

## 5. Risk Assessment

This Preliminary Hazard Analysis (PHA) is based on a HAZID (Hazard Identification) workshop conducted on 29<sup>th</sup> August 2005, at the Bell Bay Pulp Mill Project Office. Full details of the workshop and minutes can be found in Appendix 48, Volume 15 (Preliminary Risk Assessment). A Health Risk Assessment in relation to air emissions from the mill has also been undertaken and is discussed in detail in Section 4.20 of Volume 2. The full text of the report is set out in Appendix 21, Volume 10 (Human Health Risk and Toxicological Assessment of Bell Bay Pulp Mill Air Emission).

Further detailed risk assessment will be undertaken during the detailed design phase, when specific information on the design and operation of the pulp mill is available. Details of the risk assessment requirements are outlined in Volume 4 of the Draft IIS.

### 5.1 Process Description

The pulp mill is to be situated adjacent to the existing woodchipping facilities. Native and plantation eucalyptus and plantation pine will be used, although, during the life of the plant, wood supply is likely to trend towards plantation supply.

Treatment of the woodchips will involve three processes: cooking, bleaching and drying. The finished product will be pulp bales ready for export.

To the extent possible, the mill will operate on a self-sufficient basis for chemicals, and chemicals which are consumed in the process will be manufactured from raw products on site. All chemicals from the fibre line will be recycled. A chlor-alkali plant will manufacture chlorine for use in chlorine dioxide synthesis. The other raw products needed to produce chlorine dioxide (hydrochloric acid and sodium chlorate) will also be manufactured on site. There will also be an onsite oxygen plant to generate oxygen for use in the delignification and bleaching processes as well as to produce oxidised white liquor.

All water on site will be collected and treated to appropriate standards prior to discharge. Where possible, run off water will be recycled into the process. After treatment, effluent will be pumped to a discharge point offshore.

Raw water for the process will be sourced from the existing Trevallyn Dam in the South Esk River. Gas for the process will be supplied by a pipeline which will be taken off the pipeline supplying Bell Bay Thermal Power Station, which lies to the north of the proposed facilities. The pulp mill will be a net supplier of electricity into the National Electricity Market (NEM).

For a detailed process description, reference is made to the pre-engineering report completed by Jaakko Pöyry (2006).

### 5.2 Hazardous Chemicals

A number of hazardous substances are proposed to be used on site including (Jaakko Pöyry, 2006):

- ▶ Chlorine

Chlorine gas is a respiratory irritant. Symptoms which may be caused by inhalation include headache, painful and difficult breathing, burning sensation of the chest, nausea and watering of the eyes. At concentrations of 1 ppm there will be slight symptoms after several hours of exposure. At 15 ppm there is throat irritation, levels of 40 ppm are dangerous for exposure duration of 1 ½ - 2 hours. At 1000 ppm it is fatal after a few breaths.

Chlorine is manufactured in a chlor alkali plant on site. An electric current is passed through a brine solution, producing chlorine, hydrogen and a caustic solution. Chlorine is not proposed to be stored on site, as it will be immediately used in the manufacturing of chlorine dioxide.

► Sodium chlorate

There are no exposure limits set for sodium chlorate solution. If sodium chlorate solution leaks and evaporates, solid sodium chlorate will remain. While not flammable in itself, it is a strong oxidising agent and will support combustion as it gives off oxygen as a product of decomposition. If a leak of sodium chlorate comes into contact with acid, chlorine dioxide gas will be liberated.

Sodium chlorate solution is produced and stored on site. It is used as a raw product in the production of chlorine dioxide. As such it forms a part of the integrated chlorine dioxide plant.

► Chlorine dioxide solution

The concern with chlorine dioxide solution is the potential for chlorine gas and chlorine dioxide gases to be emitted from solution if a spill occurs. While chlorine dioxide gas is flammable, its toxic effects are worse than its flammable effects. Case reports show that exposures of 5 ppm chlorine dioxide are irritating. Regular exposure to levels of 0.1 ppm leads to respiratory irritation.

