of Mr Edward Joseph Bechberger, Expert for Gunns Limited.

⁷Beca AMEC Limited, *Review of Section 6.3.4 – Bleaching Chemical Preparation of Gunns’ Draft Integrated Impact Statement*, Appendix A, October 2006.

⁸Ecotox Services Australasia, *Bell Bay Pulp Mill Ecotoxicology Project- Pine Campaign*, PR0177, April 2006.

⁹ibid.

¹⁰Ecotox Services Australasia, *Ecotoxicity of Bell Bay Pulp Mill Project*, PR0177, June 2005.

chlorine dioxide process is new pulp mill technology. There is no basis in fact to make their assertion. The effluent dioxin concentration of 3.376 pg TEQ/L is an estimate by Jaakko Pöyry based on 10% of average Canadian/Swedish mill effluent concentrations in the 1990s ⁽¹¹⁾. Given the use of different technology, such historical data has no relevance to Gunns' proposal.

Odour

SWECO PIC say that TRS emissions will comply with the Guidelines for the recovery boiler, lime kiln, CNCG incinerator and CNCG generator, even though they state that meeting the emission limits for these mill components is “*likely to be challenging*”. They also state (in the Executive Summary) that TRS “*non-compliance is expected to occur ... at a frequency of once every 11 years*”. These two statements are difficult to reconcile; SWECO PIC's reliance on the flawed air emissions modelling⁽¹²⁾—from which the expected exceedance frequency of once every 11 years is derived—is, in my opinion, negligent.

Gunns' experts have already acknowledged that peak TRS emissions will exceed the RPDC criterion of 1.5 µg/m³ in the vicinity of the mill ^(13,14). The impact of fugitive emissions⁽¹⁵⁾ was not considered by SWECO PIC.

Omissions

Section D.3.10 – Airshed Capacity

Section D.3.10 of the Guidelines states: “*To retain a reserve capacity for airsheds, no point source activity should be permitted to emit a pollutant in a manner or quantity that, allowing for other reasonable emissions to the relevant airshed, would prejudice compliance with the National Environment Protection Measure for Air Quality (National Environment Protection Council 1998)*”.

SWECO PIC claim they have assessed this Guideline but their report contains no statement as to whether the mill complies with the Guideline. To comply with the legislation a statement and commentary should have been included. This is a disturbing omission.

¹¹Jaakko Pöyry Pty Ltd, “*FE Loads 31 10 06 Avg Range*”. Referenced by Toxicos Pty Ltd as received by email Wednesday, November 1st, 2006.

¹²Reviewed below under **Section D.3.10 – Airshed Capacity**.

¹³Draft IIS, *Impact on Air Quality*, Volume 9, Appendix 16. Figure 9.13.

¹⁴Pacific Air & Environment, *Supplementary Air Quality Assessment of Proposed Mill*, August 2006. Figure 4.25.

¹⁵CSIRO, *Review of Air Quality Aspects of Gunns Ltd “Bell Bay Pulp Mill Draft Integrated Impact Statement, July 2006”*.

Gunns' air emissions modelling fails to meet US EPA acceptability criteria, as Gunns' expert acknowledges⁽¹⁶⁾. It does not match the dispersion of SO₂ and NO_x emissions, and fails to track PM₁₀ particulate matter below 5 µg/m³ ⁽¹⁷⁾. PM_{2.5} particulate matter, which has a significant health and mortality impact, was not modelled. Moreover, the 1695 t/year of NO₂ emitted (together with the 374 t/year of SO₂) has an associated mortality of 0.35 ⁽¹⁸⁾. That is, 35 premature deaths annually in the Tamar Valley predominantly amongst children, the elderly and those with cardiovascular disease and asthma.

Use of the US EPA pollutant screening model SCREEN3 ⁽¹⁹⁾ gives a PM₁₀ pollutant concentration at Rowella of 7 µg/m³ due to emissions from the mill alone. Average annual emissions of PM_{2.5} were calculated to exceed the NEPM Air Shed goal ⁽²⁰⁾ of 8 µg/m³ at 8 of the 12 sites ⁽²¹⁾. The mill emission of 410 t/year of particulate matter is almost the same as that for the whole of Launceston (470 t/year in 2004 ⁽²²⁾).

Based on the airshed modelling carried out by Gunns, it is my opinion that no competent consultant could reasonably assert that the reserve capacity of the Tamar Valley airshed will not be compromised by emissions from the mill and that the mill complies with Section D.3.10 of the Guidelines.

