SWECO PIC

Assessment of the Gunns Limited Bell Bay Pulp Mill against the Environmental Emission Limit Guidelines

Report prepared for the Tasmanian Government

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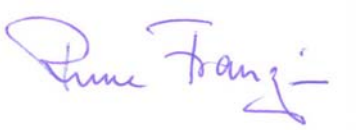

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REVISIONS

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DISTRIBUTION

Revision	Date	Tasmanian Govt	SWECO PIC	SWECO VIAK
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Preamble

The Tasmanian Government has contracted SWECO PIC Oy to undertake an assessment of the proposed technological specifications, management practices and predicted environmental performance of the proposed Gunns Limited Bell Bay Pulp Mill against the *Recommended Environmental Emission Limit Guidelines for any new Bleached Eucalypt Kraft Pulp Mill in Tasmania* dated August 2004 (the Guidelines) as required by the *Pulp Mill Assessment Act 2007*.

SWECO PIC Oy's and the sub-consultant SWECO VIAK AB's process and environmental experts have examined the Draft Integrated Impact Statement (DIIS), Supplementary information to it and other related documentation prepared by Gunns Limited and the Tasmanian Government and on this basis has assessed the project's compliance with the Guidelines, to the best of their professional skill and experience. SWECO PIC Oy declare that the assessment undertaken and the conclusions reached represent the independent views of SWECO PIC Oy.

REPORT SCOPE AND THIRD PARTY DISCLAIMER

This report was generated by SWECO PIC Oy and SWECO VIAK AB according to the Contracted Services specified by the Tasmanian Government. The content of the report constitutes SWECO PIC's and SWECO VIAK's assessment of the Gunns Limited Bell Bay Pulp Mill against the *Recommended Environmental Emission Limit Guidelines for any new Bleached Eucalypt Kraft Pulp Mill in Tasmania.*

Only the Tasmanian Government is entitled to rely on this report. SWECO PIC and SWECO VIAK accept no liability whatsoever to anyone other than the Tasmanian Government in relation to this report and its contents. In accepting delivery of the report the Tasmanian Government agrees and acknowledges that it is accepting the report on the basis set out above.

ASSESSMENT OF THE GUNNS LIMITED BELL BAY PULP MILL AGAINST THE ENVIRONMENTAL EMISSION LIMIT GUIDELINES

25 June 2007

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List of Abbreviations

Abbreviation	Definition
ADt	Air dry ton of pulp
AGSO	Australian Geological Survey Organisation
AMT	Accepted modern technology
ANZECC	Australia and New Zealand Environmental Conservation Council
AODC	Australian Oceanic Data Centre
AOX	Adsorbable organic halide
BAT	Best available techniques
BEK	Bleached eucalypt kraft
BFB	Bubbling fluidized bed
BMRC	Bureau of Meteorology Research Centre
BOD	Biological oxygen demand
BPEM	Best Practice Environmental Management
BREF	Reference document of BAT
Cl	Chlorine
ClO_2	Chlorine dioxide
CNCG	Concentrated non-condensible gas
CO	Carbon monoxide
CO_2	Carbon dioxide
COD	Chemical oxygen demand
D0, D1, D2	Bleaching stages using chlorine dioxide
DCS	Distributed control system
DIIS	Draft Integrated Impact Statement dated July 2006 prepared by Gunns Limited
DNCG	Diluted non-condensible gas
ECF	Elemental chlorine free
EMPCA	Environmental Management and Pollution Control Act 1994
EMS	Environmental management system
EOP	Bleaching stage using alkaline and oxygen and hydrogen peroxide addition
ESP	Electrostatic precipitator
ETP	Effluent treatment plant
EU	European Union

Abbreviation	Definition
GUIDELINES	Recommended Environmental Emission Limit Guidelines for any new Bleached Eucalypt Kraft Pulp Mill in Tasmania dated August 2004
HCl	Hydrochloric acid
HRT	Hydraulic retention time
H_2SO_4	Sulphuric acid
HW	Hardwood
IDP	Integrated chlorine dioxide plant
IPCC	Intergovernmental Panel for Climate Change
IPPC	Integrated Pollution Prevention and Control
NDm_3	Normal dry cubic metre
NEPMs	National Environment Protection Measures
NO_x	Aggregated measure of nitrogen oxides
NTF	National Tidal Facility
PCDD	Polychlorinated dibenzo-p-dioxin
PCDF	Polychlorinated dibenzofuran
PM	Particulate matter
ppb	Parts per billion
RPDC	Resource Planning and Development Commission
SO_2	Sulphur dioxide
SO_3	Sulphur trioxide
SW	Softwood
TCDD	Tetrachloro-dibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran
TCF	Total chlorine free
TDF	Target dilution factor
TRS	Total reduced sulphur
TSS	Total suspended solids
US EPA	United States Environmental Protection Agency
WQO	Water quality objectives
ZID	Zone of initial dilution

Executive Summary

SWECO PIC Oy has completed an assessment of the Gunns Limited Bell Bay Pulp Mill (Project) against the Guidelines.

The assessment was undertaken in a defined timeframe. We acknowledge the support of the Tasmanian Government's representatives and the Gunns Limited team and its consultants in addressing requests for information promptly.

The Draft Integrated Impact Statement (DIIS) generated by Gunns Limited and its consultants is extensive and methodically prepared. Some deficiencies in the documentation were identified during the assessment. Supplementary information and clarification provided by Gunns and the Tasmanian Government assisted in resolving these matters.

Measured on an item by item basis some 92 % of the assessed Guidelines requirements are met by the Project. Among these are items with deficiencies in the documentation that can be addressed through permit conditions. Special attention is drawn to the single line design of the effluent treatment plant. Even though this can be accepted as AMT the substantial risks related to equipment failures, malfunctions or incorrect operations must be mitigated by means of a rigorous plan concerning management of any disturbances at the mill.

The following items were assessed as non-compliant with the Guidelines:

- The estimated emission of NO_X exceeds the limit. However the proposed emission rates are considered to represent accepted international best practice for a project of this nature and scale and ambient NOx values are predicted to be well within the guideline design criteria.

- A comprehensive plan for proper management of situations of accidental spills, leakages and releases has not been provided in the documentation prepared to date. This should be required through permit conditions. A plan that applies best industry practice should address this requirement.

- The use of an integrated chemical plant (Option 1) for production of bleaching chemicals is not specified as AMT in the Guidelines. However, provided that processes to reduce entrained chlorine in the chlorine dioxide solution to acceptable levels are applied, then this is considered an acceptable technology.

- The momentary (three min average) TRS level in the ambient air is predicted to exceed the design criteria. The non-compliance is expected to occur under certain conditions and at a frequency of once every 11 years. Based on the predicted very low frequency of occurrence, the predicted TRS exceedence is not considered significant.

- The stack is not 2.5 times the height of the recovery boiler, however the proposed height of the stack is consistent with that used in projects of this nature and scale. The dispersion modelling shows insignificant improvements to the ambient air concentration from further increasing the height of the stack.

- The hydrodynamic studies and modelling as well as the conclusions about the ambient water quality are not of the quality level required by three sections of the Guidelines. Further modelling is recommended through permit conditions to further refine the mixing zone. Nevertheless, 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.

The proposed pulping of pine (Pinus radiata) in short campaigns carries the risk of causing limited operational disturbances. However, proper operational procedures at the capacity level proposed for the pulping of pine in the DIIS should limit the environmental effects such that they fall below the threshold specified by the Guidelines.

It is SWECO PIC's opinion, based on the assessment of the project against the Guidelines, that the project can proceed to further consideration by the Tasmanian Parliament. In making this recommendation, SWECO PIC assumes that the matters recommended in this report will be addressed in any permit conditions prepared for the Parliament by the Minister for Planning, and that all of the other aspects of the project are assessed by the relevant authorities as being acceptable.

1 Statement of Competency

The Swedish SWECO group, with 4500 employees, is today the leading technical consultant in Scandinavia. SWECO is primarily focused on construction, environmental protection and industrial projects.

SWECO PIC Oy, founded in 1971, is the group's industrial arm. The 1100 employees provide services for investment and product development projects in the process, machinery, electronics and marine industry.

From the beginning SWECO PIC has specialised on serving the pulp and paper industry providing engineering services for the investment project cycle, from the studies and pre-engineering to the detailed design and the start-up. Some 300-400 engineers have been engaged in well over 100 forest industry assignments per year over the last decade.

Recent major assignments have included engineering and design for the Zellstoff Stendal pulp mill in Germany, the Stora Enso Veracel pulp mill in Brazil and the CMPC Santa Fe pulp mill in Chile. The latter two ones use eucalyptus as raw material.

SWECO VIAK AB with some 500 employees is Scandinavia's leading consultant within the fields of water and environment.

SWECO VIAK has newly been assigned to engineer the SCA Packaging Munksund mill (bleached pulp and paper mill) new effluent treatment plant. Other recent projects are the Södra Mörrum Mill effluent treatment plant, the Billerud Gruvön mill landfill for ashes and green liquor dregs and EIA for a detailed development program and plan for the M-real Husum kraft pulp mill.

The senior team members involved in this assessment have been:

- Rune Franzén, Director Pulp and Paper. Team leader, Rune has been active in the industry since 1969 first as an operator, then as a plant and equipment supplier and the last 18 years as consultant.
  Specialty: Pulping in general and plant operation.

- Pentti Keinänen: Senior Consultant.
  Specialty: Energy management and chemical recovery.

- Johan Engström: Senior Consultant.
  Specialty: Chemical pulping.

- Arto Sikander: Consultant.
  Specialty: Bleaching chemicals.

- Henrik Tideström: Senior Consultant.
  Specialty: Water management, EIA, monitoring.

- Peter Ullman: Senior Consultant.
  Specialty: Environmental management, effluent treatment.

- Leif Axenhamn: Senior Consultant.
  Specialty: Air quality management, emission modelling.

- Karin Eberle: Consultant.
  Specialty: Solid waste management, environmental engineering.

- Charlotte Gyllenhammar: Consultant.
  Specialty: Marine biology.

- Per Barkander: Senior Consultant.
  Specialty: Effluent treatment.

- Stig Morling: Senior Consultant.
  Specialty: Effluent treatment.

- Carsten Staub: Consultant.
  Specialty: Hydrodynamic modelling

- Mats Ivarsson: Consultant.
  Specialty: Hydrology, hydrodynamic modelling.

2 Scope of Assessment

The services to be provided, as specified in the contract between SWECO PIC and the Tasmanian Government, are as follows:

SWECO PIC is required to assess the proposed Gunns Limited Bell Bay Pulp Mill against the Guidelines. In undertaking this assessment SWECO PIC must take into account:

- Developments in pulping technology and techniques that have occurred since August 2004;
- Current best available technology and environmental emission limits for a bleached kraft pulp mill processing both pine and eucalypt; and
- The documents received by or prepared for the Resource Planning and Development Commission for the purposes of its assessment of the project as listed in the contract.

In particular the SWECO PIC must:

a) Assess whether the project design and emission control systems (meaning treatment technology and management practices) are consistent with the accepted modern technology and world best practice environmental management measures specified in section D1 of the Guidelines;

b) Assess whether the project is capable of and likely to achieve the emission limits to atmosphere and the discharge limits to the marine environment specified in section D1 of the Guidelines;

c) Assess whether the project design and proposed waste management practices are consistent with accepted modern technology for the reduction and handling of solid waste and other landfill and waste management requirements specified in section D2 of the Guidelines;

d) Assess whether it has been shown that the Project is capable of and likely to achieve the air quality design criteria specified in section D3.9 of the Guidelines and the requirements specified in section D3.10 relating to the National Environment Protection Measure for Air Quality;

e) Assess whether the information provided by Gunns satisfies the requirements relating to hydrodynamic studies contained in sections D3.14, D3.15 and D3.16 of the Guidelines;

f) Assess whether it has been shown that the project is capable of and likely to achieve the ambient water quality criteria specified in section D3.17 and D3.18 of the Guidelines;

g) Suggest any additional accepted modern technology relevant to environmental performance and emission limits that should apply to the

project as a consequence of processing pine feedstock, and assess the project against that technology and those limits;

h) If limits specified in the Guidelines are unlikely to be met, advise on whether the predicted emissions are considered consistent with accepted international best practice for a project of this nature and scale; and

i) If accepted modern technology and best practice environmental management measures or other requirements specified in the Guidelines will not or are unlikely to be met, advise on whether that aspect of the project is considered consistent with accepted international best practice for a project of this nature and scale.

In undertaking the assessment, SWECO PIC should note that the baseline and operational monitoring programs are currently under preparation by the proponent. The Guidelines relating to the baseline and operational monitoring programs (section D4) will be assessed by the relevant regulatory authorities and are thus not required to be assessed by SWECO PIC unless the necessary documentation on the final monitoring programs is submitted at least two weeks prior to the submission of the draft report by SWECO PIC (such documentation was not received).