**Chlorine dioxide is manufactured on site in an integrated chlorine dioxide plant.**

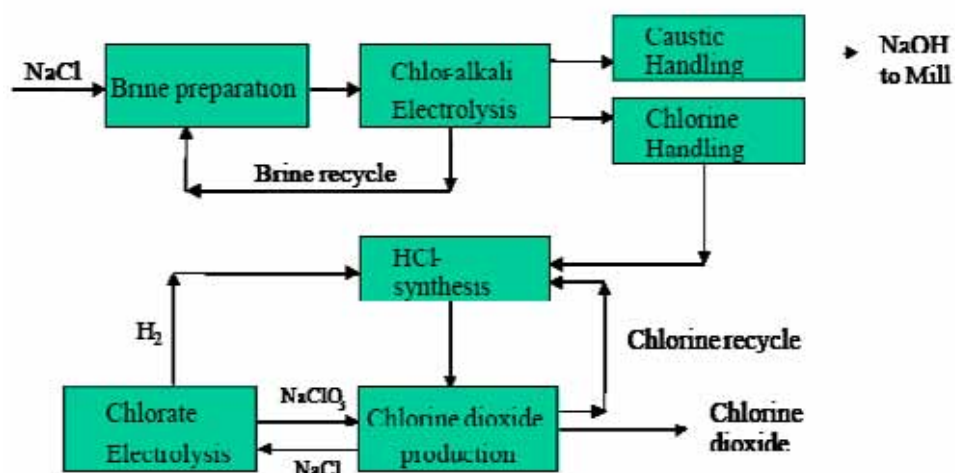
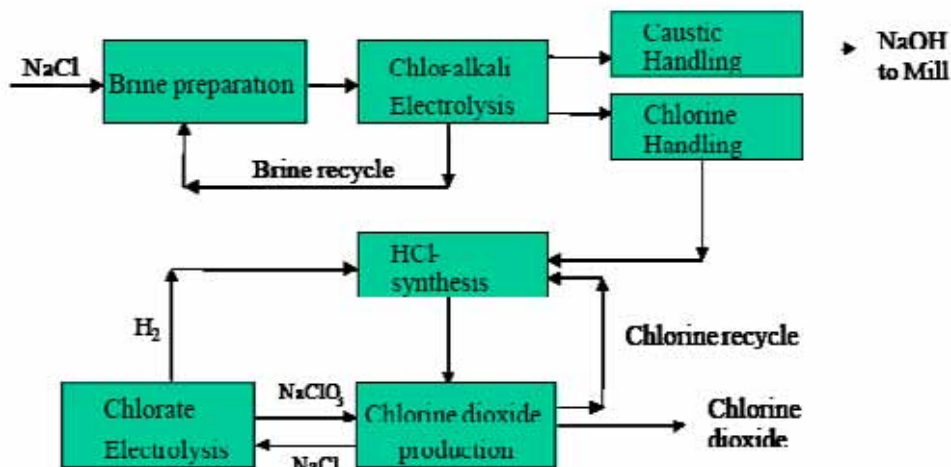


Figure 5-1 below shows the process for chlorine dioxide preparation, and how it is linked with the chlorine plant and sodium chlorate electrolysis. Chlorine dioxide is used as a bleaching agent in the fibre line. It attacks the aromatic ring of the lignin but does not react with carbohydrates thus preserving pulp yield and giving superior pulp strength compared to other oxidants.



**Figure 5-1 Integrated Chlorine Dioxide Plant**

► Hydrogen Peroxide

Exposure to hydrogen peroxide can occur by skin contact, inhalation of mist or ingestion. Ingestion of large quantities can be fatal. Prolonged exposure to skin may lead to irritation and burns, and exposure to eyes can cause blindness. It is a strong oxidising agent and when mixed with combustible materials it burns fiercely or may explode.

Hydrogen peroxide is used in the bleaching plant, along with chlorine dioxide.

► LPG

LPG is heavier than air and may accumulate in low lying areas (eg gutters, drains) where it can become a serious fire and explosion hazard. LPG is highly flammable and explosive. Pressurised containers may BLEVE in a fire situation. It will ignite on exposure to heat or ignition source and may also ignite on exposure to strong oxidising agent. Flashback may occur.

LPG is used in various parts of the process, but mainly in the workshop as a fuel / heat source for miscellaneous equipment items in the workshop.

► Miscellaneous Chemicals

A number of chemicals are used on site which are dangerous substances but are used in very small quantities. These chemicals are: acetylene, natural gas, nitrous oxide, hydrogen, methanol, turpentine, and red oil. The effects of these chemicals is not listed here, as they are present in such small quantities.

Table 133 below lists the inventories of each of dangerous substances which will be present on site. This is presented for the two cases of integrated chemical plant and merchant case. The quantities listed are the maximum capacities on site (sum of maximum storage and in process inventory).

**Table 133: Dangerous Substances Present**

Chemical	Integrated Chemical Plant	Merchant Case
	Amount Present (tonnes)	Amount Present (tonnes)
Chlorine	0.054	0.054
Chlorine dioxide solution	18	18
Sodium Chlorate	118	368
Liquid Oxygen	102	201
Acetylene	0.4	0.4
Natural Gas	1.1	1.1
LPG	9.7	9.7
Nitrous oxide	0.018	0.018
Hydrogen	0.00088	0.00088
Combustible liquids	38	38
Oxidising agents	60	60

### 5.3 Site Layout and Site Boundary

Figure 5-2 below shows the proposed site layout and the site boundaries.

