2.1 Overview of Current Operations

SEFE currently harvests and processes hardwood and softwood logs at its Munganno Point mill site. The total log intake at the SEFE plant over the past four years is set out in **Table 2-1**. In recent years, approximately 40% of total log intake has come from NSW State Forests, 50% from Victorian State Forests and 10% from private property, including SEFE owned plantations.

Approximately one third of the volume is harvested by contractors directly engaged by SEFE and two thirds is sourced through mill door sales arrangements with VicForests and Forests NSW.

Table 2-1 Log and Waste Volumes

Parameter	2005	2006	2007	2008
Hardwood logs received (t)	917,217	1,002,968	963,211	954,982
Softwood logs received (t)	-	-	-	161,317
Waste generated				
Hardwood fines (t)	22,201	24,285	23,320	23,124
Pine bark (t)	-	-	-	10,243
Hardwood mill waste (t)	1,144	1,250	1,200	1,190
Pine fines (t)	-	-	-	3,550
Total (t)	23,345	25,535	24,520	38,107
Incinerated (t)	1,144	1,250	1,200	1,190
Transported off-site as mulch (t)	15,819	20,057	20,138	23,772

Note: excess waste is carried over to the following year

Logs are received at the gatehouse where deliveries are monitored and recorded in compliance with SEFE's Chain of Custody procedures.

Mature logs, re-growth and plantation logs are stockpiled in the log storage area prior to being fed into the Woodchip Mill. Logs are placed into a secondary storage area when the main storage area is full.

Within the Woodchip Mill logs are fed by conveyor to a chipper and chips are then screened to remove oversize and undersize chips and fines prior to stockpiling. Both a hardwood and softwood chipping line are in operation. Woodchips from the mill are conveyed via stockpile conveyors to one of two existing stockpiles.

Oversize waste is removed by the log wash immediately ahead of the chipper, stockpiled and then burnt in the incinerator once every three or so months. Screen oversize is reprocessed through a rechipper and returned to the screens. Fines removed by the screens are stockpiled and sold to external markets. Typically between 1,144 t and 1,250 t of waste is incinerated each year and between 15,819 t and 23,772 t transported off-site as garden mulch, primarily to the metropolitan areas of Sydney and Canberra (**Table 2-1**).

Chips are reclaimed from the stockpile by tunnel / transfer conveyors and delivered to the wharf conveyor. The chips are delivered to the ship-loading berth from the wharf conveyor.

The woodchip loading berth at Munganno Point is privately owned by SEFE and has the following features:

- T-head jetty centre loading point, with six dolphins and a four buoy mooring system.
- Maximum vessel size of 50,000 gross register tonnage, 230 m long and 11.3m draught.
- Maximum loading rate of 1400 tph.

The site also contains a truck dump area where woodchips from other facilities are accepted. This material is added to the existing stockpiles.

The site also contains a workshop area where equipment maintenance is undertaken, administration building and electrical switchyard. Light towers are established around the site to assist with activities undertaken during early morning or at night. The site is surrounded by an electrified security fence.

Water management on the site consists of:

- stormwater diversion drainage – to reduce the volume of water requiring treatment, uncontaminated stormwater is diverted around the site and discharged to the surrounding environment;
- leachate collection system – potentially contaminated surface runoff from the site is collected via leachate drains and directed to collection pits for pumping to the water treatment plant;
- water treatment plant – dirty water is recycled from the log wash and pH-adjusted by caustic addition at the entry to a 4.5 ML clarifier. Alum is also added to aid removal of suspended solids, which are removed in a twin-wire dewatering press. Water is routinely used in, and around, the mill for cleaning purposes and this water is diverted through a collection system back into the clarifier. Rain water also tops up the clarifier; and
- truck and dozer wash areas – water from these areas is directed to the water treatment plant for treatment.

Normal operating hours of the mill are 0700 to 2300 Monday to Friday. Only very occasionally does the mill operate for a single shift on a Saturday, and not in the recent past. For the hardwood chipping line the operation is essentially continuous between these limits, other than for short stops to change chipper knives or attend to plant malfunctions as they randomly arise. For the softwood chipping line the operation is also restricted to Monday to Friday. Operations start at 0700 but the shutdown time varies from 1800 to 2300 hours, dependent on production requirements, which do not conform to a regular pattern.

Shiploading is undertaken up to 22 times per year in three-day campaigns around the clock.

The wood chip mill operates under Environmental Protection Licence 1482 for the Scheduled Activities “shipping in bulk” (> 500,000 t loaded and unloaded) and “wood or timber milling or processing” (> 200,000 m^3 processed).