It should also be noted that requirements of the Guidelines relating to implementation and quality assurance (section D5) are expected to be addressed through conditions attached to the Pulp Mill Permit and are thus not required to be assessed by SWECO PIC.

The assessment of the project is limited to those matters referred to in the Guidelines and includes emissions to the atmosphere and the marine environment and solid waste management practices, but does not include wider matters such as noise emissions, impacts on surface or estuarine waters, effects on flora and fauna, transport implications and social and economic effects, and does not include construction impacts and does not include impacts from off-site infrastructure development such as the raw water supply pipeline, effluent pipeline or quarry.

Based on its assessment, SWECO PIC must report to the Minister for Planning on whether or not the project can proceed, from the perspective of its compliance with the Guidelines and subject to assessment of the project by all “relevant persons” and the Australian Government.

If, from the perspective of the matters assessed by it, SWECO PIC reports that the project can proceed, the report is to state whether or not the project

complies with the Guidelines, provide reasons as to why the project can proceed and recommend matters to be considered in the conditions being determined by statutory regulators.

The recommended matters must be based on its assessment against the Guidelines, including its consideration of accepted international best practice for a project of this nature and scale.

3 Methodology

SWECO PIC has, in relation to the defined timeframe made available for the assessment, concentrated its efforts on issues deemed essential for the Tasmanian Government's further use of the report.

SWECO PIC has strived to understand the intentions behind the Guidelines by reviewing background material and through discussions with the Tasmanian Government's representatives.

The Guidelines contain both requirements relevant to the assessment process, sections of commentary that contain no requirements of the proponent, as well as requirements relating to permit conditions, monitoring and the operation of the pulp mill. At this stage of the project development it is not practical to undertake an assessment of these latter requirements and these are appropriate for consideration by the relevant statutory authorities at a later time.

The table below indicates which items in the Guidelines have been assessed in this report.

Item		**Assessment Status**	**Comments**
D.1 Emission limits			
D.1.1		Not assessed	Commentary only
D.1.2		Not assessed	Commentary only
D.1.3		Not assessed	Documentation required for this assessment is yet to be developed by the proponent.

Item		Assessment Status	Comments
D.1.4.	Table 1	Assessed	Except TRS dot point 7 (spot monitoring) – documentation required for this assessment is yet to be finalised by the proponent.
D.1.5		Assessed	
D.1.6 – D.1.8	Table 2	Assessed	
D.1.9	Table 3	Assessed	
D.1.10		Assessed	
D.1.11		Not assessed	Commentary only
D.1.12	Table 4	Assessed	
D.1.13		Assessed	
D.1.14	Table 5	Assessed	
D.1.15		Not assessed	Commentary only
D.1.16		Not assessed	Commentary only
D.1.17	Table 6	Not assessed	Contains suggested test methods only.
D.2 Solid waste disposal guidelines			
D.2.1	Table 7	Assessed	Except dot point 4 which is a repeat of the statutory requirement in D.2.4.
D.2.2		Not assessed	Commentary only
D.2.3		Assessed	
D.2.4		Not assessed	Commentary only – reiterating statutory requirement.
D.2.5		Assessed	
D.2.6		Assessed	
D.2.7		Assessed	
D.2.8		Assessed	
D.2.9		Assessed	
D.3 Site suitability criteria			
D.3.1-D.3.3		Not assessed	Commentary only
D.3.4-D.3.8	Table 8	Assessed	
D.3.9		Assessed	
D.3.10		Assessed	
D.3.11	Table 9	Assessed	
D.3.12		Not assessed	Commentary only

Item		Assessment Status	Comments
D.3.13 – D.3.18	Table 10	Assessed	
D.3.19		Not assessed	ANZECC is a reference guideline, not a compliance document for potential pollutants.
D.3.20 – D.3.23		Not assessed	Monitoring – Documentation required for this assessment is yet to be finalised by proponent.
D.4 Monitoring		Not assessed	Documentation required for this assessment is yet to be finalised by proponent.
D.5 Implementation quality assurance and review		Not assessed	Relates to mill operation. Documentation required for this assessment is yet to be developed by proponent.

SWECO PIC has reviewed the Draft Integrated Impact Statement (DIIS) and Supplementary Information prepared by Gunns Limited. Deviations from the Guidelines identified by Gunns in the DIIS have been given special emphasis in this assessment. Similarly the key requirements of the Guidelines have been investigated in more depth through supplementary documentation provided by the proponent and the Tasmanian Government.

Scandinavia today is internationally recognised as the leader in the development of the technology for chemical wood pulping and the European standards for the pulp and paper industry. These have been largely developed by Scandinavian pulping experts, and are a key international benchmark. For this reason the permit conditions and reported emission data for a number of Scandinavian and European mills have been used as reference for this assessment. Noting the difference in raw material for the Scandinavian mills, the design data for the latest world-scale eucalypt pulp mill projects in South America have also been referenced.

SWECO PIC visited Tasmania from 7 to 9 May 2007. The visit included an aerial inspection of the mill site including the proposed water dam and landfill sites, their near surroundings, as well as the geographical routings of the fresh water supply pipe and the effluent discharge pipe. The visit also encompassed a surface inspection of the sites for the pulp mill, the wharf, the landfill and the water dam. The nearby communities, including George Town and Rowella, were visited and both sides of the Tamar River travelled between the proposed mill site and Launceston. During the visit SWECO PIC had several meetings with the representatives of the Tasmanian Government. Special sessions were held with Gunns Limited's project team and their consultants, including representatives from Pöyry, Pitt & Sherry, Toxikos and Pacific Air and Environment. Additional meetings with Pöyry were held in Vantaa, Finland on 22 and 23 May 2007.

4 Assumptions

SWECO PIC has assumed that the Gunns Limited project team and their consultants have prepared the DIIS adhering to the highest ethical principles and applying their best professional skills. Consequently SWECO PIC has limited its work to checking the validity of the individual statements and data (numbers) in the DIIS that have been identified as requiring special emphasis.

SWECO PIC has assumed that the Minister of Planning will recommend that the Proponent be required to present more detailed plans to deal with the matters required in Table 1, "General measures for best practice environmental management" in section D.1.3 of the Guidelines, and that these plans will be required to reflect best industry practice.

SWECO PIC has noted that the ambient limits specified have been developed by processes in Tasmania and assumed that in general the limits are appropriate for protecting the receiving environment and were not required to be reviewed.

5 Reference Guidelines of the Assessment

The following reference guidelines were used in this assessment:

Tasmanian Government: Recommended Environmental Emission Limit Guidelines for Any New Bleached Kraft Eucalypt Pulp Mill in Tasmania, August 2004.

For certain items the opinion about AMT and BAT was cross-checked with the EU BAT BREF document referenced below.

The European Commission: Integrated Pollution Prevention and Control (IPPC); Reference Document on Best Available Techniques in the Pulp and Paper Industry, December 2001.

6 Documents Assessed

The following documents were assessed or used in the assessment as relevant.

1. Tasmanian Government: Recommended Environmental Emission Limit Guidelines for Any New Bleached Eucalypt Kraft Pulp Mill in Tasmania, August 2004

2. Gunns Limited: Bell Bay Pulp Mill - Draft Integrated Impact Statement, July 2006

3. Gunns Limited: Bell Bay Pulp Mill Draft Integrated Impact Statement - Supplementary Information, January 2007

4. Pulp Mill Assessment Act 2007

5. Relevant Public and State Government Agency submissions to the RPDC on the Draft Integrated Impact Statement

6. Beca AMEC Limited – Peer Review Report

7. CSIRO Marine and Atmospheric Research – Review of Air Quality Aspects

8. Beca AMEC Limited – Review of Toxicological Appendices

9. UniQuest Pty Ltd – Review of Volume 17 of the Gunns' Report

10. UniQuest Pty Ltd – Review of Volume 10 of the Gunns' Report

11. Documented information received in meetings held in Tasmania 7-9 May 2007 and SWECO PIC Oy's office 22 May 2007 with Gunns' consultants.

7 Assessment Results

The assessment results are shown in the following tables which have the same table numbers as in the Guidelines.

Table No	Title	Issues assessed against Guidelines
1	Accepted Modern Technology (AMT) for the Reduction of Emissions to the Atmosphere	Selected technology to limit emissions to the atmosphere
2	Emission Limits to the Atmosphere	Emissions to the atmosphere
3	AMT for the Reduction of Emissions to the Marine Environment	Selected technology to limit emissions to the marine environment
4	Monthly Average and Daily Discharge Limits to the Marine Environment	Emissions to the marine environment
5	Discharge Limits for each Biologically Treated Effluent Sample Analyzed	Quality of effluent discharged to the marine environment
6	AMT for the Reduction and Handling of Solid Waste	Proposed principles and technology to reduce and to handle solid waste
7	Meteorological Studies	Requirements for meteorological studies and dispersion model
8	Air Quality Design Criteria	Impact of the mill on the ambient air quality
9	Stack Height	Height of the main stack
10	Hydrodynamic Studies	Hydrodynamic modelling and water quality objectives

The compliance of the proposed technology, estimated emissions and management practises, and measures with the requirements in the Guidelines is assessed as either ‘Yes’ or ‘No with related brief assessment grounds and comments.

While noting that the Guidelines were developed for a mill processing eucalyptus feedstock, SWECO PIC has also assessed compliance with AMT

and emissions limit requirements in the Guidelines when the mill is operating with pine (Pinus radiata) as the raw material.

We have in total assessed 100 requirements of the Guidelines. The assessment identified 92 compliances and 8 non-compliances.

TABLE 1: AMT for the Reduction of Emissions to the Atmosphere

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.1.4 Table 2	**Inorganic Chlorinated Compounds** • Collection and scrubbing in the bleach plant scrubber, which uses alkaline scrubbing media.	Yes	DIIS Volume 6, chapter 3.8.2, pages 53 -54	Selected technology includes required equipment.
	• Collection and scrubbing in the chlorine dioxide plant environmental scrubber, which uses alkaline scrubbing media.	Yes	DIIS Volume 6, chapter 3.8.3, pages 62 – 70	Selected technology includes required equipment and collection system.
D.1.4 Table 2	**Total reduced Sulphur (TRS)** • Collection and incineration of concentrated gases (CNCG) in either the recovery boiler or a stand-alone low-NO_x incinerator.	Yes	DIIS Volume 6, chapter 3.8.10, pages 82– 83	Selected technology features collection of CNCG gases from relevant sources (including cooking plant, foul condensate stripping column, evaporator surface condenser, foul condensate tank and firing liquor tank) and oxidising them in either the recovery boiler or a dedicated incinerator.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment

	• Backup system for the CNCG – which is activated during upsets, maintenance or other shutdowns of the main system – consisting of:
	  • A flare/incinerator and secondary unit (e.g. lime kiln), or
	  • A pre-purged alternative disposal with interlocks permitted to allow switching without (bump less transfer).
		Yes	DIIS Volume 6, chapter 3.8.10, pages 82 – 83	CNCG gases will be burned partly in the recovery boiler and partly in a separate incinerator backed up by the second hot stand-by incinerator. Each incinerator is automatically interchangeable with each other and has the capacity to combust the full amount of CNCG gases. All of them are automatically controlled via DCS.