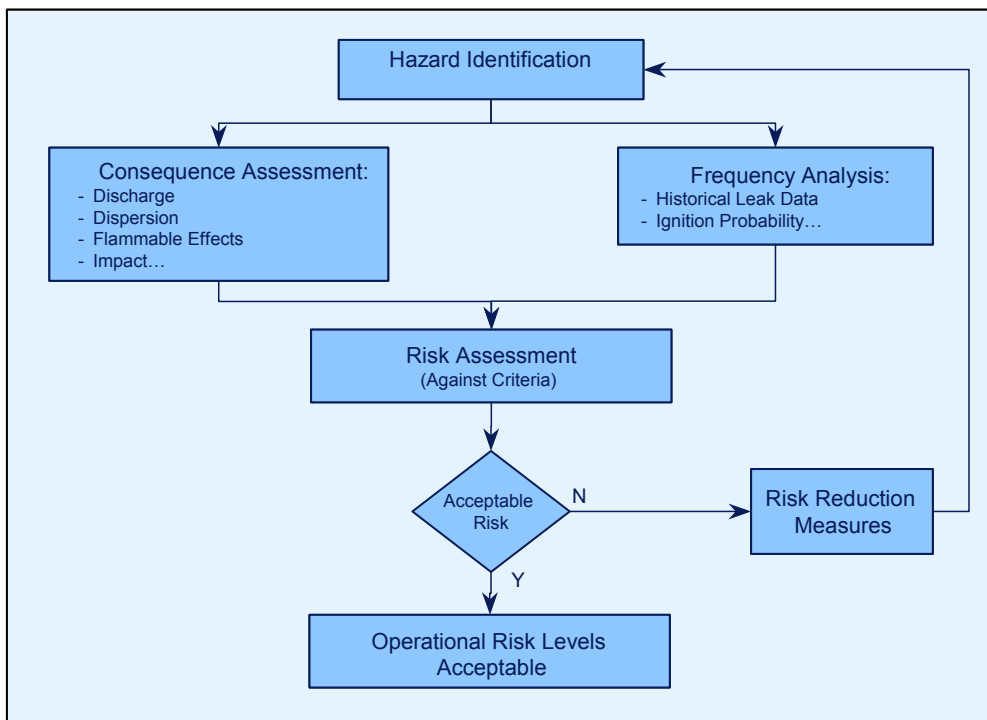


**Figure 5-2 Site Layout, Showing Site Boundaries**

The blue line in Figure 5-2 denotes the lease boundary for the pulp mill site. The East Tamar Highway runs through this lease boundary (the red line). The site boundary for off site risk effects has therefore been taken as the East Tamar Highway on the east side, and the lease boundary on the other sides.

## 5.4 Methodology

The methodology employed in this assessment is summarised in Figure 5-3 below. Each stage identified in the process is discussed in detail below.



**Figure 5-3 Risk Assessment Process**

This methodology is consistent with the following regulations and standards:

- ▶ Australian Risk Management Standard AS 4360:2004.
- ▶ Control of Major Hazard Facilities National Standard [NOHSC:1014 (2002)] and National Code of Practise [NOHSC:2016 (1996)].
- ▶ Dangerous Substances (Safe Handling) Act 2005. (This Act will be the Major Hazard Facilities Regulations for Tasmania. The Act has been passed but it is not expected that the regulations will be in place until late 2006 / early 2007.

#### 5.4.1 Hazard Identification

The Hazard Analysis was conducted in a HAZID workshop conducted on 29<sup>th</sup> August 2005, at the Bell Bay Pulp Mill Project Office. During this workshop, the focus was on hazards involving dangerous substances which could result in off site impact; be it safety, asset or environmental. Hazards which were thought to have the potential for off site impact were carried forward for consequence analysis.

#### 5.4.2 Consequence Analysis

The objectives of the consequence analysis are to:

- ▶ Determine relevant toxic and flammable inventories;
- ▶ Analyse a representative set of release cases; and
- ▶ Determine the consequences of each release with regards to their potential to cause offsite fatalities.

Release, dispersion, and subsequent fire, explosion and toxic effect calculations are performed using PHAST (Process Hazard Analysis Software Tool) commercial software package. The PHAST package models have been extensively validated and a description of the consequence models employed in PHAST is provided in Appendix 48, Volume 15.

The processes used to complete the analysis are;

- ▶ Discharge rate modelling;
- ▶ Dispersion modelling;
- ▶ Fire and explosion impact modelling; and
- ▶ Toxic impact modelling.

Hazards identified as having a potential off site impact are reviewed in detail and a consequence footprint is determined for them. These footprints are then overlaid onto the site layout and a conclusion can be made whether or not an offsite impact occurs. The consequences of interest are:

- ▶ For explosion: overpressure of 7 kPa outside the facility boundary. An overpressure of 7 kPa causes shattering of glass windows and damage to internal partitions of buildings which can be repaired. There is a 10% likelihood of injury and no likelihood of fatalities;
- ▶ For fire: radiant heat level of 4.7 kW/m<sup>2</sup> outside the facility boundary. If a person is exposed to a heat flux of 4.7 kW/m<sup>2</sup> they will experience pain in 15 to 20 seconds, and second degree burns after 30 seconds exposure; and
- ▶ For toxic release: concentrations in the atmosphere exceeding ERPG 3. This is the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

It should be noted that these represent very conservative offsite consequence criteria. Exposure to these levels of consequences will not lead to fatalities. In all cases it could be reasonably assumed that a person will fully recover from the exposure at the levels as defined. These criteria are consistent with other consequence criteria nominated by other Major Hazard facilities Regulations.

### **5.4.3 Frequency Analysis**

Where a potential hazard is identified as having consequences which extend beyond the site boundary, a frequency analysis is conducted to determine the magnitude of the risk associated with the potential hazard.

In this step, the role of passive controls in reducing the likelihood of the hazards are considered qualitatively.

The risk is the combination of the consequence and frequency assessment of the potential hazard.

### **5.4.4 Assessment of Results**

Once the consequences from hazard scenarios with potential for offsite consequence have been determined, they need to be compared against risk criteria in order to determine if there is a meaningful

offsite consequence or not. These risk criteria are normally published in guidelines. However, in Tasmania there are currently no guidelines that define offsite effects.