2.2 Power Plant

A plan of the proposed Power Plant and its main components is shown in **Figure 2-1**. A schematic of the overall process is shown in **Figure 2-2**. The key components of the Power Plant include:

- weatherproof fuel storage bunker with 1000 m^3 capacity;
- fuel reclaim bunker and feed conveyor (reusing existing plant) to supply 6 tph of wood waste to the Power Plant;
- 90 t fuel storage bin;
- 18 MW grate furnace;
- 485 degree high pressure (65 bar) 22 tph superheated steam boiler;
- ash handling systems;
- exhaust stack (35 m high) with electrostatic precipitator to remove fly ash from the flue gas stream;
- 5.5 MW multi-stage steam turbine;
- 11 KV generator set connected to the existing 11 KV bus located in SEFE's existing high voltage switch room;
- vacuum steam condenser and cooling water system;
- seawater intake structure, delivery and return water pipelines, and diffuser;
- ancillary plant items such as boiler make-up water treatment plant, condensate pumping system and control room; and
- the in-forest application of ash.

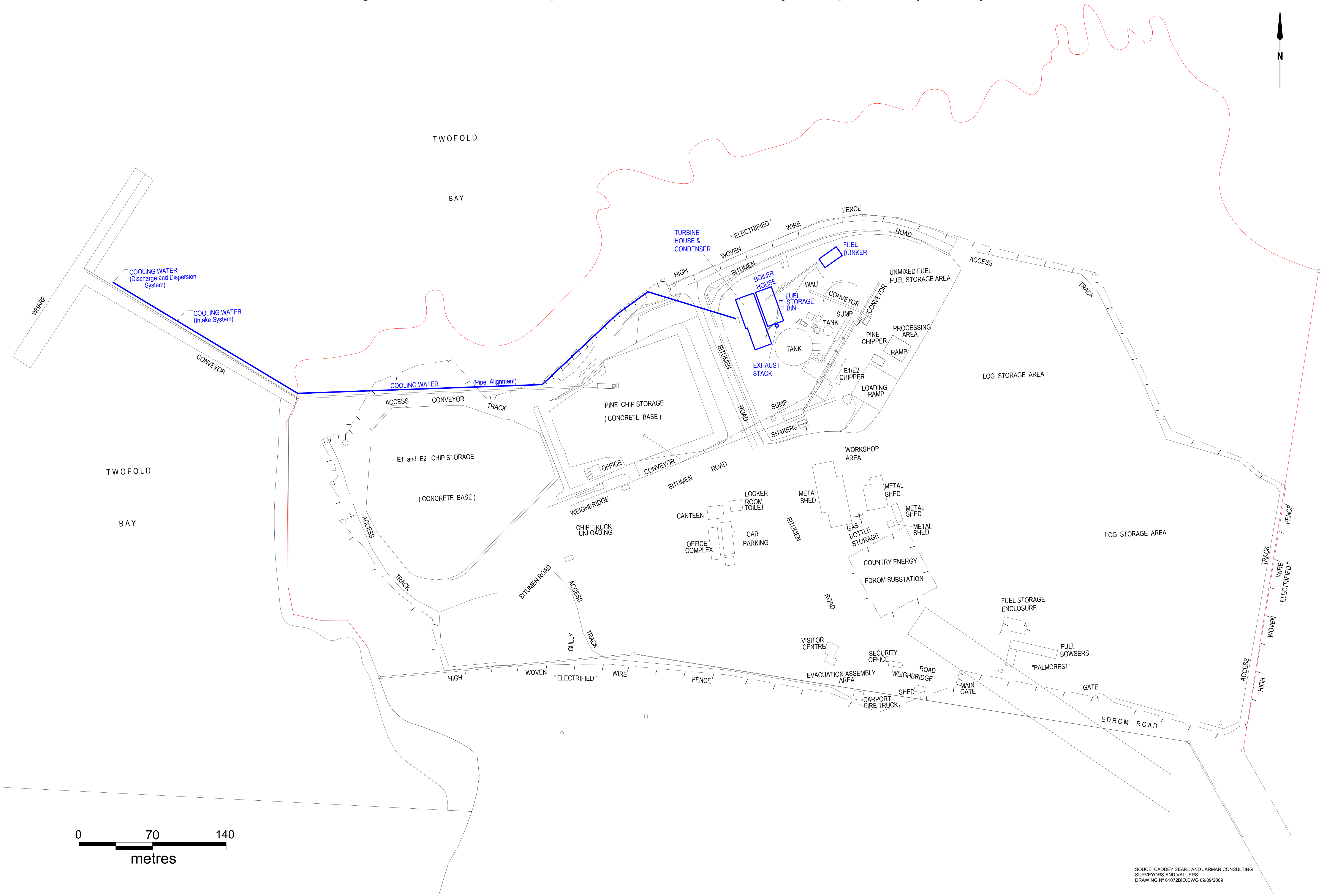
2.2.1 Fuel Storage and Handling

Unmixed wood waste fuel would be stored in piles in the existing wood-waste storage area according to fuel source. Sufficient dry mixed fuel to fire the furnace for three days would be stored in a 1000 m^3 capacity covered bunker to provide a source of dry fuel during wet weather events. This bunker will be located between the unmixed fuel piles and the drag chain conveyor.