	• Collection and incineration of dilute NCG (DNCG) gases in the recovery boiler after their addition to the secondary or tertiary combustion air.	Yes	DIIS Volume 6, chapter 3.8.10, pages 79 and 83	Selected technology features collection and oxidising of DNCG gases in the recovery boiler. Power boiler and CNCG incinerators are the back-up units.
	• Methanol recovery from the foul condensate stripper off-gases.	Yes	DIIS Volume 6, chapter 3.8.4, page 74	Selected technology includes liquid methanol recovery system from foul condensate off-gases by stripping.
	• For the recovery boiler: computerized combustion control and carbon monoxide (CO) measurement.	Yes	DIIS Volume 6, chapter 4.2, page 122	Selected technology includes computerized combustion control system and carbon monoxide measurement in the recovery boiler.
	• For the lime kiln: control of the excess oxygen, use of low-sulphur fuel, and control of the residual soluble sodium in the lime mud fed to the kiln.	Yes	DIIS Volume 6, chapter 4.2, page 124	Lime kiln will be fired with natural gas and is equipped with the control of excess oxygen and residual alkali in the lime mud fed to the lime kiln.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.1.4 Table 2	**Dioxins and Furans** • Inhibiting the formation of dioxins and furans within power and recovery boilers by appropriate design to achieve the most suitable time/ temperature profile, and by appropriate operation including control of oxygen content, instituting systematic soot blowing, and the firing of fuels having minimum contamination with dioxins, furans and their precursors to minimise dioxins and furans in the flue gases.	Yes	DIIS Volume 6, chapters 3.8.5, 3.8.9, 4.2 and 4.5.1, pages 75 – 77, 81 – 82, 121 – 122, 125 – 126 and 128	Recovery boiler and power boiler, with related processes and control systems, are designed in the line with the latest developments, and only forest originated bio-fuels are to be used as a fuel in the power boiler. Measurements in operating recovery and power boilers of modern design have shown insignificant detectable dioxin and furan contents in flue gases, which are compliant with international standards.
D.1.4 Table 2	**Sulphur Dioxide (SO_2)** • For the recovery boiler: firing of black liquor with high dissolved solid concentration to mitigate SO_2 formation or flue gas scrubbing, or both.	Yes	DIIS Volume 6, chapter 3.4 and 3.8.5, page 30 and 75 – 77	Design dry solids content of the virgin black liquor (=dissolved proportion of wood and cooking chemicals recovered in brown stock washing) to be burned in the recovery boiler is 80 % (including boiler ash), which is typical modern practice. High black liquor dry solids content practically eliminates SO_2 release. The recovery boiler therefore does not require a flue gas scrubber.
	• For a standalone CNCG incinerator: flue gas cooling with either steam boiler or quench coolers and flue gas scrubbing.	Yes	DIIS Volume 6, chapter 3.8.10, page 82 – 83	Selected technology features two CNCG incinerators, one in operation and one as hot back-up. Both are equipped with steam boiler and flue gas scrubber.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• For the power boiler: use of bark, gas, low-sulphur oil, low-sulphur coal or flue gas scrubbing.	Yes	DIIS Volume 6, chapter 3.8.9, page 81 - 82	The power boiler is designed for burning of bio-fuels and in normal operation the power boiler combusts bio-fuels only. Natural gas is used as the start-up and steam balance fuel. Due to burning of bio-fuels, a flue gas scrubber is not needed to reduce sulphur emissions.
D.1.4 Table 2	**Nitrogen Oxides (NO_x)** • For the recovery boiler: control of combustion temperature profile; air distribution and excess air; and black liquor nitrogen content; and also appropriate design (low NO_x).	Yes	DIIS Volume 6, chapters 3.8.5 and 4.2, page 75 – 77, 121 - 122 and DIIS Volume 7, Annex XV ("NOx Issues")	The combustion air to the furnace is controlled and introduced at several levels (staged) to achieve smooth vertical air / flue gas flow in the furnace resulting in staged oxidation of volatile compounds and thus reduced NO_x formation. The recovery boiler includes the computerised burning control and optimisation system. Nitrogen content in black liquor (almost the entire source of NO_x from the recovery boiler) is determined by the nitrogen content of the wood resource.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• For the lime kiln: control of firing conditions and also appropriate design (low NO_x).	Yes	DIIS Volume 6, chapters 3.8.7 and 4.2, page 79 – 80, 124 and DIIS Volume 7, Annex XV ("NO_x Issues")	Firing of the lime kiln is equipped with low-NO_x burner and controlled by DCS. The fuel is natural gas which yields higher NO_x discharge than fuel oil but provides other advantages (lower SO_2 emissions). In spite of the choice of a fuel that is higher in nitrogen content than another possible fuel, the technology and firing method represents AMT.
	• For the power boiler: control of firing conditions and also appropriate design (low NO_x).	Yes	DIIS Volume 6, chapters 3.8.9 and 4.2, page 81– 82, 125 – 126 and DIIS Volume 7, Annex XV ("NO_x Issues")	Firing of the power boiler in normal operation by bio-fuels is controlled by DCS. Natural gas is used only in start-ups and temporary balancing of steam demand. NO_x emissions are essentially determined by the nitrogen content in the fuel.
D.1.4 Table 2	**Particulate Matter (PM) or Dust** • Cleaning of the flue gases from the recovery boiler, the power boiler (in which other bio-fuels or fossil fuels, or both are burned) and the lime kiln with efficient electrostatic precipitators	Yes	DIIS Volume 6, chapters 3.8.5, 3.8.7, 4.2 and 3.8.9, pages 75 – 77, 79 – 80, 81 – 82 and 12 - 125	Selected technology includes an electrostatic precipitator (ESP) with three parallel chambers and each chamber with four fields for the recovery boiler, an ESP with one chamber with three fields for the lime kiln and an ESP with one chamber with four fields for the power boiler. The particle removal efficiency of an ESP is about 99.9 %.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.1.5 Table 2	**Reasonable and Practical Measures to avoid Emissions to the Atmosphere** (a) avoidance (b) reuse; (c) recycling; (d) recovery of energy; (e) treatment; (f) containment; and (g) disposal.	Yes	DIIS Volume 6	CNCG and DNCG gases from pulping and chemical recovery are collected and combusted in the recovery boiler and in an incinerator to produce energy. Sulphur compounds from flue gas of the incinerator are recovered with a flue gas scrubber to produce sodium bi-sulphide to be reused in the fibre line. Heat generated from black liquor in the recovery boiler and from bio-fuels in the power boiler is used to generate steam and power. Flue gases from the recovery boiler, lime kiln and power boiler are cleaned with ESPs.

TABLE 2: Emission Limits to the Atmosphere

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	**Emission limit Monthly average**	**Eucalypt**	**Pine**		
D.1.6 …1.8 Table 3	**Recovery Boiler** • Particulate Matter (PM)	50 mg/NDm^3@ 3% O_2 See note s in Guidelines.	Yes	Yes	DIIS Volume 6, chapter 4.2, page 121 and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen	PM emissions from the recovery boiler equipped with three parallel electrostatic precipitator chambers can meet the requirement. Design value is 30 mg/NDm^3**.**
	• TRS	7 mgH_2S/NDm^3@ 3 % O_2 for > 99 % of the time. See Notes c and d in Guidelines.	Yes	Yes	DIIS Volume 6, chapter 4.2. page 121 – 122 and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen	High dry solids content of the firing liquor maintains low TRS emissions during normal operation. Estimated average TRS emission is 2 mg/NDm^3. As higher TRS emissions usually come from operational malfunctions and transition situations, it is likely to be challenging to meet the limit for more than 99 % of the time in early operation years because the mill is likely to have shut-downs and re-starts more often than during later years. These situations are likely to become less frequent and less significant over time as experience with the mill operation increases.

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	**Emission limit Monthly average**	**Eucalypt**	**Pine**		
	• NO_x	See note e in Guide-lines				Specified as part of mill-wide NO_x limit..
	• SO_2	See note d in Guide-lines				Specified as part of mill-wide sulphur limit.
	• PCDD/PCDF	100 pg I-TEQ/NDm^3@ 3 % O_2	Yes	Yes	Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen.	The magnitude of PCDD/PCDF emissions from modern recovery boilers is typically less than one tenth of the given limit.
D.1.6 …1.8 Table 3	**Lime Kiln** • Particulate Matter (PM)	40 mg/NDm^3@ 3 % O_2 See note s in Guidelines	Yes	Yes	DIIS Volume 6, chapter 4.2, page 124 and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen.	PM emission from the lime kiln with an electrostatic precipitator can meet the requirement. Design value is 30 mg/NDm^3.
	• TRS	16 mgH_2S/NDm^3@ 3 % O_2 for >95 % of the time. See note c and d in Guidelines	Yes	Yes	DIIS Volume 6, chapter 4.2, page 124 and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen	Selected technology uses a disc-type lime mud wash filter (lime mud dryness is about 80 %), clean condensate as washing media to minimise sulphur carry-over and lime mud flash dryer. With selected technology and adequate high surplus air factor in the lime kiln, TRS emissions can be held well below the required limit. Calculated average TRS

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	**Emission limit Monthly average**	**Eucalypt**	**Pine**		
						release is 5 mg/NDm3. As higher TRS emissions usually come from operational malfunctions and transition situations, it is likely to be challenging to meet the limit with over 95 % duration in early operation years because the mill probably will see shut-downs and re-starts more often than in later years. These situations are likely to become less frequent and less significant over time as experience with the mill operation increases.
	• NO_x	See note e in Guide-lines				Specified as part of mill-wide NO_x limit.
	• SO_2	See note d in Guidelines				Specified as part of mill-wide sulphur limit.
	• PCDD/PCDF	100 pg I-TEQ/NDm3@ 3 % O_2	Yes	Yes	Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen.	Magnitudes of PCDD/PCDF emissions from modern lime kilns are typically less than one tenth of the given limit.

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	**Emission limit Monthly average**	**Eucalypt**	**Pine**		
D.1.6 …1.8 Table 3	**CNCG Incinerator** • TRS	7 mgH_2S/NDm^3@ 3 % O2 for >99 % of the time. See notes c, d and r in Guidelines.	Yes	Yes	DIIS Volume 6, chapter 3.8.10 and 4.2, page 82 - 83 and 126 and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen	With well-controlled operation, the required limit can be met, but to do so for more than 99 % of the time will be challenging. Estimated TRS emission with efficiently working scrubber is 7 mg/NDm^3.
	• NO_x	See note e in Guidelines.				Specified as part of mill-wide NO_x limit.
	• SO_2	See note d in Guidelines.				Specified as part of mill-wide sulphur limit.
	• $SO_2 + SO_3$	See note d in Guidelines.				Specified as part of mill-wide sulphur limit.
	• $H2SO_4$ mist	See note d in Guidelines.				Specified as part of mill-wide sulphur limit.
D.1.6 …1.8 Table 3	**CNCG Emergency Incinerator** • TRS	See note d and r in Guidelines.				Specified as part of mill-wide sulphur limit.
	• NO_x	See note e in Guidelines.				Specified as part of mill-wide NO_x limit.
	• SO_2	See note d in Guidelines.				Specified as part of mill-wide sulphur limit.
	• $SO_2 + SO_3$	See note d in Guidelines.				Specified as part of mill-wide sulphur limit.

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	**Emission limit Monthly average**	**Eucalypt**	**Pine**		
D.1.6 …1.8 Table 3	**Power Boiler** • Particulate matter (PM)	30 mg/NDm^3@ 8 % O_2	Yes	Yes	DIIS Volume 6, chapter 3.8.9 and 4.2, page 81 – 82 and 125 – 126 and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen.	The requirement can be met with a properly designed electrostatic precipitator with four fields. Design value is 30 mg/NDm^3. Daily emissions from the power boiler will be lower in pulping of pine than with eucalypt pulping, due to lower power boiler load.
	• NOx	80 mgNO_2/MJ fuel input. See note h in guidelines. ~ 200 mgNO_2/NDm^3@ 8 O_2	Yes	Yes	DIIS Volume 6, chapters 3.8.9 and 4.2, page 81 – 82, 125 – 126 and DIIS Volume 7, Annex XV "NO_x Issues" and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen.	The NOx emissions from the power boiler are derived nearly exclusively from the bio-fuel. NO_x emissions from modern BFB boilers fired with wood-based bio-fuels are typically lower than 200 mgNO_2/NDm^3 with 3 % excess O_2.
	• SO2	See note j in Guidelines				No limit specified.
	• PCDD/PCDF	100 pg I-TEQ/NDm^3@ 8 % O_2	Yes	Yes	DIIS Volume 6, chapters 3.8.9, 4.2 and 4.5.1, pages 81– 82, 125 – 126 and 128 and Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen.	Magnitudes of PCDD/PCDF emissions from BFB power boilers are typically about one tenth of the limit.