## **5.5 HAZID**

### **5.5.1 HAZID Methodology**

As part of the PHA, a hazard identification workshop was conducted. A HAZard IDentification (HAZID) workshop aims to systematically identify all hazards associated with a particular plant, process, area, activity etc. It is commonly carried out in a workshop in which an experienced facilitator leads the team through the HAZID process.

The steps followed in the HAZID process are summarised below:

1. Select system
2. Structured brainstorm of the system to identify hazards
  - ▶ use keywords to recover momentum if needed
3. For each identified hazard, document:
  - ▶ description;
  - ▶ impact;
  - ▶ outcome;
  - ▶ prevention measures.
4. If necessary, state the required action(s)
5. Repeat from step 1 for next system

The first step is to select a system for investigation. The systems chosen in this HAZID were each of the various processing areas. The possibility of an offsite effect from each of these materials was considered in turn.

The second step was to consider the hazards associated within each area. The focus in the HAZID was on dangerous substances materials, with the potential for offsite effects. Methods of losing containment of the material were discussed.

In step 3, a short description of the hazard is given, if required. This is to ensure that everyone in the room is thinking about the same hazard, and to avoid any confusion in the discussion. Only hazards with potential for offsite impact were discussed. Prevention measures for each of the outcomes were identified and documented.

If any deficiencies are found in the prevention measures, actions can be recorded to rectify them. Actions can also be used where new control measures, currently not in place, are thought of.

This process is then repeated for each of the systems / areas identified.



### 5.5.2 Attendance

A one day workshop was conducted at the Bell Bay Pulp Mill Project Office, Tasmania, on Monday 29<sup>th</sup> August 2005. The workshop was facilitated by GHD - Qest personnel, with the following project personnel in attendance:

**Table 134: HAZID Attendance**

Name	Position / Role	Company
Lawson Harding	Environmental Systems Coordinator	Gunns Ltd
Sven Lundgren	Engineering and Construction Manager	Gunns Ltd
Peter Ryder	Consultant	Jaakko Pöyry
Richard Fawkes	Environmental Manager	Gunns Ltd
Greg Stanford	Infrastructure Manager	Gunns Ltd
Steve Cooper	Facilitator	GHD - Qest
Chris Griffioen	Facilitator	GHD - Qest

The group comprised of participants with sufficient knowledge and experience in different disciplines of the project to ensure that the output of the workshop is soundly based.

### 5.5.3 HAZID Systems and Guidewords

The systems identified in the workshop are summarised in Table 135 below.

**Table 135: Systems Identified**

System No	System Description
1	Chemical plant
2	Fibre line, including chip storage and screening
3	Recovery; waste evaporators / power boiler / turbine / water treatment
4	Recausticising lime kiln
5	Effluent
6	Natural gas
7	Electrical substation / HV connections

<b>System No</b>	<b>System Description</b>
8	Solid waste disposal
9	Water supply line and pipeline (including Trevallyn Dam)
10	Ocean outfall
11	Wharf

The guidewords used to prompt the team for hazards are shown below:

- ▶ Falls and Dropped Objects
- ▶ Electrical Upsets
- ▶ Collisions
- ▶ Structural Upsets
- ▶ Emissions
- ▶ Security
- ▶ Aggressive Releases
- ▶ Fires and Explosions
- ▶ Mechanical Upsets
- ▶ Emergency Services
- ▶ Natural Forces
- ▶ Flora and Fauna

#### **5.5.4 Minutes**

A complete set of the minutes is attached in Appendix 48, Volume 15. A total of six actions were identified and agreed in the HAZID workshop. These are shown in Table 136 below.

**Table 136: Actions identified and agreed in the HAZID Workshop**

<b>Action No</b>	<b>Area</b>	<b>Description</b>	<b>Responsible</b>
1	Chemical plant	Model a chlorine release from the chemical plant to determine the maximum impact distance for the worst-case chlorine release. Inventory is 60 kg, at just above atmospheric pressure.	Covered in this report
2	Chemical plant	Ensure spills from pipe bridges are contained and drained to effluent.	Gunns

Action No	Area	Description	Responsible
3	Chemical plant	Model dispersion of worst case ClO <sub>2</sub> release. The worst case is vaporising from a pool after tank rupture (600 m <sup>3</sup> volume at 10 g/l). Also model release of 0.4 kg of ClO <sub>2</sub> vapour.	Covered in this report
4	Fibre Line, including chip storage and screening	Ensure design of screening plant avoids areas in which dust can build up, as dust presents a fire and explosion risk.	Gunns
5	Electrical Substation / HV Connections	Ensure there is protection on site access road to protect power lines from damage from run away trucks / vehicles.	Gunns
6	Wharf	Provide adequate pumping capacity at the wharf to ensure that all products can be pumped to the chemical plant. The ship's pumps may not be sufficient.	Gunns

Two of these actions (1 and 3) were subjected to consequence modelling to determine offsite consequences for worst case events from loss of containment of chemicals. For all other dangerous substances as outlined in Section 5.6, the workshop was able to determine that there would be no offsite consequences from an accidental release of the substance, due to the control measures in place. A discussion of these controls is included in Section 5.6. The scenarios identified in the actions were short listed because the workshop group could not conclusively decide the same for these scenarios.

Three actions (2, 4 and 5) relate to reducing risk to on site personnel, and to ensure that events will not escalate to offsite events. The remaining action (6) is an operational concern relating to pump capacity on the wharf.