Hydrodynamic Modelling

SWECO PIC identify serious deficiencies in the hydrodynamic modelling and propose that these can be ameliorated through permit conditions. This proposal seriously misrepresents the scientific method for assessing the impact of the pulp mill on the marine environment and the adequacy of the design basis. While the RPDC guidelines are quite specific on the requirements of a hydrodynamic model, and it is clear that Gunns' work fails to meet these criteria, the purpose of the hydrodynamic model is to assess the impact of the mill effluent on ambient water quality criteria (Sections D.3.17 and D.3.18). The proposed permit conditions do not address this objective.

SWECO PIC propose that retrospective hydrodynamic studies can enable Gunns to show compliance with the Guidelines. Given the inadequacy of the hydrodynamic modelling, no positive statement can be made with respect to the adequacy of the

¹⁶Ibid. Sections 4.3.1 to 4.3.3.

¹⁷Ibid. Figure 4.15.

¹⁸*Thematic strategy on air pollution*, Communication from the Commission to the Council and the European Parliament, Brussels, September 2005. Figure 2.

¹⁹www.epa.gov/scram001/dispersion_screening.htm

²⁰Draft IIS, *Impact on Air Quality*, Volume 9, Appendix 16.

²¹Australian Risk Audit, *Bell Bay Pulp Mill Risk Audit Report*, 24 September 2006

²²CSIRO Atmospheric Research, *Woodheaters in Launceston – Impacts on Air Quality*, Department of the Environment and Heritage, September 2005

current design basis to meet water quality criteria. The mill can only be considered to have met Sections D.3.17 and D.3.18, if hydrodynamic studies have demonstrated that effluent discharge to the marine environment will pose no significant threat to human health, marine life and fisheries. The current work by Gunns does not show this; indeed, screening studies such as those carried out for dioxins and chlorate demonstrate the contrary.

The proposal that serious deficiencies in the hydrodynamic modelling can be ameliorated through permit conditions abrogates SWECO PIC's responsibility for determining the capacity of the mill to meet the Guidelines. In my opinion, this proposal is unprofessional and undermines the impartiality and credibility of SWECO PIC as consulting engineers.

Pollutants and the Marine Environment

Chlorate

The Patterson Britton review shows that Gunns' calculation of the areal extent of chlorate pollution near the outfall of the mill may have been underestimated by a factor between 300 and 600 times.

This is consistent with the areal extent of dioxin pollution being underestimated by a factor of 370 ⁽²³⁾. The potential for chlorate pollution is significant as this pollutant was implicated in the precipitous, massive die-off and migration of one of the largest breeding colonies of black-necked swans from the Carlos Anwandter Nature Sanctuary, in the southern most province of Valdivia, Chile caused by effluents from the newly-installed CELCO pulp mill. The WWF International Assessment Mission report of November 2005 states that "*a single major pollution episode can be enough to wipe out plant life*" ⁽²⁴⁾. Beca AMEC also note that the "*chlorate ion formed in ECF bleaching may be toxic to large brown algae, such as kelps, which are common in many parts of the Australian marine environment, because of a competitive uptake with nitrate*" ⁽²⁵⁾.

The Patterson Britton report confirms that the impact of pollutants released from the proposed mill could extend over an area of 100 km². This area potentially extends from Five Mile Bluff to Low Head and the Tamar Estuary.

²³Wadsley, A.W., *A Review of the Impact of Dioxin Accumulation*, June 2007.

²⁴WWF, *Findings and Recommendations Report*, WWF International Assessment Mission for the Carlos Anwandter Nature Sanctuary and CELCO Pulp Mill Controversy in Valdivia, Chile, November 2005.

²⁵Beca AMEC Ltd, *Review of ECF and TCF bleaching processes and specific issues raised in the WWF report on Arauco Valdivia*, Ref. 2531950.200, May 2006.

Dioxin Calculation Errors

Previous work identified that Gunns' calculation of the impact of dioxins in Bass Strait contains significant errors ⁽²⁶⁾. A straightforward mistake was made in implementing the risk assessment protocol of the US EPA (Environmental Protection Agency). In the *Human Health Risk Assessment* of Gunns' draft integrated impact statement, this mistake leads to an underestimation of dioxin concentration in offshore sediments by a factor of 338; this increases to a factor of 1390 if background dioxin concentrations and maximum allowable effluent emission limits are used in the calculation.