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	Emission limit Monthly average	Eucalypt	Pine		
D.1.6 …1.8 Table 3	**All sources** • Sulphur	Annual average 0.4 kgS/ADt. See note k in Guidelines	Yes	Yes	DIIS Volume 7, Annex VI Supplementary information Book A, Expert Witness Statement by Esa Vakkilainen	Gaseous sulphur releases from processes are collected and oxidised either in the recovery boiler, CNCG incinerators, or in the power boiler. Estimated S_{tot} emission including fugitive emissions is 0.34 kgS/ADt. Of that the power boiler's share is estimated at 0.19 kgS/ADt. In 2005, the annual average sulphur emission from Finnish mills was 0.3 kgS/ADt and from Swedish mills 0.4 kgS/ADt. The Scandinavian mills are older, use mostly softwood, and operate at clearly higher sulphidity levels, thus having higher sulphur emissions than new hardwood mills.
D.1.6 …1.8 Table 3	**All sources** • NO_x from recovery boiler, lime kiln and CNCG incinerators but excluding power boiler	Annual average 1.3 $kgNO_2$/ADt. See note l in Guidelines	No	No	DIIS Volume 7, Annex XV " NOx Issues" and Supplementary information Book A, Expert Witness Statement by Kari Vakkilainen	Estimated annual average NO_x emission is for plantation eucalypt 1.26 $kgNO_2$/ADt, for native eucalypt 1.56 $kgNO_2$/ADt and for pine 1.64 $kgNO_2$/ADt. In 2005, Finnish pulp mills, which are older and mostly process both soft and

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	Emission limit Monthly average	Eucalypt	Pine		
						hardwood, thus resulting in higher NO_x emissions per ton of pulp, emissions were typically 1.4 – 1.7 $kgNO_2$/ADt/a and in average 1.58 $kgNO_2$/ADt/a. 5 mills, 3 of them burning oil and 2 natural gas in the lime kiln, go even below 1.4 kgNO2/ADt/a down to 1.1 $kgNO_2$/ADt/a. Currently most mills have a permit limit of 2.0 $kgNO_2$/ADt/a but in the latest permits the mills have been given the target to reduce NO_x emissions down to 1.5 $kgNO_2$/ADt/a. In Swedish mills, using fuel oil with somewhat lower NO_x emissions in lime kilns, the annual average NOx emission was 1.3 $kgNO_2$/ADt/a in 2005. This project is considered unlikely to achieve the NO_x emission limit of 1.3 $kgNO_2$/ADt/a during early operation years with native eucalypt. However, it is reasonable to pursue that limit after a few years, when the mill will operate mainly with plantation eucalypt, operating experience has been gathered

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	Emission limit Monthly average	Eucalypt	Pine		
						and technical developments may have taken place. Pine pulping will not have a significant impact on the NO_x emission level when emission is measured as an annual average.
D.1.6 …1.8 Table 3	**All sources** • H_2SO_4 mist	See note d in Guidelines.				Specified as part of mill-wide sulphur limit.
D.1.6 …1.8 Table 3	**All sources** • Hydrogen chloride (HCl)	See note m in Guidelines.				Specified as part of mill-wide inorganic chlorinated compounds limit.
D.1.6 …1.8 Table 3	**All sources** • Odour	See note d in Guidelines.				Specified as part of mill-wide sulphur limit.

Guideline Ref.	Guideline Requirement		Compliance		Assessment Ref.	Assessment
	Source/Parameter	**Emission limit Monthly average**	**Eucalypt**	**Pine**		
D.1.6 …1.8 Table 3	All sources • Inorganic chlorinated compounds. • Main stack • C 1: Bleach plant scrubber. • B 1: H2 scrubber at ClO2 plant. • B 2: Hypo/ClO2 scrubber at ClO2 plant • B 3: HCl scrubber at HCl synthesis plant. • Other possible chlorinated compounds emitting source.	50 mgCl_2/NDm^3 respectively for each source.	Yes	Yes	DIIS, Volume 7, Annex VIII, Environmental emission diagrams, page 5, Main stack and points B1, B2, B3 and C1. Emission figures confirmed also by Mr E.J. Bechberger/Erco in "Expert witness statement" §6, Conclusion No4 for points B1 and B2.	Calculated emission from the main stack is about 2 mgCl_2/NDm^3 and from sources B1, B2, B3 and C1 between 7 – 16 mgCl_2/NDm^3. The emission limit in permits for Finnish pulp mills is typically 30 mgCl_2/NDm^3. The limit at source B3 is readily achievable, according to Finnish experience.

TABLE 3: AMT for the Reduction of Emissions to the Marine Environment

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.1.9 (Table 4)	**Avoidance of Synthetic Dioxin Precursors** • Exclusion of wood chips produced from wood treated with polychlorinated phenols	Yes	DIIS Volume 1 A, chapter 5.2, page 19 -20	The proposal is to use only fresh wood from forests and plantations free from polychlorinated phenols. Gunns must establish relevant control procedures before the start of wood reception at the mill for the origin of incoming wood and to reject wood from unacceptable sources.
	• Exclusion of de-foamers containing more than 10 ppb dibenzo-p-dioxin and 40 ppb dibenzofuran by weight	Yes	Volume 1 B, chapter 6.2.18, page 6 -264	The proposal is not to use de-foamers containing dibenzo-p-dioxins and dibenzofurans. Gunns must establish chemical procurement procedures that ensure that such chemicals will not be purchased.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• Exclusion of polychlorinated phenols in paint, cutting oils and other inadvertent inputs to the process	Yes	Volume 1 B, chapter 6.2.18, page 6 -265	The proposal is not to use polychlorinated phenols in paint, cutting oils, and other inadvertent inputs. Gunns must implement proper management and operating instructions to ensure that inputs with polychlorinated phenols and other inadvertent materials are not used in the mill.
D.1.9 Table 4	**Optimised Wood Handling** • Optimization of raw material storage, seasoning period, chipping process, chip storage and chip dimensions .	Yes	DIIS Volume 6, chapter 3.8.1, page 43-45	Special attention has been paid to optimize chip quality. The existing chip mills will be modified and one new chipping line for plantation logs will be built. Softwood, native wood and plantation wood will be stored in separate chip piles.
	• Dry debarking	Yes	DIIS Volume 6, chapter 3.8.1, page 43	The wood will be debarked in the forest. The wood raw material is received as debarked round wood.
D.1.9 Table 4	**Pulping and Brown Stock Washing** • Modified batch cooking or modified continuous cooking.	Yes	DIIS Volume 6, chapter 3.8.2, page 45-48	The cooking process will be Lo Solids which is a modified continuous cooking process.
	• Closed brown stock screening and washing (i.e. return of all filtrates to chemical recovery).	Yes	DIIS Volume 6, chapter 3.8.2, page 49-51	Closed brown stock screening and washing is proposed. All filtrates are returned counter-currently from brown stock washing through the digester to the chemical recovery system.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• Oxygen delignification followed by efficient washing (99% overall recovery of dissolved wood solids and pulping chemicals from the pulp).	Yes	DIIS Volume 6, chapter 3.8.2, page 51-52	The lignin content of the pulp is further reduced after brown stock washing by an oxygen de-lignification stage by adding oxygen and alkali to the pulp. We have assumed that the 99 % overall recovery of dissolved wood solids and pulping chemicals refers to cooking, brown stock washing, and oxygen, and the required recovery rate is expected to be achieved with the selected technology.
D.1.9 Table 4	**Chemical Recovery and Handling of Accidental Discharges** • Effective control, containment, recovery and storage of all spills, leakages and releases of process liquids and solids and avoidance of any loss of these materials prior to their re-introduction to the process or their disposal in an approved manner	No	DIIS Volume 6, chapter 4.8.1, page 134 - 137	Proposed design includes necessary bunded areas for critical process areas and tank farms, spill collection and handling systems as well as control and monitoring automation. Sufficiently detailed management plans and control/monitoring procedures have not yet been provided. Gunns will need to implement detailed management and control/monitoring procedures before the start-up of the mill to satisfy this requirement.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• Adequate size of black liquor evaporation plant and recovery boiler to handle additional liquor and dry solids loads due to collection of spills and possible recycle of selected bleach plant effluents	Yes * * at the 820 000 ADT/a capacity. De-bottlenecking required for 1 100 000 ADt/a capacity.	DIIS Volume 6, chapter 3.3, page 26. Memo from Pöyry dated 11 May 2007	Design capacity of the evaporation plant is 1100 tH_2O/h and recovery boiler 4100 tDS/d. Required average evaporation capacity is 951 tH_2O/h and recovery boiler capacity 3704 tDS/d at the mill capacity of 820 000 ADt/a with native eucalypt. The reserve for the evaporation plant is about 16 % and for the recovery boiler 10 %. In order to maintain this reserve capacity at the maximum mill capacity of 1 100 000 ADt/a (operating on plantation eucalypt and possible recycling of EOP bleach effluent), de-bottlenecking of the evaporation plant and the recovery boiler will be required.
	• Stripping and appropriate reuse of foul condensates	Yes	DIIS Volume 6, chapter 3.8.4, page 73	Proposed technology includes stripping and reuse of foul conden-sates for pulp washing and lime mud washing in the recausticization plant.
	• Collection and reuse of clean cooling and sealing waters, including those from cooling towers	Yes	DIIS Volume 6, chapter 3.8.12, page 86 – 87	The cooling water from the mill's processes is collected and led to the cooling towers and from cooling towers back to the consumption points. Blow-down of the cooling towers is piped to the fresh water inlet of the mill. Clean sealing waters are also collected for reuse.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• Efficient washing of lime mud.	Yes	DIIS Volume 6, chapter 3.8.6, page 79	Lime is washed with clean secondary condensate and thickened to high dryness (about 80 %) with a disc filter, which is the AMT technology typically used in lime mud washing.
D.1.9 Table 4	**Bleaching** • ECF or TCF bleaching.	Yes	DIIS Volume 6, chapter 3.8.2, page 53-55	ECF bleaching technology is proposed.
	• Extraction stage reinforced by either oxygen (EO) or hydrogen peroxide (EP), or both (EOP).	Yes	DIIS Volume 6, chapter 3.8.2, page 53-55	EOP stage is included in the process design.
	• High shear chemical mixing (i.e. with high power dissipation).	Yes	DIIS Volume 6, chapter 3.8.2, page 53-55	Chemical mixers for medium-consistency pulp will be used.
	• Partial bleach plant closure (i.e. increased recycle of filtrates within the bleach plant and possibly recycle of some bleach plant filtrate to the brown stock area and to chemical recovery).	Yes (Recycling of alkaline effluent is a future option)	DIIS Volume 6, chapter 3.8.2, page 55	Acid filtrate from D2-stage washer is recycled through washers in D1 and D0 bleach stages before discharge to the effluent treatment plant. A future option is to recycle alkaline effluent from the EOP-stage washer for reuse as washing liquor at the last washer in the post-oxygen-delignification stage.
	• Efficient washing of pulp.	Yes	DIIS Volume 6, chapter 3.8.2, page 53-55	DD washers proposed after each bleaching stage.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.1.9 Table 4	**Bleaching Chemical Preparation** • On-site generation of chlorine dioxide with low contamination of elemental chlorine (methanol or hydrogen peroxide processes).			
	• Option 1 - Integrated sodium chlorate-chlorine dioxide plant (base case in the DIIS) including chlorine – alkali plant.	No	DIIS Volume 6, chapter 3.8.3, page 64 - 66	The proposed integrated chemical plant does not use a methanol or hydrogen peroxide process and is not listed as AMT in the Guidelines. At present, only three pulp mills are using the proposed low-chlorine integrated sodium chlorate-chlorine dioxide plant for the production of ClO_2. There is no public documentation to support that these three plants are consistently producing a ClO_2 solution of the low chlorine content indicated for the proposed IDP plant. It is considered possible, however, to reduce Cl_2 residue in the ClO_2 solution to the same level as in methanol- or hydrogen peroxide based processes by dosing the ClO_2 solution with hydrogen peroxide. Producing ClO_2 with low chlorine content by the proposed method is thus considered technically achievable.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• Option 2 - Non-integrated bleaching chemical production (alternative 2 in the DIIS) consisting of sodium chlorate plant, chlorine dioxide plant based on hydrogen peroxide as reducing agent, hydrogen peroxide plant and oxygen plant.	Yes		Independent sodium chlorate, chlorine dioxide, hydrogen peroxide and oxygen plants, are all well-proven installations. Most pulp mills have installed only on-site chlorine dioxide and oxygen plants, and sodium chlorate and hydrogen peroxide are imported chemicals. When chlorine dioxide production is then based on methanol or hydrogen peroxide as reducing agent, the technology is considered AMT.
D.1.9 Table 4	**Effluent Treatment** • Primary and secondary (biological) treatment of all process effluent, excluding uncontaminated cooling water. See note a in Guidelines.	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B- Project Description, page 336 – 350	Selected technology includes a primary sedimentation and a low-loaded activated sludge plant with minimum retention times at 22.5 hours and normally around 30 hours.
	• Anoxic selector for chlorate reduction.	Yes	DIIS Volume 1B- Project Description, page 336 – 350 DIIS Volume 6, chapter 3.8.14, page 88 – 99	Selected technology includes an anoxic chlorate removal stage with a minimum retention time of two hours, plus selector basins with a minimum retention time of three hours, prior to the activated sludge plant.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	• Provision of containment basin(s) to temporarily store, for subsequent treatment, untreated process effluent that has sufficiently high levels of contamination to adversely affect the operation of the effluent treatment plant.	Yes	DIIS Volume 6, chapter 3.8.14, page 93 DIIS Volume 1B- Project Description, page 336 – 350.	Selected technology includes emergency basins (98 600 m^3) allowing temporary storage of mill effluent for a minimum of 24 hours, and normally for 30 hours. <u>ETP Conclusion</u> The basic elements of an AMT effluent treatment plant are fulfilled. The chosen process as such is therefore regarded as complying with the AMT requirements. However, the single-line installation results in the risk that an equipment failure in the single-line process section may lead to releases exceeding the permit limits in the effluent quality if the influent to the waste water treatment plant is not stopped and the mill is not shut down. It is, therefore, strongly recommended that permit conditions require that either at least the aeration basin be designed as a complete double-line installation or Gunns be required to shut down certain process areas of the mill in the event of equipment failures in the effluent treatment plant that may lead to exceeding of the emission limits.
D.1.9 Table 4	**Cooling Water** • Recirculation to a cooling tower and reuse of indirect cooling water	Yes	DIIS Volume 6, chapter 3.8.12, page 86 – 87	Recirculation of cooling water to cooling towers and its reuse are proposed.