### 5.5.5 Consequences

Based on the consequence modelling conducted by GHD-Qest, the distance to ERPG-3 values for the chlorine and chlorine dioxide hazards short-listed for further analysis are summarised in Table 137.

The weather conditions used to model these consequences is 1.5 m/s wind speed and stable atmosphere (stability class F). These represent weather conditions in which the scenarios will have the largest consequence footprint, ie, conservative weather conditions for consequence modelling.

**Table 137: Consequence Distance for Hazards Short Listed in the HAZID Workshop as Potentially Having Offsite Impact**

<b>Scenario</b>	<b>Distance to ERPG 3 (m)</b>
Release of 60 kg of chlorine. (See action 1 in Table 136)	490
ClO <sub>2</sub> vaporising from pool after tank rupture. (See action 3 in Table 136)	200
Release of 0.4 kg of ClO <sub>2</sub> . (See action 3 in Table 136)	350

The distance to the nearest site boundary from the proposed chemical plant is 500 metres. Therefore none of these scenarios has an offsite impact.

In addition to this, it was noted in the workshop that the transmission lines run through the site. If these lines become enveloped by gases or vapours emitted under any one of the scenarios described above, they will not be damaged. An explosion could potentially damage them. However, the workshop concluded that the open areas will adequately dissipate any explosion overpressure so that there will be no damage to the transmission lines. The potential for damage from flying debris was considered to be negligible.

### **5.5.6 Frequency Analysis**

In the methodology, it was stated that a frequency analysis is conducted if any of the potential hazards is identified as having consequences which extend beyond the site boundary. As none of the potential hazards have meaningful offsite consequences, as established above, a frequency analysis is not necessary.

## **5.6 Control Measures**

In the HAZID, control measures were identified which it was expected will prevent an offsite hazard involving dangerous substance. The passive control measures in place are discussed below, with particular emphasis on how they will prevent the hazard from occurring. A full list of all the hazards and which controls act to prevent offsite consequences are included in the HAZID minutes, Appendix 48, Volume 15.

### **5.6.1 Process Areas and Chemical Plant**

The passive control measures discussed in this section relate to the chemical plant in general. Specific areas of the plant which contain dangerous substances but are not in the chemical plant are discussed separately.

- ▶ Collision Prevention

Equipment which is located inside bunds cannot be impacted by vehicles. This is because vehicles cannot physically enter the bunds. By preventing vehicle access, the potential for vehicle collision resulting in leaks has been removed.

- ▶ **Pipe Racks**

All pipe runs between processing areas are contained within pipe racks. Pipes in pipe racks are less susceptible to collision from moving equipment. Moreover, there are only site roads underneath pipe racks. As vehicle access to site is restricted, this reduces the probability of a vehicle striking the pipe rack by travelling underneath it.

Pipes carrying chemicals along the jetty are placed away from vehicle movement areas on the jetty. This minimises the potential for impact with these pipelines. When not in use, these pipelines are drained. By draining them when not in use, the period during which a leak could potentially occur is limited to the times when chemicals are being pumped, which is very small.

- ▶ **Bollards**

Bollards are used in areas where the protection of equipment from collision cannot be guaranteed by bunding or pipe racks. Bollards significantly reduce the potential for process equipment to be hit by a vehicle. This in turn significantly reduces the potential for a large leak from being hit by a vehicle.

- ▶ **Plant layout – no lifting over equipment**

Dropping objects onto equipment items can result in large leaks, due to the energy contained in the fall. By designing the plant so that it is not necessary to lift over live equipment, this source of major leaks has been removed.

- ▶ **Bunding / Spill Tanks.**

In the eventuality of a leak, bunding around process areas present the primary method for containment. Bunding is designed in accordance with industry best practise, ie, 110% of the volume of the largest vessel. Spills in a bund are diverted to spill tanks. This ensures that any spill from a vessel in the process area will be contained and will not leak into the environment. Small spills are recycled directly into the process.

The spill tanks contain conductivity meters. If the conductivity is too high, the spill is directed to the effluent treatment plant. Otherwise the spill is directed to the contaminated stormwater storage pond.

- ▶ **Contaminated Stormwater Storage Pond**

This storage pond represents the secondary method for containment and treatment of spills from the process, and will be of sufficient size to accommodate normal rain and process water run off from process areas. There are two separate ponds; one for the pulp mill and one for the chemical plant. This ensures there can be no adverse chemical reaction in the storage pond. Water quality of the water in this pond is measured. If the water quality is adequate, the water is discharged to the settling and oil catchment pond, prior to being discharged to the river. If the water quality does not meet river discharge requirements, it is sent to effluent treatment.

- ▶ **Effluent Treatment**

This represents the tertiary method for containing contaminated water. A bacterial process is used to treat effluent prior to it being pumped to a discharge location 4 km offshore. Water quality is monitored before the water is discharged.

#### ► Dust Suppression Systems

An electrostatic suppression system (ESP) operates in the stack to prevent dust particles from being released into the atmosphere. The design of these ESPs includes redundancy, so that it is possible to operate with some of them offline and still meet the requirements for dust control.

In the event of power failure, the ESPs will continue to operate on back up power supply. Moreover, the plant will shut down due to the power failure, so no more dust will be produced.