Fuel would be mixed to a consistent size and moisture content using a front end loader as it is loaded onto a drag chain conveyor for transfer to the 90 t capacity fuel bin. The fuel bin has a live bottom discharge system and, at 6 tph fuel demand, can store up to 15 hours of fuel for the furnace.

Fuel will be supplied on demand to a dosing bin with a number of fuel feeding screws at the bottom. The dosing bin serves as a small intermediate bunker with an automatic regulation of the fuel level between minimum and maximum set points. This results in a continuous layer of fuel in the dosing bin which functions as an air lock. A rotary valve is positioned on the top of the dosing bin as a supplementary air lock in order to prevent ambient air leaking into the combustion chamber.

Figure 2-1 Plan of Proposed Power Plant and Key Components (in blue)



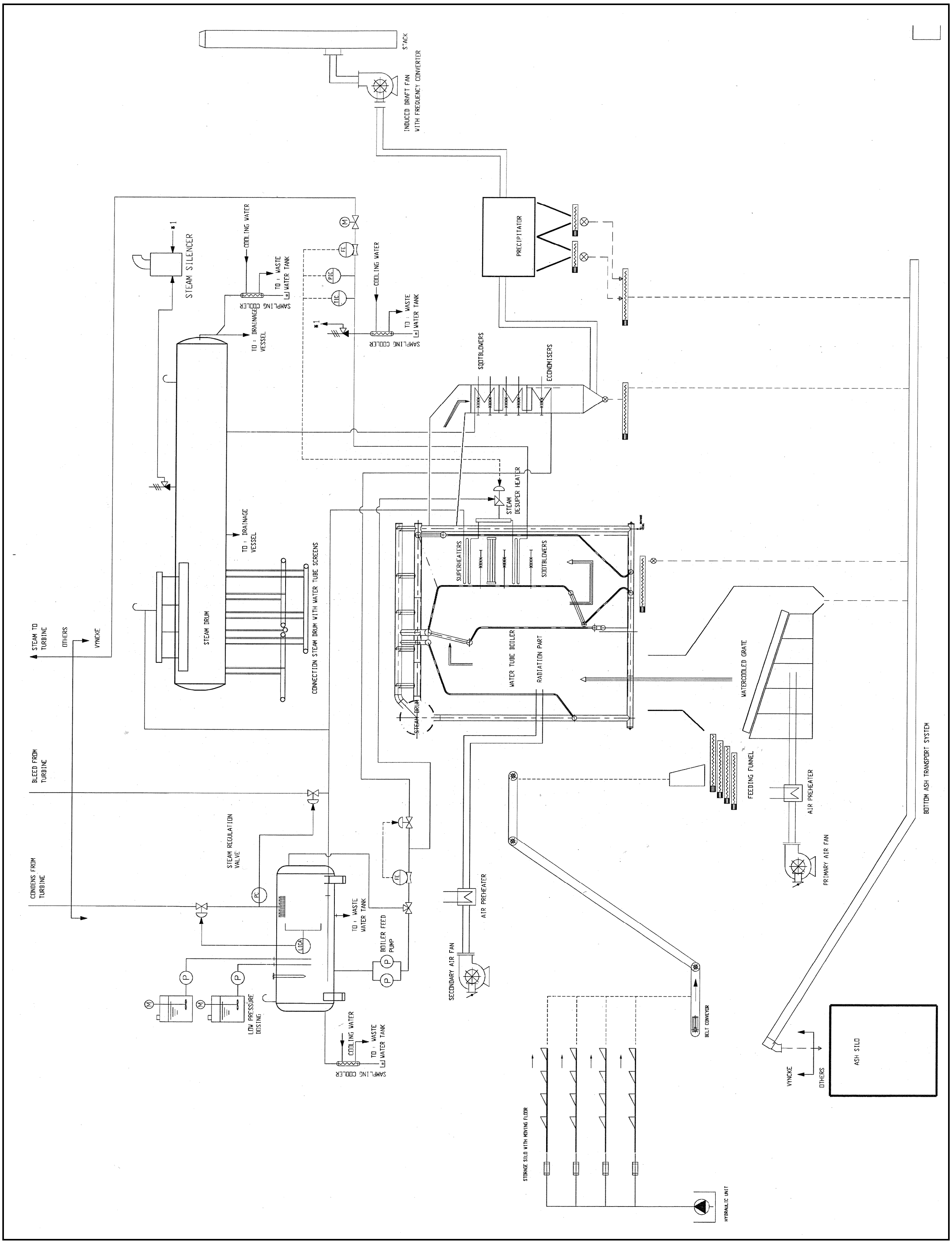


Figure 2-2 Process Flow Diagram

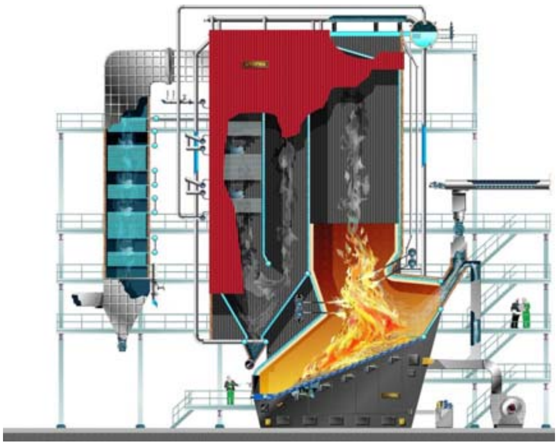
2.2.2 Combustion System

Fuel would be delivered on energy demand into the combustion chamber at the top of a water-cooled hydraulic powered step grate. The top level of the grate is water cooled to allow dry fuels to burn in this area. Wetter fuels would be moved down the grate to be fully combusted at a lower semi-water cooled part.

A chain conveyor located underneath the grate evacuates the ash from the furnace to the ash hopper.

2.2.3 Steam Boiler

The vertical water tube steam boiler consists of three major parts:



- water cooled furnace;
- radiation part; and
- convection part.

The furnace will be integrated into the boiler. The sidewalls and the furnace roof will be cooled by the membrane walls of the boiler. The integration of the furnace into the boiler assists in the control of combustion temperatures. As a result, the furnace is extremely efficient for combustion of wood based fuels.

An internal membrane screen divides the radiation part of the boiler into two empty passes. The flue gases arising from the combustion grate and the furnace enter the first empty pass where burnout of the flue gases takes place. The injection of secondary air at a high velocity at the inlet of the first empty pass strongly accelerates the burnout process of the flue gases. While residing in the empty pass two, the flue gases are cooled down by radiation.

In the vertical convection part a superheater is used to heat the steam from saturation point to superheated steam.

In the five economisers, the flue gases are cooled to the outlet temperature of the boiler.