TABLE 4: Monthly Average and Daily Discharge Limits to the Marine Environment

Guideline Ref.	Guideline Requirement or Parameter	Guideline Limit Monthly Ave. Max.	Guideline Limit Daily Max.	Compliance		Assessment Ref.	Assessment
				Eucalypt	Pine		
D.1.10 Table 4	**Emission limits to the marine environment** (b) Pollutant discharges to the environment should be reduced to the maximum extent that is reasonable and practical having regard to best practice environmental management, and in accordance with the following hierarchy of waste management, arranged in decreasing order of desirability: (1) waste avoidance; (2) recycling/reclamation; (3) waste re-use; (4) waste treatment to reduce potentially degrading impacts; and (5) waste disposal.			Yes	Yes	DIIS Volume 6	Brown stock is washed counter-currently, and the wash filtrate is led to the chemical recovery. Acid bleach filtrate from D2 stage is recycled through D1- and D0-stage washers. Foul condensates are recovered, cleaned and re-used in pulp washing and in the recausticization plant. Cooling water is recycled in closed loops through cooling towers back to use. Clean storm water is collected and reclaimed for the mill water production. Cooling tower blow-downs are reclaimed for the mill water production.

Guideline Ref.	Guideline Requirement or Parameter	Guideline Limit Monthly Ave. Max.	Guideline Limit Daily Max.	Compliance		Assessment Ref.	Assessment
				Eucalypt	Pine		
D.1.12 (Table 5)	**TSS**	2.6 kg/ADt	4.5 kg/ADt	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B-Project Description, page 336 – 350	Estimated average effluent load of 0.41 kg/ADt will be lower by a clear margin than the Guideline's limits. Required removal efficiency to achieve the Guideline's value is 80 %.
D.1.12 Table 5	**BOD_5**	2.1 kg/ADt	3.6 kg/ADt	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B-Project Description, page 336 – 350	The BOD_5 removal efficiency required to achieve the Guideline value is 87 %, COD removal efficiency 56 % and AOX removal efficiency 57 %. Estimated average effluent loads of 0.22 kg/ADt BOD_5, 9.4 kg/ADt COD_{Cr}, and 0.14 kg/ADt AOX will be lower by a clear margin than the Guideline's limits. The low effluent load when treating pine should also comply with the limit. The estimated effluent load is also consistent with EU/IPPC Guidelines. The estimated effluent load is similar or even lower than effluent emissions from Swedish and Finnish Mills.
D.1.12 Table 5	**COD**	20 kg/ADt	34 kg/ADt	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B-Project Description, page 336 – 350	

Guideline Ref.	Guideline Requirement or Parameter	Guideline Limit Monthly Ave. Max.	Guideline Limit Daily Max.	Compliance		Assessment Ref.	Assessment
				Eucalypt	Pine		
D.1.12 Table 5	**AOX**	0.2 kg/ADt	0.4 kg/ADt	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B-Project Description, page 336 – 350	Estimated effluent load is similar to what is considered normal for modern bleached kraft pulp mills. The selected treatment process and its dimensioning will, according to SWECO's experience and opinion, meet these required treatment efficiencies. In practice, higher efficiencies than those stated above are expected.
D.1.12 Table 5	**Colour**	42 kg/ADt	72 kg/ADt	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B-Project Description, page 336 – 350	The estimated effluent colour of 10 kg/ADt will be lower by a clear margin than the Guideline's limit. No practical removal effect is expected in the biological treatment. The expected colour emission from the process, however, is such that the given emission limit is expected to be complied with.

Guideline Ref.	Guideline Requirement or Parameter	Guideline Limit Monthly Ave. Max.	Guideline Limit Daily Max.	Compliance		Assessment Ref.	Assessment
				Eucalypt	Pine		
D.1.13	**Colour** Notwithstanding the recommended colour limits, any proponent of a BEK pulp mill to be built in Tasmania should ensure that the colour emissions will not affect the visual amenity of the local beaches and environs.			Yes	Yes	Commentary/Review of Request for Information No. 029. EnviroGulf Consulting. Bell Bay Pulp Mill IIS, Response to SWECO queries. GHD Pty Ltd. Memo concerning clarification to matters related to the effluent properties dated June 7 2007. Poyry Forest Industry Oy.	Based on the documentation available, it is assessed that the colour requirements of the Guidelines will be met. On this basis, colour discoloration near the diffuser (if any) will not be visible from the beach.

TABLE 5: Discharge Limits for each Biologically Treated Effluent Sample Analyzed

Guideline Ref.	Parameter or Pollutant	Limit (RPDC Guidelines)	Compliance		Assessment Ref.	Assessment
			Eucalypt	Pine		
D.1.14 Table 6	**Acute toxicity**	Acute toxicity should be measured in 100% effluent. The effect from the effluent should be less than 50%. (LC_{50}/EC_{50}).	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B- Project Description, page 336 – 350 Ecotox: Toxicity Assessment of a Pulp Mill Effluent for proposed Tasmanian Pulp mill, June 2005 and April 2006	Gunns has indicated that the dilution of effluent at the edge of the mixing zone shall be greater than 1 in 100. Assuming the effluent from the pulp mill proposed for Bell Bay is the same as that sampled and tested by Gunns from the Thai pulp mill, and that the sample was representative of effluent quality over time, and the dilution of effluent at the edge of the mixing zone is greater than 1 in 100, no acute or sub-lethal toxicity (chronic) would be expected at the edge of the mixing zone.
D.1.14 Table 6	**Chronic toxicity**	Chronic toxicity should be measured in effluent at various dilutions above and below the dilution expected at the edge of the mixing zone. The concentration at which a 50% effect is obtained should be determined. The Lowest Observed Effect Concentration (LOEC) and the No Observed Effect Concentration (NOEC) should also be determined. The discharge limit will be set such that the NOEC is not exceeded at the edge of the mixing zone.	Yes	Yes		
D.1.14 Table 6	**2,3,7,8-TCDD**	10 pg/l	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B- Project Description, page 336 – 350	The estimated discharge of effluent complies with the Guidelines and is also in accordance with international guidelines (e.g. US EPA Guidelines on BAT for pulping processes, 2003, EPA Water guide, Rules and Regulations, 1998).

Guideline Ref.	Parameter or Pollutant	Limit (RPDC Guidelines)	Compliance		Assessment Ref.	Assessment
			Eucalypt	Pine		
D.1.14 Table 6	**2,3,7,8-TCDF**	30 pg/l	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B- Project Description, page 336 – 350	The estimated discharge of effluent complies with the Guidelines and is also in accordance with international guidelines (e.g. US EPA Guidelines on BAT for pulping processes, 2003, EPA Water guide, Rules and Regulations, 1998.
D.1.14 Table 6	**Chlorate**	10 mg/L	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B- Project Description, page 336 – 350 Ecotox, 2006. toxicity Assessment of Chlorate to the Brown macro-alga Rosemarin A, et al. 1994. Effects of pulp mill chlorate on Fucus vesiculosus.	The estimated discharge concentration 1.9 mg/l is lower than that given in the Guidelines. Laboratory tests indicate that site-specific brown algae tolerate higher concentrations than 10 mg/l. The estimated chlorate discharge concentration from the Gunns mill is similar to the reported chlorate concentrations in effluent from Swedish and Finnish ECF pulp mills.
D.1.14 Tabl3 6	**Trihalomethanes including Chloroform**	2 mg/L	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B- Project Description, page 336 – 350	The estimated discharge of effluent will be negligible or less than 2 mg/L. Estimated effluent load is expected to comply with the Guidelines and be consistent with Swedish and Finnish experience.

Guideline Ref.	Parameter or Pollutant	Limit (RPDC Guidelines)	Compliance		Assessment Ref.	Assessment
			Eucalypt	Pine		
D.1.14 Table 6	**Oil and Grease**	No visible contamination	Yes	Yes	DIIS Volume 6, chapter 3.8.14, page 88 – 99 DIIS Volume 1B- Project Description, page 336 – 350	The estimated discharge of effluent is unlikely to yield visible contamination. The estimated effluent quality is expected to comply with the Guidelines.

TABLE 6. AMT for the Reduction and Handling of Solid Waste

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.2.1 Table 8	Any new mill will be required to incorporate technologies listed in Table 8, which are considered AMT for the reduction and handling of solid waste, or equivalent.			
	• Minimised generation of solid waste and recovery, recycle and reuse of these materials as far as possible.	Yes	DIIS Volume 16, Appendix 55 DIIS Volume 2, chapter 11.2.3, page 660) DIIS Volume 6, chapter 4.6 Meeting with Pöyry 7 May 2007	The aim to reduce the landfill waste as much as possible is stressed and examples are given. However the viability of feasible reuse alternatives should be further investigated and described in a waste minimization plan. Use of certain waste fractions as a soil amendment can be finally assessed only after analysis of the waste actually produced. Availability of suitable land for spreading of ashes etc. may also pose a restriction.
D.2.1 Table 8	• Separate collection of waste fractions at the source and, if necessary, intermediate storage of residuals/ waste to make possible an appropriate handling of the remaining waste products.	Yes	DIIS Volume 2, chapter 4.14.1 Section 8.9, DIIS Volume 16, Appendix 55	A more detailed description of how the various process wastes will be handled including dewatering, separate storage and its capacity (e.g. silos for the lime kiln ESP dust), weighing and chemical analysis (quality assurance for alternative use), and means and frequency of transport to the landfill is a recommended permit condition and should be addressed in the detailed design phase.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.2.1 Table 8	• Incineration of all non-hazardous organic material (e.g. bark, wood waste, effluent sludge) in a power boiler, specially designed for burning of moist, low calorific value fuels (e.g. a fluidised bed boiler). Bio-sludge may be burned in the recovery boiler.	Yes	DIIS Volume 7, Annex XV	This is satisfied through the burning of available biomass, such as bark, sawmills residues, fines from woodchip mills, residues from the forest and primary (fibre) sludge from the effluent treatment in the power boiler, and the burning of bio-sludge in the recovery boiler.
D.2.1 Table 8	• Material that cannot be reused, recovered or has to be handled differently should be taken to a landfill that is approved to receive the type of waste to be disposed of. Only inert, primarily inorganic waste should be land-filled. Organic waste should not be land-filled.	Yes	DIIS Volume 16, Appendix 55	Inorganic process wastes shall be reused as far as possible, and this shall be further elaborated upon a waste minimization plan that will be further refined after start-up of the mill's operation. Organic process wastes will be incinerated within the pulp mill. The minor streams of organic waste [a] from canteens etc. (putrescible waste) should not be landfilled at the site, but be handled by an external operator. It is recommended to make the preparation of a waste minimisation plan a permit condition. The landfill shall be designed as Category C for secure landfills according to the Tasmanian Landfill Sustainability Guide (LSG) 2004.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.2.1 Table 8	• Generation of dioxins and furans can occur in the convection back passes (the cooler sections) of power and recovery boilers. Depending on concentrations, dusts from these sections should be managed in the same way as other controlled wastes and not spread on land.	Yes	Supplementary information, Book A, Expert Witness Statement by E.Vakkilainen, Attachment 4	Gunns does not propose burning salt laden bio-fuels (e.g. sea water soaked wood), which may generate dioxins and furans whilst burning, in the power boiler. The total calculated dioxin and furan quantity in the power boiler ash is about 2 mg/a. Fly ash separated out in the electrostatic filter has a concentration of dioxins and furans of some 20 times higher than the bottom ash does. All power boiler ash is proposed to be landfilled. The possibility of utilising boiler ash fractions for soil amendment or spreading on land will be depend on thorough analysis of the materials after the mill has started operation.
D.2.1 Table 8	• Efficient washing of green liquor dregs prior to disposal to landfill, to minimise leaching of caustic.	Yes	DIIS Volume 6, chapter 3.8.6, page 78 - 79	After the green liquor dregs separated out via green liquor filter will be washed and concentrated with a centrifuge to about 40 % (possibly up to 50 %) dryness and then land-filled. The technology selected performs in terms of dregs dryness equally to or better than typically used pre-coat filters and is thus considered as AMT.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.2.1 Table 8	• Efficient washing of lime mud prior to reuse in the lime kiln to minimise the formation of hydrogen sulphide (H2S) during the mud drying process.	Yes	DIIS Volume 6, chapter 3.8.6, page 78 - 79	Lime mud will be washed with clean condensate and thickened to high dryness (about 80 %) with a disc filter and fed to a lime dryer working with the flue gas of the lime kiln. The technology selected is typical in pulp mills.
D.2.1 Table 8	• External utilisation of residuals/waste as substitutes in forestry, agriculture or other industries, if possible and subject to approval under the Waste Management Regulations 2000.	Yes		See above, item 1 of this table.
D.2.3	All wastes, solid and otherwise, will be managed in accordance with the waste hierarchy: (a) avoidance; (b) reuse; (c) recycling; (d) recovery of energy; (e) treatment; (f) containment; and (g) disposal.	Yes	DIIS Volume 16, Appendix 55	The waste management is compliant with the waste hierarchy, provided that the suggested means of reuse are actually implemented. Although the incineration for energy recovery is suggested over the reuse for (e.g.) fibre sludge, it can still be considered to be compliant with the strategy to employ landfill disposal only as the last option.
D.2.3	The disposal of solid wastes should be reduced by minimizing the generated amounts and by recovering, recycling and re-using potential waste fractions wherever practicable. Separate collection and intermediate storage of different fractions should be applied to meet this aim.	Yes	DIIS Volume 16, Appendix 55	As above. The minimization of waste is stressed, although there is need for further clarification on how separate collection and storage will be handled. More information on this as well as minimization of