Emissions from the stack are continuously monitored to determine if there is any dust present. This provides continuous feedback on ESP performance.

### 5.6.2 Pipelines

Several pipelines supply the pulp mill with raw products, or remove effluent from the plant.

#### ***Gas pipeline***

Gas will be supplied from a tie in point in the gas pipeline feeding Bell Bay Thermal Power Station. A separate risk assessment workshop has been carried out on this pipeline. This risk assessment was carried out in accordance with AS2885.1-1997. This Standard stipulates the number of physical and procedural controls required for a pipeline, as a function of the type of area it is in. The conclusion of this study was that 'assessment of [the] likely impacts or threats has produced management measures compliant with AS 2885. Upon implementation, it will effectively minimise any likely impacts on the environment, human population and third party services, enabling the safe transport of gas to the pulp mill. Risks associated with this pipeline were therefore not discussed in detail in this HAZID. On site risks associated with natural gas were discussed.

#### ***Supply Water Pipeline***

The supply water pipeline will provide water for the pulp mill from the Trevallyn Dam. The length of this Proposed pipeline is approximately 40 kilometres. As the water transported in this pipeline will be clean (Trevallyn Dam is also used for recreational purposes), a leak from this pipeline does not present an environmental contamination issue. The main issue identified with this pipeline is the potential for a flood of water should a complete rupture occur. This flood can potentially result in fatality, or erosion of the environment. The following passive control measures reduce the probability of a complete rupture of the pipeline:

- Pipeline rated for pressure service. Internal water pressure will not rupture the pipeline as it will be designed for this pressure.
- Pipeline primarily buried. A collision with a vehicle or large mobile equipment is a high energy collision, with the potential to cause significant damage to the pipeline. As the pipeline will be buried for most of its length, the potential for impact on the pipeline from vehicles or other mobile equipment is significantly reduced. The potential for complete rupture is therefore also significantly reduced.
- Large diameter pipeline. As the pipeline will be of a large diameter it has a higher inherent strength than a smaller diameter pipeline. The energy required for a complete rupture is therefore increased. This significantly reduces the probability of the pipeline being impacted in any way with enough energy to result in a complete rupture.

### ***Effluent Pipeline***

The effluent is treated on site then pumped through an underground pipeline and discharged 3 km offshore into Bass Strait. Should the pipeline leak, the effluent that will be discharged into the environment will already have been treated on site and will meet the appropriate requirements for discharge. A leak at any point along the length of the pipeline will therefore not have any adverse environmental effects, apart perhaps from local flooding and erosion.

A separate risk assessment was carried out on the pipeline, which concluded that its risk management measures complied with AS 2885. Upon implementation, it will effectively minimise and eliminate any impact on the environment, human population and third party services, enabling the safe transport of effluent to the ocean outfall exit point (Hargraves, 2005). Risks associated with this pipeline were therefore not discussed in detail in this HAZID workshop.

### ***HAZOP***

A formal HAZOP will be conducted covering modifications at the Alinta Bell Bay Meter Station and for the Gunns meter and pressure reduction station. All changes to the Piping and Instrument Diagrams (PANDIDs) after the HAZOP will be examined in a follow-up HAZOP conducted towards the end of the detailed design process.

## **5.6.3 Transport Risks**

### ***Road Transport***

As most chemicals used in the bleaching process will be manufactured on site, the goods that will be transported to site are the raw chemicals used for the production of these chemicals. The amount of dangerous substances transported to the site will therefore be significantly lower than would otherwise have been the case if these chemicals were purchased from third party suppliers. Supply of chemicals to the site is outside the scope of the PHA.

Solid waste will be transported by road to the solid waste disposal area. For this road transportation, the following passive control measures were identified:

- ▶ Road design. The road at the turn offs to both the pulp mill and solid waste disposal areas will have a slip lane and passing lane. This will enable heavy vehicles to safely gather speed before merging with traffic.
- ▶ Existing heavy vehicle route. The route from the pulp mill to the solid waste site is an existing heavy truck route. The number of vehicles hauling solid waste will add only fractionally to the existing heavy trucks using this route. The risk increase from solid waste haulage is therefore negligible.
- ▶ While in transit, the solid waste loads will be covered with tarpaulin to prevent dust from blowing off.

### ***Sea Transport***

The pulp will be shipped for export from a dedicated wharf. Currently, woodchips are shipped from a wharves at the woodchipping facilities. As a result of the pulp mill operations, initial vessel movements (for the first four years of operation) will significantly reduce, with a corresponding reduction in operational risks. In the medium term (years five to 14), vessel movements will be similar to current

levels. Long term vessel numbers will be higher than current shipping levels, but similar to that forecast if the pulp mill does not proceed. Risks from the long-term shipping operations will initially be no greater than current, and ultimately, no greater than forecast woodchip exports.

The wharf will be designed with low concrete or wooden edges to minimise the possibility of vehicles or pulp bales from falling into the river during loading.