The economisers and superheaters are equipped with a series of soot blowers using superheated steam to clean the heat exchangers on-line during operation. Fly ash that accumulates at the bottom of the economiser tower is collected in a dust bin.

The boiler will be housed in a building around 16 m wide, 30 m long and 23 m high.

2.2.4 Thermal Deaerator

The function of the deaerator is to thermally remove oxygen and carbon dioxide in the boiler feed water.

In a vertical deaerator column, water is spread on a stainless steel contact medium through sprinklers, while low pressure steam is injected into the water flow in the opposite direction. The water being superheated releases the dissolved gases.

The deaerator water is collected in a horizontal insulated water tank which is also maintained at temperature through steam injection and temperature regulation.

2.2.5 Electrostatic Precipitator and Flue Gas Stack

An Electrostatic Precipitator (ESP) will remove dust from the flue gas prior to the flue gas being discharged to atmosphere. Dust-laden flue gas will enter the ESP casing horizontally and be evenly distributed over several “ducts” which are formed by the walls of the grounded collecting electrodes. In the centre of each duct there are several spray electrodes that are distributed over the whole length. High negative voltages are applied to the spray electrodes, which ionize the gases in their vicinity by a corona discharge. During their passage through the duct the dust particles are negatively charged by the impact of the gas ions and then deflected towards the positively charged collecting electrodes, where they are temporarily deposited. The dust layer collected on the collecting electrode is continuously removed by a beater mechanism. Dust falls into a collecting trough and is carried to a dust bin by a conveyor.

A variable speed Induced Draft (ID) fan will be used to ensure accurate negative pressure control in the furnace. The ID fan expels the combustion gases up the flue gas exhaust stack. The stack will be 35 m high, 1.6 m in diameter and the discharge velocity will be 18 m/s, for a flow of 37,000 Nm^3/h.

2.2.6 Steam Turbine and Generator Package

The turbine / generator package will provide automatic conversion of the embedded energy of the superheated steam from the steam boiler unit into electricity. The steam turbine proposed will be a multistage axial flow horizontally mounted type together with a single reduction gear unit, automatic lubrication system, generator set and turbine controls all mounted on a common skid.