The Premier, Paul Lennon, publicly stated that these calculations would be examined by SWECO PIC. Subsequently, a copy of the relevant documents was forwarded to SWECO PIC. In their report, no comment on the impact of dioxin on the environment near the proposed outfall has been made.

Nevertheless, both the Patterson Britton review and, by omission, the SWECO PIC report support the conclusion that the impact of effluent pollution on the Tasmanian coastal and Commonwealth marine environments will be sufficient to pose a likely risk to marine life, to commercial and recreational fisheries, and to human health.

Mill Commissioning

During commissioning of the mill (anywhere from 18 months to 3 years) no legal limit is imposed on dioxin or chlorate concentrations discharged into Bass Strait in the mill effluent. SWECO PIC state that the integrated chlorine dioxide process (IDP) chosen by Gunns for their mill is not Accepted Modern Technology (AMT). Moreover, they conclude that *“an equipment failure in the single-line process section may lead to releases exceeding the permit limits in the effluent quality”*.

SWECO PIC strongly recommend that a permit condition be imposed which requires either the aeration basin be designed as a double-line installation or Gunns be required to shut down process areas of the mill in the event of equipment failures in the effluent treatment plant that may lead to the exceeding of the emission limits. However, this permit condition fails to address potential environmental impacts of mill emissions during the commissioning period when emission limits do not apply.

²⁶Wadsley, A.W., *A Review of the Calculation of the Concentration of Dioxin Sorbed to Bed Sediment*, May 2007.

Emission Limits

With respect to dioxins, the SWECO PIC assessment is in breach of Section D.1.2 of the RPDC guidelines⁽²⁷⁾. Although the dioxin/furan limits are in accordance with common international regulations, they do not take into account site specific issues; in particular, the low flushing of Bass Strait waters near the effluent outfall⁽²⁸⁾ and the fact that Gunns proposed mill is 3 to 4 times larger than the average north American mill⁽²⁹⁾. Thus the total load of dioxin to the environment, and its potential for accumulation in benthic sediment, is significantly higher than reference mills in north America and Europe.

Because of these site specific issues, SWECO PIC are required by the Guidelines to independently determine a level of dioxin in the effluent that would lead to no contamination of the marine environment. It should be noted that lower emission limits for dioxin can be achieved using existing BAT as modern American mills have dioxin concentrations in their effluent of less than 2 pg TEQ/l^(30,31) compared to the 13 pg TEQ/l set in the Guidelines⁽³²⁾.

Conclusions

The SWECO PIC report is not fit for purpose; it does not meet the requirements of the Pulp Mill Assessment Act 2007 and, if relied upon, has the potential to mislead the Tasmanian Parliament.

SWECO PIC appear not to have acted impartially; they appear to have selectively reviewed the data made available to them and have ignored facts which conflict with their client's objective of securing the compliance of Gunns' proposed design basis with the Guidelines.

In my opinion SWECO PIC have been improperly selective with respect to the data they have reviewed and they have been negligent in checking and certifying the validity of critical assertions of the draft IIS.

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²⁷D.1.2 *More stringent standards may be required to mitigate any deleterious environmental impacts identified during the environmental impact assessment for the proposed mill.*

²⁸Patterson Britton, p4.

²⁹Pöyry Forest Industry Consulting Oy, *Pulp Industry Trends – Implications for Metso*, March, 2007.

³⁰pg TEQ/l = picogram (10⁻¹²g) per litre equivalent toxicity to the "Seveso-dioxin" 2,3,7,8-TCDD.

³¹Beca AMEC Limited, *Review of ECF and TCF bleaching processes and specific issues raised in the WWF report on Arauco Valdivia*. Section 2.7.

³²Toxicos Pty Ltd, *Marine Impact Assessment - Bell Bay Pulp Mill Effluent*, 23 January 2007. p122.

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Professor Wadsley has extensive experience in the auditing of major resource projects including two recent carbon-dioxide sequestration projects in Australia, numerous oil and gas field developments both locally and internationally, and is also an expert in the mercury contamination of natural gas. He has been Umpire and Expert Witness for dispute resolution within the oil and gas industry. He is an expert in the numerical modelling of multi-phase transport processes and is the author of six commercially available software programs. A recent submission by Australian Risk Audit on Gunns' referral under the EPBC Act was undertaken independently; a previous submission to the RPDC was commissioned by the Tasmanian Greens.