#### **5.6.4 Solid Waste**

Solid waste will be stored in the solid waste disposal area. This will be located on the opposite side of the East Tamar Highway to the pulp mill. Safeguards for the offsite risks associated with transporting the solid waste from the plant to this location have been discussed in previous sections. In the solid waste disposal area itself, the following control measures are in place:

- ▶ The landfill area is sealed with a composite clay and geosynthetic lining. This minimises the potential for any liquid run off or leachate from entering the ground water;
- ▶ Leachate from the solid waste area will be pumped back to the effluent treatment plant. The pipeline that carries the leachate will run through a conduit where it crosses the East Tamar Highway. This will prevent damage in case of a traffic accident or car running off the side of the Highway at this location;
- ▶ Ground water in the vicinity of the solid waste dump will be constantly monitored. Any leachate into the ground water system will be quickly noticed and managed; and
- ▶ Once a particular disposal cell is full it will be capped and revegetated. The capping minimises the potential for run off water to become contaminated. Even at this stage, the area is still clay lined.

#### **5.6.5 Separation Distance**

The separation distance between the process area and the nearest site boundary is 500 metres. Based on the consequence modelling and given the control measures for other potential hazards described in Appendix 48, Volume 15, this distance should ensure that the effects of a hazardous incident at the pulp mill site dissipate to below the criteria established in Section 5.4.

Moreover, the population immediately beyond the site boundary is a transient population. Commuters on the East Tamar Highway will only be present for several minutes. People fishing on the river or walking through the forest in the buffer zone will also only be temporarily present in the vicinity of the pulp mill site. The population at risk immediately beyond the site boundary is therefore not a vulnerable population. It is one which is moving through rather than staying in a place where they could potentially be exposed to hazardous substances emitted from the pulp mill site in the event of an incident.

### **5.7 Conclusions / Recommendations**

Based on the HAZID workshop and the consequence modelling conducted by GHD-Qest, it is concluded that there are no hazards that will have offsite impacts. The controls in place adequately safeguard against offsite consequences and hazards associated with dangerous substances.

Three actions were identified in the HAZID that will be incorporated into the design. These are:



- ▶ Ensure spills from pipe bridges are contained and drained to effluent treatment at high risk areas;
- ▶ Ensure the chip screening plant is designed to minimise dust build up, as dust presents a fire and explosion risk; and
- ▶ Ensure there is protection on site access road for power lines from damage from vehicle accidents.

The control measures outlined in Section 5.6, in combination with these three minor changes, adequately prevent a hazard involving dangerous substances from presenting an offsite risk.

In addition to this, one operational action was identified:

- ▶ Provide adequate pumping capacity at the wharf to ensure that all products can be pumped to the chemical plant. The ship's pumps may not be sufficient.

At the time of writing, the *Dangerous Substances (Safe Handling) Act 2005* (Tas) has received assent but its commencement date has not yet been proclaimed. Therefore it is not possible to assess the need for a safety report at this stage.

## **5.8 Effluent Pipeline Risk Assessment**

### **5.8.1 Risk from Third Party Accidents**

The outfall pipeline is subject to accidental impact from third party activities, such as commercial vessels (vessel sinking, ship's anchor impact) and fishing operations (trawl board impact). A risk assessment of potential impacts on the effluent pipeline has been undertaken and is contained in Appendix 45, Volume 15 .

Marine and Safety Tasmania has been approached to have the area surrounding the outfall pipeline marked 'Not for Anchorage'. This will ensure that the location of the outfall will be published on the relevant marine charts and as a 'notice to mariners'. This will further reduce the likelihood of third party conflict .

### **5.8.2 Preliminary Hazard Analysis – Hargrave Pipeline Group**

A preliminary hazard analysis for the effluent pipeline was performed by Hargrave Pipeline Group Pty Ltd. It considered the threats to the pipeline from existing infrastructure, construction activities, third party activities during operation and intentional damage that threaten the continual operation of the mill and the township of George Town, its people and the environment. All recorded threats indicate they are manageable. The risk assessment is consistent with AS/NZS 4360:2004, AS 2885.1-2004 and SAA HB105 -1998.

The hazard analysis identifies:

- ▶ possible sources and causes of potential hazardous events or threats (see Table 138:); and
- ▶ likely consequences for off-site human and safety and the environment including the marine environment should a rupture of the pipeline occur.

### 5.8.3 Selection of Credible Accident Events for Further Analysis

A quantified risk assessment for consequences outside the perimeter of the premises for credible accident events has been performed using route selection maps and the risk assessment reports and is included in Appendix 45, Volume 15. The threats were individually assessed and mitigation requirements recorded to prevent and/or manage credible accident events, and minimising impact to the surroundings and any further impact or consequences to the remainder of the pipeline.

### 5.8.4 Results of the Risk Assessment

The risk assessment identified a number of credible threats to the surrounding environment and third party services between the pulp mill and the ocean outfall. Table 138: below summarises the findings. Consideration of maintenance requirements is summarised below under Operational Maintenance Requirements and Contingency Measures.

**Table 138: Risk Assessment in accordance with AS 2885 and HB 105**

<b>Risk Assessment in accordance with AS 2885 and HB 105</b>			
Pipeline Sections	<b>T1</b> – Industrial / suburban	<b>R2</b> – semi Rural	<b>S</b> - submarine
Kilometre point (kp)	0 – 12	12 – 18.6	18.6 – 22
Identified Threats (Pre-Defined)	24	13	1
External Interference Protection	12	2	0
Protection by design	1	0	0
Failure Analysis	1	0	0
Risk Evaluation and Rank	1	0	0
Risk Management	1	0	0

(Jaakko Pöyry (2006) Appendix 7, Volume 6) assessed the potential risk on the environment in the event of a leak from the effluent pipeline. The results are provided below.