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
				waste from offices, canteens etc. is recommended as part of the waste minimisation plan which should be a permit condition.
D.2.5	(1) Bark, fibres, wood residues and other organic material which cannot be reused should be burned and the energy recovered. (2) When burning mixed organic waste of different origin in power and recovery boilers, the formation of dioxins and furans within the boiler must be inhibited by appropriate design to achieve the most suitable time/ temperature profile, and by appropriate operation including control of oxygen content, instituting systematic soot blowing, and the firing of fuels having minimum contamination with dioxins, furans and their precursors to minimise dioxins and furans in the flue gases. The boiler must also be equipped with adequate flue gas cleaning (i.e. electrostatic precipitators).	Yes	DIIS Volume 16, Appendix 55	Fibre sludge from primary effluent treatment and wood waste from the wood yard are to be burned in the power boiler. Biological sludge from secondary treatment (activated sludge) is to be burned in the recovery boiler. Compliance with AMT in terms of airborne emissions of the selected technology is assessed in Table 1 “AMT for the Reduction of Emissions to the Atmosphere”, and in item 2.1 of this table.
D.2.6	Disposal of any solid waste that is not inert and primarily inorganic and that cannot be reused, recovered or burned for fuel must be undertaken by persons authorised to do so under EMPCA or the *Waste Management Regulations 2000*. Prior to disposal the waste must be dewatered to the maximum extent possible using high intensity press.	Yes	DIIS Volume 6, chapter 3.8.6, 3.8.9 and 4.6, pages 78, 81 – 82 and 131 Meeting with Pöyry 7 May 2007	Authorisation must be assessed by the relevant statutory regulator during the operational phase. Some of the process wastes are dry (ash and lime dust) while green liquor dregs has a dry solids content of some 40–50% after dewatering by centrifuge and the slaker grits 45% dryness. The slaker grits, mostly consisting of sand and other inert residues from the recaustisization process, may

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
				be dewaterable further. It should be ensured that there is a back-up system for dewatering if the centrifuge needs maintenance or similar to avoid any land-filling of liquid waste.
D.2.7	Any landfill sites used by the mill operator for disposal of solid wastes that are water soluble should be chosen and managed in agreement with relevant State agencies. They should include, as a minimum, cut-off drains, leachate collection drains and storage and subterranean collectors capable of accommodating run off from the site of a volume equal to a 10-year recurrence interval storm, and from areas surrounding the site of a volume equal to a 50-year recurrence interval storm. Sufficient groundwater monitoring wells per site to satisfy the regulatory authorities that adequate monitoring and reporting of leachate, if identified, will be possible should also be included.	Yes	DIIS Volume 16, Appendix 55	The general design requirements have been addressed, however the provision of further detail is recommended as a permit condition. Some technical issues related to the landfill construction (e g., groundwater table control, modelling of leachate production, relevant leachate storage capacity, and relevant choice of liner material) require further elaboration. Information on final rehabilitation and after-care should be given, also. The landfill should be designed in accordance with the Tasmanian Landfill Sustainability Guidelines for secure landfills. It is recommended that Gunns be required to provide the above information as part of their detailed engineering design as a permit condition.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.2.8	Sections of the landfill that have been completely filled should be covered and sealed according to appropriate procedures.	Yes	DIIS Volume 16, Appendix 55	The suggested operation procedures are compliant provided that organic (putrescible) canteen waste is not land-filled. If, despite the recommendation of this report, putrescible waste is to be landfilled, it is recommended that the permit conditions require a more thorough analysis of methane gas generation and information on how this will be handled.
D.2.9	Liquid wastes are not permitted to be disposed of at a landfill.	Yes	DIIS Vol 16, 55	None of the waste categories proposed for land-filling can be classified as liquid, provided that the dewatering of green liquor dregs is performed effectively.

Note a**:** The intent of the restriction on landfilling organic waste is interpreted to apply to process organic waste.

TABLE 7: Meteorological Studies

Guideline Ref.	Guideline Requirement	Limit	Compliance with Limit		Assessment Ref.	Assessment
			Eucalypt	Pine		
D.3.4	Study of meteorological and topographical characteristic of the site based on adequate data from at least one year which, combined with emission stack design.		Yes	Yes	PAE Supplementary Air Quality Assessment of Proposed Pulp Mill, 8 August 2006, job no 2238, chapter 3, pages 3 – 5. GHD Impact on Air Quality, June 2006, chapter 4.1 pages 8-9.	Proposed data input includes the requirements.
D.3.5	Where several sites are being considered for their suitability, knowledge of their topography and meteorological characteristics, such as air stability and prevailing winds, will be required to discriminate between the sites.		Yes	Yes	PAE Supplementary Air Quality Assessment of Proposed Pulp Mill, 8 August 2006, job no 2238, chapter 3.1.4, pages 4 – 5. GHD Impact on Air Quality, June 2006, chapter 4.1 pages 6 - 7.	Proposed data input includes the requirements.
D.3.6	Standards and meteorological parameters.		Yes	Yes	PAE Supplementary Air Quality Assessment of Proposed Pulp Mill, 8 August 2006, job no 2238, chapter 3.1.4, pages 4. GHD Impact on Air Quality, June 2006, chapter 4.1 pages 8 - 9.	Proposed data input are using data from a standard measurement station.

Guideline Ref.	Guideline Requirement	Limit	Compliance with Limit		Assessment Ref.	Assessment
			Eucalypt	Pine		
D.3.7	Meteorological data and background levels.		Yes	Yes	PAE Supplementary Air Quality Assessment of Proposed Pulp Mill, 8 August 2006, job no 2238, chapter 3.1.4, page 4. GHD Impact on Air Quality, June 2006, chapter 4.1 pages 8-10 and 22 – 28. And additional information from CSIRO Assessment of Background Air Quality collected by "Tamar Valley Air Quality Monitoring Project", 9 May 2007.	The meteorological data used are based on information for 01 July 2005 to 30 June 2006. Background concentrations are taken into consideration except TRS.
D.3.8	Meteorological data and dispersion model.		Yes	Yes	PAE Supplementary Air Quality Assessment of Proposed Pulp Mill, 8 August 2006, job no 2238, chapter 3.1.4, pages 4 – 9. GHD Impact on Air Quality, June 2006, chapter 3, pages 6 – 7.	The proposed data input has been incorporated into the dispersion model as required.

TABLE 8. Air Quality Design Criteria

Guideline Ref.	Pollutant	Guideline Limit	Predicted max. con-centration from the mill	Max. from the mill plus background concentration	Compliance		Assessment Ref.	Assessment
					Eucalypt	Pine		
D.3.9	**Particulate matter PM10** (24-hour average)	50 µg/m^3 (NEPM requirement)	2 µg/m^3	<37 µg/m^3 (at George Town)	Yes	Yes	PAE 8 August 2006, Section 4.4.1.3, CSIRO 9 May 2007.	Predicted maximum PM10 contribution of the mill as a 24-hour average is 2 µg/m3 at Tippogoree Hills B, Hillwood and Midway Point. The predicted modelled PM10 emission is compliant with the NEPM requirement. The contribution of the mill to the predicted ambient air concentration is insignificant everywhere within modelled area.
D.3.9	**Nitrogen dioxide** (NO2)	330 µg/m^3 (160 ppb) 1-hour	33 µg/m^3 (16 ppb)	< 180 µg/m^3 (at Mt George)	Yes	Yes	PAE 8 August 2007, Section 4.4.1.1 CSIRO 9 May 2007	The maximum predicted contribution of the mill as NO_2 and one-hour average is 0.016 ppm (or 33 µg/m^3) at Mt George. The concentration of

Guideline Ref.	Pollutant	Guideline Limit	Predicted max. con-centration from the mill	Max. from the mill plus background concentration	Compliance		Assessment Ref.	Assessment
					Eucalypt	Pine		
								nitrogen oxides in the ambient air is likely to remain below the design criterion after the addition of the predicted emission from the mill.
D.3.9	**Sulphur dioxide** (SO2)	570 µg/m^3 (200 ppb) 1-hour	200 µg/m^3 (70 ppb)	< 340 µg/m^3 (at Tipporogee Hills A)	Yes	Yes	PAE 8 August 2006, Section 4.4.1.2 CSIRO 9 May 2007	The maximum predicted contribution of the mill as SO_2 and one-hour average is 0.07 ppm (or 200 µg/m3) at Tippogoree Hills B. The concentration of sulphur dioxide in the ambient air is likely to remain below the design criterion after the addition of the predicted emission from the mill.
D.3.9	**Total reduced sulphur (TRS)** (H_2S)	1.5 µg/m^3 (1.1 ppb) 3-min aver-age	~2 µg/m^3	>2.2 µg/m^3 (at Tippogoree Hills)	No	No	PAE Section 6.2.2, Figure 9	The maximum predicted TRS contribution of mill as H_2S and the three-minute average, 99.9%-ile is ~2 µg/m3. The predicted peak TRS value from the mill is expected to exceed the

Guideline Ref.	Pollutant	Guideline Limit	Predicted max. con-centration from the mill	Max. from the mill plus background concentration	Compliance		Assessment Ref.	Assessment
					Eucalypt	Pine		
								design criterion specified in the Guidelines, approximately once every 11 years, mainly over the Tamar Estuary and the hills to the east of the pulp mill site (Tippogoree Hills and Midway Point).
D.3.9	**Inorganic Chlorinated Compounds**	10 µg/m^3 3-min avg	9.9 µg/m^3	9.9 µg/m^3	Yes	Yes	PAE Section 6.2.4	The mill contribution is predicted as the sum concentrations of chlorine, chlorine dioxide and hydrogen chloride. The sum concentration of inorganic chlorinated compounds in the ambient air is predicted to remain just below the strict design criterion as a result of the predicted emissions from the mill. In some USA states, corresponding one hour guideline values are over 10 times higher.

TABLE 9: Stack Height

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.3.11	It is sound engineering practice (USEPA 1985) for the exhaust stack to be at least 2.5 times higher than the recovery boiler building height and for the stacks from lime kiln, CNCG incinerator, CNCG emergency incinerator and power boiler to be taken to the same height as the recovery boiler stack. Site selection factors such as geographic location and air dispersion modelling will also influence the common stack height.	No	DIIS Volume 7, Annex XII, page 23	The multiple flue stack contains emissions from all sources listed. The design height of the stack is about 1.5 times that of the recovery boiler building. Typical stack heights of new pulp mill installations vary between 120 and 140 m. We consider that a simple definition of the stack height asf 2.5 times the height of the highest building at the mill is not to be a relevant specification. The stack height must be defined according to the dispersion calculations and so as to ensure that acceptable emissions at the ground level can be achieved. It is probable that increasing the stack height above the planned 130 m will not significantly reduce the ground level concentrations**.**

TABLE 10: Hydrodynamic Studies

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
D.3.13	At the preferred site, studies shall be conducted to predict the dispersion of effluent in the receiving waters. In particular the influence of water currents on the effluent plume distribution must be considered.	Yes	Review of documents re: Hydrodynamic modelling of effluent from proposed offshore effluent outfall for Gunns Pulp Mill, Tasmania, Patterson Britton & Partners Pty Ltd.	The requested studies have been conducted.
D.3.14	It is expected that the studies will require the use of a hydrodynamic model and appropriate wind, current and water density measurements to determine the effluent dispersion characteristics under a variety of weather conditions, and allow for seasonal variability.	No	Supplementary Information Book B: GHD: Addendum for Gunns Limited Mill IIS Additional Modelling Works, August 2006. GHD: Addendum for Gunns Limited Mill IIS Additional Modelling Works, Report 2, January 2007.	A hydrodynamic model has been used to determine effluent dispersion characteristics. The following issues were noted. • The boundary conditions concerning tidal elevation, wind, bottom topography and coastal shoreline that have been applied in the model have been found to be adequate. An exception concerns the density stratification at the outfall site, where conclusions have been drawn from data obtained at a non-reference location. If stratification data of higher quality and more relevance to the outfall site are available, they should be used. This is of importance in order to confirm that there is no other scenario, including a temperature stratification that should be considered, a scenario that might bring a about a different extent of the proposed mixing zone.