The condensing steam turbine selected for this project would feature multiple steam inlet control valves controlled by a governing system.

The steam exiting the last stage of the condensing turbine will be under a vacuum but still in a steam phase. The cooling system rejects heat from the cycle to the seawater cooling system, condensing the steam discharging from the turbine so that it can be returned to the boiler.

The turbine and generator skid will be housed within a turbine building to provide weather protection and sound attenuation. The building will be around 20 m wide, 40 m long and 8 m high.

The building will contain the central control room which will allow:

- continuous monitoring and control of the major process values (temperatures, excess oxygen levels in the flue gases, negative pressure in the furnace);
- optimum boiler operation;
- continuous safety control of the plant; and
- continuous alarm feedback.

The turbine building will be constructed in blockwork on a concrete slab, and the structure including the roof will be designed to attenuate the noise generated by the system. A large roller door will be included for ease of equipment installation and maintenance.

The condenser (2.5 m diameter and 8 m long) will be located at the end of the turbine building.

2.3 Water Requirements

2.3.1 Fresh Water

Fresh water for the mill site is provided by two dams located on Tiniki Creek and Bull Creek. Licenses administered by the Office of Water allow SEFE to annually extract up to 20 ML from Tiniki Creek (SL 28970) and 53 ML (SL 55192) from Bull Creek. In a typical rainfall year the flow from both dams is around 5840 ML. SEFE's current water demand is around 35 ML (0.1 ML per day).

The power plant will consume water to make up for water expelled from the boiler as "blow-down water" at the rate of up to 350 litres per hour or 3 ML annually. This increase in water demand (ca. 8%), when combined with the existing mill demand, is well within the current licence limits.

The water will be treated in a reverse osmosis (RO) water treatment plant which reduces, among other things, the hardness of the water to boiler quality standards.

2.3.2 Seawater

A preliminary design has been prepared for the seawater cooling system and the design has been modified and optimised on the basis of the marine modelling results (**Appendix B**).

The Power Plant will use up to 333 L/s of seawater for cooling. The maximum volume will be used during warmer months when ambient seawater temperatures are highest. During cooler months around 158 L/s will be needed to achieve the required cooling rate. Over the course of a year around 10,585 ML of seawater will pass through the system.

Seawater will be pumped to the condenser via a 450 m, 450 mm diameter above ground delivery pipeline, will pass once through the condenser, and will return via a 400 mm return pipeline to the discharge point. The intake and outlet structures will be installed on the existing jetty structure. A schematic of the cooling system is shown in **Figure 2-3**.

The design incorporates three intake pumps with the capability for two duty pumps to deliver the full flow while the third pump is under maintenance.