The combined biologically treated process effluent and the sanitary sewage from the pulp mill will be pumped to Bass Strait in a pipeline approximately 22 kilometres long (19 km on land and 3 km outfall).

The average effluent flow is approximately 73 MI/d and the continuous dry weather maximum about 77 MI/d. The design flow is about 3700 kl/h.

The total amount of effluent in the full pipeline is about 20,000 kl.

The physical and chemical quality of the effluent in the pipeline is roughly as follows:

- ▶ pH                      6-7
- ▶ EC, mS/m                250-350

▶ TDS, mg/l	3000-3500
▶ BOD, mg/l	5-15
▶ COD, mg/l	300-400
▶ TSS, mg/l	20-40
▶ Chloride, mg/l	500-700
▶ Sulphate, mg/l	200-400
▶ Sodium, mg/l	700-900.

Since the sanitary sewage will be disinfected before mixing with the process effluent, the hygienic quality of the effluent is acceptable.

The effluent will not be toxic to aquatic or terrestrial flora and fauna, nor to humans (Section 11.11 of Volume 3 of the Draft IIS).

In the very unlikely case of a pipeline failure, the effluent will flow into the environment, either to the local surface water drains or to the groundwater depending on the detailed topographic and geological conditions. The actual amount of potential spill naturally depends on the topography and location of the failure. The performance of the pipeline will be continuously monitored. Pressure gauges and valves will be installed on the pipeline at intervals to be determined during the detailed design phase. The readings will be transmitted to the DCS system of the effluent treatment plant. Alarms will be activated whenever the actual pressure is either higher or lower than the preset normal pressure range.

### ***Design Principles of the Pipeline to Minimise the Environmental Risks***

The pipeline material up to the shore crossing point will be either high-density polyethylene (HDPE) or Glass Fibre Reinforced Plastic (GRP). These materials are completely resistant to corrosion.

The start elevation of the pipeline at the treatment plant is approximately + 22 m above mean sea level (AMSL), the highest elevation approximately +52 m AMSL approximately 6 km from the effluent treatment plant, and the total head at the beginning of the submerged section at the coast is about 16 metres of water column (mWC). The route of the effluent pipeline was chosen to avoid hills and significant rises to reduce pressure and volume out flows in the unlikely event of pipeline rupture.

The dynamic hydraulic pressure line along the pipeline in normal operation is roughly as follows:

- ▶ at the pressure side of the final effluent pumps: about 70 mWC
- ▶ 5 km from the pumps: about 55 mWC
- ▶ 10 km from the pumps: 40 mWC
- ▶ 18 km from the pumps: 16 mWC
- ▶ at the end of the pipeline: 4 mWC

The dynamic pressure line implies that the selected pressure class of the pipeline is about 100 m head.

In non-stable operating conditions — for instance, during a power black-out, the start and stop of pumping, and closing and opening the pipeline valves — the resulting pressure shocks and vacuum conditions in the pipeline can have serious implications, unless appropriate control measures are taken.

To eliminate any risk of a mechanical failure in the pipeline, the detailed design will be based on the hydraulic pressure line analysis in all possible steady and non-steady state hydro-mechanical conditions associated with the pipeline operation. Based on this analysis, systems to mitigate or eliminate excessive pressure surges, hammering, formation of vacuum, gas accumulation, etc. will be designed and installed.

Atteris Pty Ltd prepared an ocean outfall engineering concept design report. A copy of the report is provided in Appendix 52, Volume 16. A risk assessment was undertaken and a summary of the results is provided below.

Assessment of likely impacts or threats has produced mitigation measures compliant with the risk analysis contained in AS 2885. Upon implementation, it will effectively minimise and eliminate any likely impacts on the environment, human population and third party services, enabling the safe transport of effluent to the ocean outfall.

The pipeline operator will be required to produce an Operation and Maintenance Plan, which is a control measure of the identified likely impacts or threats. The plan will define the maintenance requirements such as:

- ▶ Routine patrolling of right of way (ROW), maintain signage, weed control, erosion monitoring, valve checks and maintenance;
- ▶ Dial Before You Dig (detailed below);
- ▶ Annual contact with landowners, councils and utility owners (eg. Transend, Aurora, Esk Water, Alinta, Pacific National) (detailed below); and
- ▶ Emergency response training and readiness of emergency equipment/services in the event of pipe breakage or leaks.

Dial Before You Dig is a service provided for third parties who wish to perform construction activities across or within the easement of the pipeline. Gunns will be part of this service. It enables a pipeline operator to be aware of, control, and supervise to maintain minimal likely impacts or threats from third parties to an acceptable level.

The main purpose of annual contact with land owners, councils and utility owners is to discuss planned activities, individual concerns or issues and ensure that all affected parties are up-to-date with the status of the pipeline to ensure likely impacts or threats identified by the risk assessment process are averted. Some of the likely impacts would include the following:

- ▶ General installation of other services in rural areas;
- ▶ Field crossings of the pipeline by third parties;
- ▶ Road repairs and/or incidents (eg. large vehicle accidents);
- ▶ Railway incidents/maintenance;
- ▶ Logging and major land clearing;
- ▶ Urban development; and
- ▶ Soil shift/land stability.