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
			Review of documents re: Hydrodynamic modelling of effluent from proposed offshore effluent outfall for Gunns Pulp Mill, Tasmania, Patterson Britton & Partners Pty Ltd. Towards an understanding of the flushing of the Bass Strait, Paul Sandery, School of Chemistry, Physics and Earth Sciences Flinders University Adelaide-Australia.	• GHD should explain/justify their confidence in the capability of the non-calibrated model. • The sensitivity analysis of model parameters presented by GHD indicates that the steady state concentration of effluent in the outfall area is sensitive to variations of turbulence parameters within realistic limits. This result underscores the need for calibration. It is important that the reliability of the model can be demonstrated so that a proposal of a mixing zone can be performed with confidence based on model results. Since the choice of turbulence parameters influences the extent of an adequate mixing zone, it should be made a condition of the Project's approval that a calibration be performed in order to allow reliable choices of turbulence parameters. It is recommended that details of the choice of density stratification, describing the model calibration, validation results for the three-dimensional D-grid, and explanation of the time step used in the far-field model be required as a permit condition.
D.3.15	The hydrodynamic studies will need to provide an adequate level of detail required to determine an appropriate mixing zone (if necessary) and an appropriate post-commissioning monitoring program. The proponent will be responsible for undertaking the hydrodynamic studies to the required standard.	No	See D.3.14	The hydrodynamic studies do not provide adequate detail to determine an appropriate mixing zone. The following issues have been identified. • The report should be supplemented with additional evidence that the far-field build up of concentrations in the area is described accurately and that a steady state is reached within the 60-days simulation period. This is of importance when it comes to determining what concentrations that can be expected at the edge and within the mixing zone, and hence the necessary extent

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
				of the mixing zone. The provision of this information should therefore be made a permit condition of the Project's approval. • To certify that the vertical grid resolution adopted is sufficient to avoid exaggerated numerical diffusion, a sensitivity analysis comparing the vertical dilution under the numerical scheme used in the analysis, to solutions obtained with alternative numerical schemes should be presented. This is important for showing that the vertical dilution in the mixing zone is not a result of the model numerical scheme but rather a result from turbulent mixing. Since the answer to this question affects the extent of a mixing zone, the provision of this information should be made a permit condition of the Project's approval. It is recommended that details of the steady state of background concentrations and analysis of the numerical diffusion in the local-scale D-grid be required as a permit condition.
D.3.16	Data from the hydrodynamic studies should be utilised to define a mixing zone for the dilution of mill effluent at the point of discharge, in accordance with the *State Policy on Water Quality Management 1997*. The size of the mixing zone is site-specific and could be varied if site-specific environmental factors indicate some change of size.	Yes	See D.3.14	A hydrodynamic model has been generated by GHD and this was used to develop dilution maps. These dilution maps were then considered by the Board of Environmental Management and Pollution Control in determining an interim mixing zone. The Board of Environmental Management and Pollution Control has satisfied the requirement of section D.3.16 in the guidelines.
D.3.17	Water quality objectives for the receiving waters will be set in accordance with the *State Policy on Water Quality Management*	No	Supplementary Information, Book C, Toxikos:Expert	Gunns have presented satisfactory information regarding the ability to meet the interim WQOs at the edge of the interim mixing zone. Gunns have also

Guideline Ref.	Guideline Requirement	Compliance	Assessment Ref.	Assessment
	1997, and hydrodynamic studies should be utilised to assist demonstration that these objectives can be met at or beyond the edge of the mixing zone.		Witness Statement of DR Roger Drew	presented satisfactory information concerning paragraph (a) and (b), section 20.4, in the State Policy on Water Quality Management 1997 but have not specifically addressed the issues specified in paragraph (c) to (e) in the same section. It is recommended that Gunns be required to provide information addressing items (c) to (e) as a permit condition.
D.3.18	A mixture of effluent and receiving water, in a proportion equal to the agreed minimum dilution at the edge of the mixing zone, should have the following properties in comparison to the receiving water alone: (a) **colour** (i) the visual clarity is not reduced by more than 20%; (ii) the hue is not reduced by more than 10 points on the Munsell Scale; (iii) the reflectance is not changed by more than 50%; and (iv) the horizontal sighting of a 200 mm black Secchi disc is more than 1.6 m. (b) **optical quality** (i) natural euphotic depth: no more than 10% change; and (ii) seasonal mean nephelometric turbidity: no more than 10% change.	Yes	Commentary/Review of Request for Information No. 029, EnviroGulf Consulting. Memo concerning clarification to matter related to the effluent properties, Poyry Forest Industries Oy.	Gunns has presented satisfactory information with regard to section D.3.18 in the Guidelines, with the exception of paragraph (a iii) concerning reflectance. Given that the other optical properties are shown to meet the standard it is SWECO PIC's estimate that it is quite likely that also paragraph (aiii) will meet the given standard. It is recommended that the information to demonstrate compliance with paragraph (aiii) of the Guidelines be made a permit condition**.**

8 Statement of Compliance

Based on the assessment, it is concluded that the DIIS is extensive and has been methodically prepared.

It is SWECO PIC's best judgement that the project complies with some 92 % of the assessed requirements. The non-compliances principally arise either from the proposed use of alternative (but acceptable) technical solutions as opposed to those anticipated by the Guidelines, from reference to documentation that is incomplete or not yet available, or from potential for marginal and infrequent exceeding of ambient design criteria.

The non-compliances identified are listed in the table below. Of the eight non-compliances identified, six can be addressed through permit conditions and two are not considered significant. Related permit conditions are specified in Section 10.

The numbering in the table follows that of the Guidelines.

TABLE 11: Non-Compliances

Guideline requirement		Non-compliance	Comments
D.1.6 … 1.8 Table 3	All sources limit for NOx emissions from recovery boiler, lime kiln and CNCG incinerators but excluding power boiler is 1.3 kg/ADt	The expected emission of NO_X is predicted to exceed the guideline value under selected conditions.	The proposed emission rates are considered to represent accepted international best practice for a project of this nature and scale and ambient NOx values are predicted to be well within the guideline design criteria. A revised limit should be specified in permit conditions. The emission of NO_X is strongly dependent on the raw material and the fuel fired in the lime kiln. The use of natural gas in the lime kiln will marginally increases NOx emission but significantly reduce the CO_2 generation compared to firing oil. This project is considered unlikely to achieve the NO_x emission limit of 1.3

Guideline requirement		Non-compliance	Comments
			$kgNO_2$/ADt/a during early operation years with native eucalypt. However, it is reasonable to pursue that limit after a few years when the mill will operate mainly with plantation eucalypt, operating experience has been gathered and technical developments may have taken place.
D.1.9. Table 4	Handling of accidental discharges	A comprehensive plan for control/monitoring procedures for accidental spills, leakages and releases has not been provided in the documentation prepared to date.	This non-compliance can be addressed through permit conditions. The proposed technical solutions for handling the consequences of malfunctions or incorrect operations are of a high AMT level. It is recommended that a detailed management plan be required as a permit condition. A plan that applies best industry practice is likely to address this Guideline requirement.
D.1.9 Table 4	Bleaching chemical preparation - On site generation of chlorine dioxide with low contamination of elemental chlorine (methanol or hydrogen peroxide processes).	The proposed integrated chemical plant (option 1) is not specified as AMT in the Guidelines. The main issue is considered to be the residual chlorine content in the produced chlorine dioxide solution.	Provided that processes to reduce entrained chlorine in the chlorine dioxide solution to acceptable levels are applied, then this is considered an acceptable technology. At present only three pulp mills are using the proposed low chlorine integrated sodium chlorate-chlorine dioxide plant for the production of ClO_2. There is no public documentation to support the idea that these three plants are consistently producing a ClO_2 solution of the low chlorine content indicated for the proposed IDP plant. It is considered possible, however, to reduce Cl_2 residue in the ClO_2 solution to the same level as in methanol or hydrogen peroxide based processes by dosing the ClO_2 solution with

Guideline requirement		Non-compliance	Comments
			hydrogen peroxide. Producing ClO_2 with low-chlorine content by the proposed method is thus considered technically achievable.
D.3.9 Table 8	Ambient design criterion for TRS.	The ambient TRS level is predicted to exceed the design criterion.	Based on the predicted very low frequency of occurrence, the predicted TRS exceedence is not considered significant. The predicted peak TRS value from the mill is expected to exceed the design criterion specified in the Guidelines, approximately once every 11 years, mainly over the Tamar Estuary and the hills to the east of the pulp mill site (Tippogoree Hills and Midway Point). The ambient design criterion for TRS is set to protect people from odour nuisance. However, the area where exceedences are predicted (albeit infrequently) is today not a populated area and the potential for nuisance is thus considered to be minor.
D.3.11 Table 9	Exhaust stack to be at least 2.5 times higher than the recovery boiler building height.	The design height of the stack is about 1.5 times the recovery boiler building height.	The proposed height of the stack is consistent with that used in projects of this nature and scale. It is probable that increasing the stack height above the planned 130 m will not significantly reduce the ground level concentrations. In light of the fact that the dispersion model predicts a very small effect from the mill on ambient air quality this non-compliance is not significant.

Guideline requirement		Non-compliance	Comments
D.3.14	Generation and validation of the hydrodynamic model.	Definition of the boundary conditions and calibration of the model is insufficient.	This non-compliance can be addressed through permit conditions. It is recommended that details of the choice of density stratification, describing the model calibration, validation results for the 3-dimensional D-grid and explanation of the time step used in the far field model be required as a permit conditions. Revision of the hydrodynamic modelling is recommended.
D.3.15	Determination of the mixing zone	Hydrodynamic model does not provide adequate details to define the mixing zone	This non-compliance can be addressed through permit conditions. It is recommended that details of steady state of background concentrations and analysis of the numerical diffusion in the local scale D-grid be required as permit conditions. Revision of the hydrodynamic modelling is recommended.
D.3.17	Water quality determination within the mixing zone	Paragraphs (c) to (e) of the State Policy on Water Quality Management, chapter 20.4 have not been addressed.	This non-compliance can be addressed through permit conditions. It is recommended that Gunns be required to provide information addressing items (c) to (e) as a permit condition.

It is SWECO PIC's opinion, based on the assessment of the project against the Guidelines, that the project can proceed to further consideration by the Tasmanian Parliament. In making this recommendation, SWECO PIC assumes that the matters recommended in this report will be addressed in any permit conditions prepared for the Parliament by the Minister for Planning, and that all of the other aspects of the project are assessed by the relevant authorities as being acceptable.

9 Processing of Pine Wood

The pulp mill is designed for hardwood (HW) but softwood (SW) can also be processed with the same equipment. Generally, more or less the same technology is used to produce SW and HW pulp. According to the DIIS, pine wood is planned to be processed in 3-5 days long campaigns about once a month.

While the design of the mill has been optimised for eucalypt processing, it has also taken into account the proposed pine campaigns. To accommodate SW the pulp mill is equipped with both turpentine and soap recovery systems. The selected process equipment can be considered as BAT and AMT for eucalypt and pine wood. The sulphidity of the white liquor used in cooking would most probably be higher in a mill designed for SW pulping. Also the possibility to optimize the pulp properties by alkali profiling in the cooking phase would probably be included, had the mill been designed principally for SW pulping.

The limits for emissions into water need not be changed to accommodate the processing of pine. SW requires more chlorine dioxide in bleaching than HW which results in higher AOX and chlorate emissions calculated per ADt of pulp. The production rate will on the other hand be lower for pine and these emissions will not be higher when calculated by actual amount (mass) per day. Unlike eucalyptus, pine contains resin and fatty acids which are toxic to fish in high concentrations. The acute toxicity test is however generally considered a good indicator of resin and fatty acids present in the treated effluent. Limits for colour, chlorate or resin and fatty acids are not normally set for pulp mills in the Nordic countries. The wood raw material has only negligible effects on the emissions to the atmosphere. Kraft pulp mill processing both HW and SW normally have only one common permit.