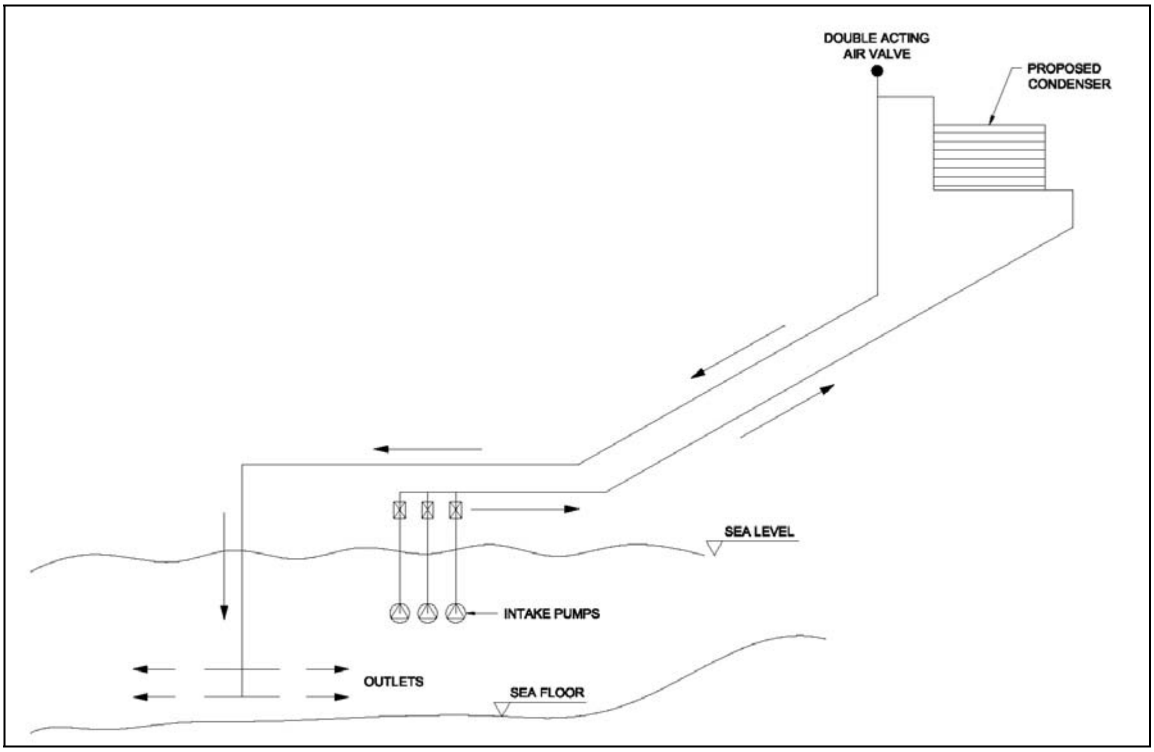


Figure 2-3 Schematic of cooling system

The inlets will be positioned approximately 90 m from the shore where the sea floor is at -9.2 m datum level (**Figure 2-1**).

The pumps will be located in a sleeve to stabilise the pump and the riser pipe against wave forces and to provide a mounting point for the intake screen. The sleeve will be supported by a concrete footing. This will anchor the bottom of the sleeve against wave forces. The proposed arrangement of the intake is indicated in **Figure 2-4**.

Wedge wire type screens will be used to remove suspended particles greater than 2 mm in diameter. This type of screen provides continuous slot openings that widen inwardly, making the screen self-cleaning by allowing "near slot size" particles to pass through rather than plug the openings.

The maximum intake velocity through the intake screens will be 0.1 m/s to prevent the entrapment of any significant sea life. To achieve this intake velocity the screens will have a diameter of 700 mm and a length of around 1700 mm. Wedge wire screens have a high open area by comparison with other screen media, giving lower entrance velocities and higher flow rates through the screen.

The intake will be approximately midway between low tide level and the sea floor, but not lower than 2 m from the sea floor. The intake screens can be easily lowered on to the mounting flange for maintenance.