SW has a lower pulp yield than eucalyptus and the wood density is also lower. The recovery boiler and the chip feeding equipment will be the bottle necks when processing SW. The calculated maximum production for Pinus radiata is 2 043 ADt/d. Due to the fact that more organic wood material is dissolved when cooking SW, it is important that the brown stock washing prior to the oxygen delignification is sufficiently sized. It has been suggested that the two DD washers (running in parallel) prior oxygen stage, which are operated as 2-stage washers for eucalyptus pulp, would operate as 3-stage washers. The amount of wash liquor used in the brown stock washing has also been suggested to be increased for SW. The brown stock washing also contains a pressure diffuser washing stage directly after the digester which provides extra washing efficiency.

Magnesium sulphate will be added in the oxygen delignification for SW to protect against carbohydrate degradation by transition metals. The A-stage of the bleaching preceding the D reactor in D0–stage is not used when processing SW. With a washer between the last D stages, the D2 stage can, after some modifications be run as a peroxide stage. This will reduce the amount of chlorine dioxide needed to reach the target brightness.

A risk with the short pine campaigns is that the process conditions will not be stabilized for SW. The cooking temperature is higher and more chemicals are charged when processing SW. The chip density is lower for SW resulting in changes in packing degree in the digester. This can impair the digester operation during and directly after the change of wood species. This can in turn result in poor washing in the bottom of the digester resulting in poor washed pulp out the digester. Consequently dirty filtrates can affect the whole brown stock washing resulting in higher chemical consumptions in the bleaching and higher pollutant load to the effluent treatment plant (ETP). This may also be seen during a period after switching back to eucalyptus since it takes time for the system to be stabilized.

An effect of the short pine campaigns is that the bacteria in the ETP will not have time to reach equilibrium for SW conditions. This can result in higher post treatment discharge levels compared to a mill running SW continuously. Additional factors are the higher inflow load stemming from the usage of higher amounts of chlorine dioxide, the higher loads of dissolved organic material, and resin and fatty acids contained in the effluent. The micro organisms in an ETP in a mill processing SW can normally effectively break down the resin and fatty acids. There is a risk that a mill running eucalyptus and only very short pine campaigns won't develop the necessary organisms. This risk can be minimized by collecting a part of the untreated pine effluent in the emergency basin. Small amounts of this effluent can then be taken to the ETP during the eucalyptus period to develop the micro organisms breaking down the resin and fatty acids. It is a recommended permit condition that a program be established to evaluate the effect of the resin and fatty acids on the toxicity of the treated effluent. The recommendation is that samples of treated effluent are taken at the end of pine campaigns. If the results indicate an insufficient reduction of the toxicity then the specific pine micro organism program mentioned above should be implemented.

Not withstanding the above highlighted risks, which can be substantially reduced by good operational procedures, the emission limits can be achieved and there is no reason why the mill should not be permitted to process pine at the levels proposed.

10 Recommended Permit Conditions

The following matters are recommended to be considered by the Minister of Planning in the conditions that should apply to the project in any Pulp Mill Permit.

Table 12: Recommended Permit Conditions

Guideline Ref	Guideline Requirement	Recommended Permit Condition
D.1.6…1.8 Table 3	All sources limit for NOx emissions from recovery boiler, lime kiln and CNCG incinerators but excluding power boiler is 1.3 kg/ADt/a.	It is recommended that the initial annual average NO_x emissions will be limited to 1.6 kg/ADt. The initial limit can be reduced in one or two steps to1.3 kg/ADt/a when the mill gradually moves to using of only plantation wood. The timing and size of the first reduction step should be decided based upon the NO_x emission monitoring data from the mill, the proportion of plantation wood being used and any future technical development to reduce the NO_x emissions of relevant equipment. Pine pulping will not have a significant impact on the NO_x emission level when emission is measured as an annual average.
D.1.9 Table 4	Exclusion of wood chips produced from wood treated with polychlorinated phenols	Prior to the start of wood intake to the mill, Gunns should establish relevant control procedures for the origin of incoming wood and how to reject wood from an unacceptable source.
D.1.9 Table 4	Exclusion of de-foamers containing more than 10 ppb dibenzo-p-dioxin and 40 ppb dibenzofuran by weight	Gunns should not use unacceptable de-foamers and must establish chemical procurement procedures which ensure that such chemicals will be not purchased.
D.1.9 Table 4	Exclusion of polychlorinated phenols in paint, cutting oils and other inadvertent inputs to the process	Gunns should implement proper management and operating instructions to ensure that inputs including polychlorinated phenols and other inadvertent materials are not used in the mill.

Guideline Ref	Guideline Requirement	Recommended Permit Condition
D.1.9 Table 4	Handling of accidental discharges	Gunns should implement detailed management and control/monitoring procedures relating to the containment, recovery and storage of all spills, leakages and releases of process liquids and solids before the start up of the mill.
D.1.9 Table 4	Bleaching chemical preparation	The proposed IDP technology is considered acceptable provided Gunns operate the integrated sodium chlorate – chlorine dioxide plant with the residual Cl_2-content at a level which does not exceed the level of residual Cl_2-content in ClO_2 achieved with methanol or hydrogen peroxide based ClO_2 production processes.
D.1.9 Table 4	Effluent Treatment Plant requirements	The pulp mill is proposed to be implemented as a single line installation to maximize the benefits of economy of scale. This has been the practice for a great majority of new pulp mills built during the last decade. The consequence is naturally that the different departments like the effluent treatment plant (ETP) have limited built-in redundancy. Other than through the temporary storage of effluent in the emergency pond, the ETP will not be able to accommodate any large or prolonged process disturbances. It is, therefore, strongly recommended that permit conditions require that either at least the aeration basin is designed as a complete double line installation or Gunns be required to shut down certain process areas of the mill in the event of equipment failures in the effluent treatment plant which may lead to exceeding of the emission limits. A comprehensive and well-practiced plan should be in place specifying the chain of responsibility and actions to be taken in such an event.
D.1.11	Emission limits to the marine environment	Limits on N and P discharges in the treated effluent should be defined. Both the EU directive and existing permits in Finland and Sweden include limitations on these parameters. These two nutrients contribute to algae production in a freshwater or marine environment, which

Guideline Ref	Guideline Requirement	Recommended Permit Condition
		in turn leads to oxygen consumption during decomposition of dead algae. Nitrogen in the form of ammonia will also contribute to oxygen consumption. N and P concentrations in the effluent are also indicators of the ETP performance.
None	Emission limits to the marine environment	It is recommended that a program be established to evaluate the effect of the resin and fatty acids on the toxicity of the treated effluent. It is recommended that samples of treated effluent are taken at the end of pine campaigns. If the results indicate an insufficient reduction of the toxicity, then a program to develop the micro-organisms for breaking down resin and fatty acids should be implemented.
None	Emission limits to the marine environment	The process control of the effluent treatment plant should include oxygen measurement as a basis for control of the aeration. In-line instrument monitoring of suspended solids, nitrogen and phosphorus, at least for the treated effluent, is recommended.
D.2.1 Table 8	Separate collection of waste fractions at the source and, if necessary, intermediate storage of residuals/ waste to make possible an appropriate handling of the remaining waste products.	A more detailed description of how the respective process wastes will be handled including dewatering, separate storage and its capacity (e.g., silos for the lime kiln ESP dust), weighing and chemical analysis (quality assurance for alternative use), and means and frequency of transport to the landfill is a recommended permit condition and should be addressed in the detailed design phase.

Guideline Ref	Guideline Requirement	Recommended Permit Condition
D.2.1 Table 8	Material that cannot be reused, recovered or has to be handled differently should be taken to a landfill that is approved to receive the type of waste to be disposed of. Only inert, primarily inorganic waste should be landfilled. Organic waste should not be landfilled.	Inorganic process wastes shall be reused as far as possible, and this shall be further elaborated in a waste minimization plan that will be further refined after start-up of operation. Organic process wastes will be incinerated within the pulp mill. The minor streams of organic waste from canteens etc. (putrescible waste) should not be landfilled at the site, but be handled by an external operator. It is recommended that the preparation of a first waste minimization plan is made a permit condition.
D.2.3	The disposal of solid wastes should be reduced by minimizing the generated amounts and by recovering, recycling and re-using potential waste fractions wherever practicable. Separate collection and intermediate storage of different fractions should be applied to meet this aim.	The minimization of waste is stressed, although there is need for further clarification on how separate collection and storage will be handled. More information on this as well as minimization of waste from offices, canteens etc. is recommended as part of the waste minimization plan which should be a permit condition.
D.2.7	Any landfill sites used by the mill operator for disposal of solid wastes that are water soluble should be chosen and managed in agreement with relevant State agencies. They should include, as a minimum, cut-off drains, leachate collection drains and storage and subterranean collectors capable of accommodating run off from the site of a volume equal to a 10-year recurrence interval storm, and from areas surrounding the site of a volume equal to a 50-year recurrence interval storm. Sufficient groundwater monitoring wells per site to satisfy the regulatory authorities that adequate monitoring and reporting of leachate, if identified, will be possible should also be included.	Some technical issues regarding the landfill construction (e g groundwater table control, modelling of leachate production, relevant leachate storage capacity, relevant choice of liner material) requires further elaboration. Information on final rehabilitation and after-care should also be given. The landfill should be designed in accordance with the Tasmanian Landfill Sustainability Guidelines for secure landfills. It is recommended that Gunns be required to provide the above information as part of their detailed engineering design as a permit condition.
D.2.8	Sections of the landfill that have been completely filled should be covered and sealed according to appropriate procedures.	The suggested operation procedures are compliant provided that organic (putrescible) canteen waste is not land-filled.

Guideline Ref	Guideline Requirement	Recommended Permit Condition
		If, despite the recommendation of this report, putrescible waste is to be landfilled, it is recommended that the permit conditions require a more thorough analysis on methane gas generation and information on how this will be handled.
Landfill Sustainability Guide 3.7	Site Security Fencing of landfill	No fencing is indicated in the DIIS but the requirement of fencing of the landfill is a recommended permit condition.
D.3.9	Air quality design criteria	A monitoring program should be established focusing on TRS and inorganic chlorinated compounds which, according to the dispersion model, are expected to be close to the Guideline design criteria.
D.3.14	It is expected that the studies will require the use of a hydrodynamic model and appropriate wind, current and water density measurements to determine the effluent dispersion characteristics under a variety of weather conditions, and allow for seasonal variability**.**	It is recommended that details of the choice of density stratification, describing the model calibration, validation results for the 3-dimensional D-grid and explanation of the time step used in the far field model, be required as a permit condition. Revision of the hydrodynamic modelling is recommended as a permit condition.
D.3.15	The hydrodynamic studies will need to provide an adequate level of detail required to determine an appropriate mixing zone (if necessary) and an appropriate post-commissioning monitoring program. The proponent will be responsible for undertaking the hydrodynamic studies to the required standard.	It is recommended that details of steady state of background concentrations and analysis of the numerical diffusion in the local scale D-grid be required as a permit condition. Revision of the hydrodynamic modelling is recommended as a permit condition.
D.3.17	Water quality objectives for the receiving waters will be set in accordance with the *State Policy on Water Quality Management 1997*, and hydrodynamic studies should be utilised to assist demonstration that these objectives can be met at or beyond the edge of the mixing zone.	It is recommended that Gunns be required to provide information addressing items 20 .4 (c) to (e) of the State Policy on Water Quality Management as a permit condition.

Guideline Ref	Guideline Requirement	Recommended Permit Condition
D.3.18	A mixture of effluent and receiving water, in a proportion equal to the agreed minimum dilution at the edge of the mixing zone, should have the following properties in comparison to the receiving water alone: (a) **colour** (i) the visual clarity is not reduced by more than 20%; (ii) the hue is not reduced by more than 10 points on the Munsell Scale; (iii) the reflectance is not changed by more than 50%; and (iv) the horizontal sighting of a 200 mm black Secchi disc is more than 1.6 m. (b) **optical quality** (i) natural euphotic depth: no more than 10% change; and (ii) seasonal mean nephelometric turbidity: no more than 10% change.	It is recommended that information to demonstrate compliance with paragraph (aiii) with Guidelines be made a permit condition.

SWECO PIC recommends that the plans and additional information referred to above be prepared sufficiently early to enable any changes to be implemented during the design phase, should this become necessary.

It is also SWECO PIC's recommendation that the initial Permit conditions be revised periodically based on the monitored environmental performance of the mill and technical development in the industry.