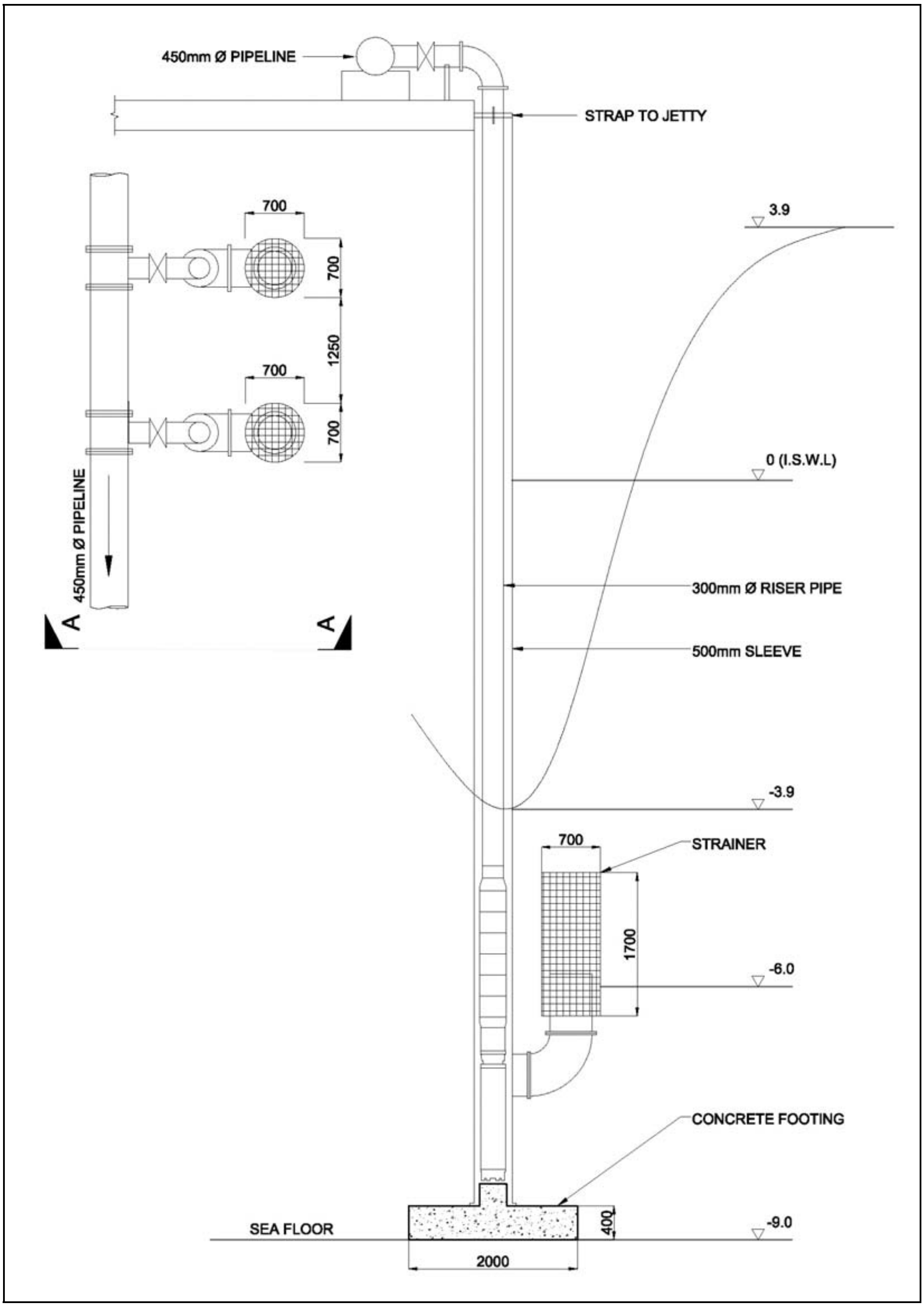


Figure 2-4 Intake Arrangement

The outlet will be located approximately 190 m from the shore where the average sea floor is at -14 m datum level (**Figure 2-1**).

The outlet pipeline will end with a vertical section down to the sea floor with two 150 mm outlets at 2 m from sea bed and another two at 1m from the sea bed (**Figure 2-5**). The outlets will be angled upwards at an angle of 30^o to maximise mixing and to keep the discharge plume off of the sea floor.

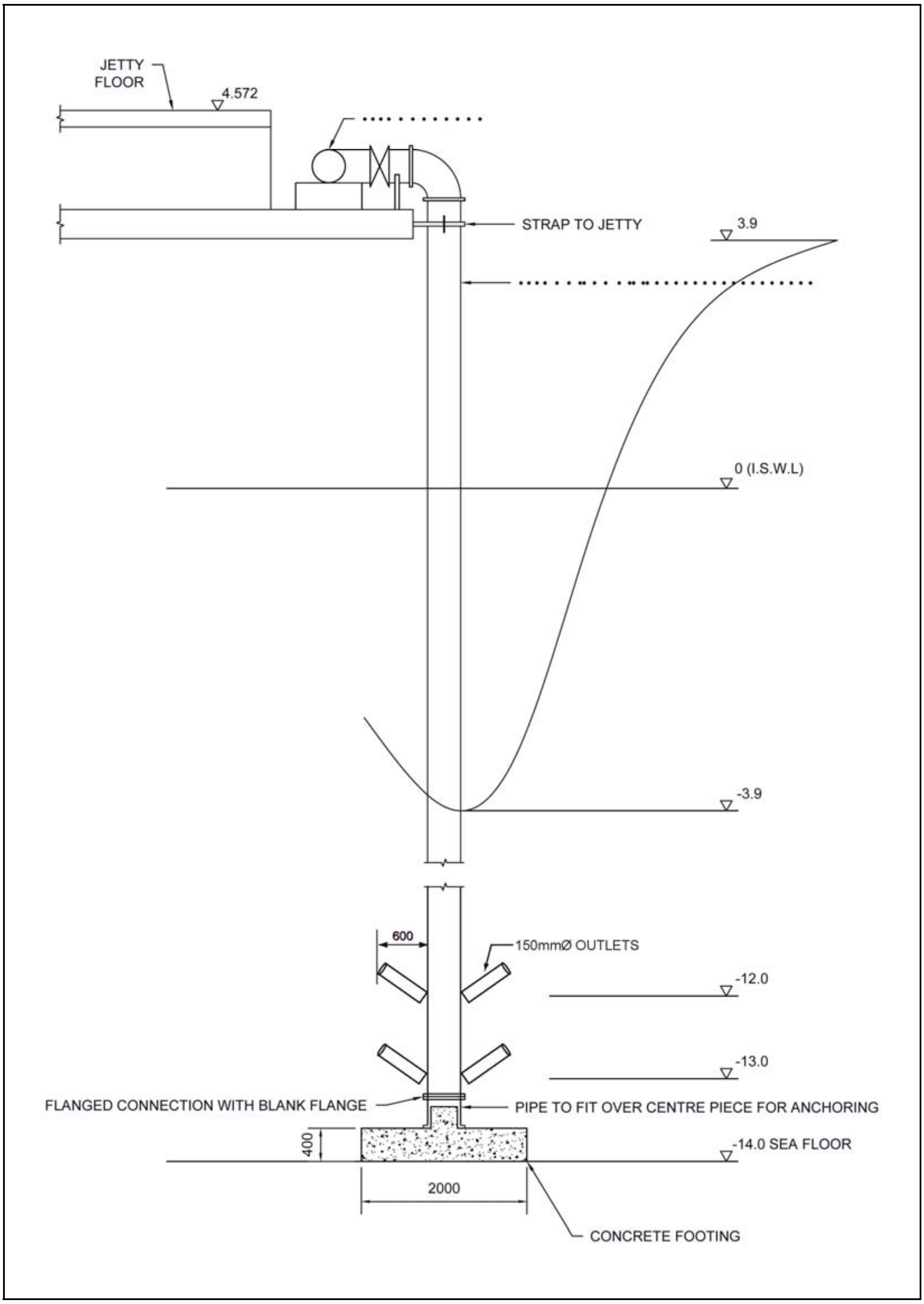


Figure 2-5 Outlet Arrangement

Ambient seawater temperature varies between 13 and 23 ^{o}C. The return water will be between 10 ^{o}C (summer) and 21 ^{o}C (winter) warmer than the intake temperature.

A copper-based antifouling system is proposed to control marine growth within the pipework. Fouling contaminates the water system resulting in:

- reduced heat transfer in heat exchangers or condensers;
- increased pressure drop in pipelines leading to a higher pump load;
- inevitable system cleaning which is usually inconvenient and expensive; and
- evolution of corrosive gasses like CO_2 or H_2S.

For these reasons anti fouling treatment is deemed necessary in industrial cooling water and other service water systems. A number of methods are available for anti fouling. Chlorine dosing is the most well-known method which is accompanied with the following problems:

- Special safety measures are required for the storage and transport of chlorine gas.
- Often complicated dosing installations are required.
- Regular maintenance is necessary.

One of the solutions using copper ions is called the Vandervelde Protection anti-fouling system. This is an effective method without the above mentioned disadvantages. The system operates through the controlled continuous dissolution of copper located in the water intake of the system. Metallic copper is oxidised to cupro ions (Cu+) which dissolve to create a temporary toxic medium for fouling. Cupro ions are also unstable and rapidly react with oxygen dissolved in water to produce inert and non-toxic cupper(II)oxides. The concentration of dissolved copper is relatively small, circa 0.01 ppm (10 µg/L).

2.4 Fuel

2.4.1 Start-up

Diesel fuel will be required to refire the furnace. Up to 50 L will be required for each start with up to four starts per year. Fuel will be stored in the existing 28,000 L storage tank adjacent to the burner.

2.4.2 Biomass Fuel Sources and Types

The Power Plant will consume around 57,700 tpa of wood waste. Waste will be drawn primarily from SEFE's current operations with around 22,600 tpa being obtained from local and regional saw mills (**Table 2-2**).

Table 2-2 Wood waste fuel types

Fuel Type	Tonnes per annum	Description	Source
Hardwood fines	21,250	This fuel is waste from on-site chipping / screening of hardwood logs which is currently sold to various customers in bulk and generally used for landscaping purposes (i.e. gardening mulch).	This resource is generated from the screening of SEFE's current hardwood chip production (material <6mm).
Pine bark	9,525	This fuel is waste from on-site contract chipping / screening of plantation softwood logs which is currently sold to a single customer and used for landscaping purposes.	Pine bark is generated at the SEFE site from contract debarking of softwood logs.
Pine fines	3,300	This waste is generated on-site during the chipping / screening of plantation softwood logs and is currently sold to customers for such purposes as lining hens' cages on poultry farms.	Pine fines are generated at the SEFE site from the screening of softwood chip production (material <6mm).
SEFE hardwood mill waste	1,060	This fuel is waste from on-site chipping of hardwood logs and is currently disposed of on site in the tepee burner for no energy recovery.	Generated at SEFE site by current operations.
Hardwood sawmill waste	17,600	This is hardwood sawmilling and screening waste which will be imported from local and regional sawmills with which SEFE already has commercial relationships.	It is estimated that sawmills in East Gippsland could supply 60% of this material, and sawmill and hardwood timber processing facilities in south eastern NSW are capable of providing 40%.
Softwood sawmill waste	5,000	This is waste which will be purchased from plantation softwood sawmills.	Softwood timber processing facilities in south eastern NSW.

Waste from SEFE's operations comprises hardwood fines (**Plate 2-1**), pine bark (**Plate 2-2**), hardwood mill waste (**Plate 2-3**) and pine fines.

Only wood waste will be burnt in the Power Plant. No native or plantation forests will be felled for the particular purpose of fuelling the Power Plant.

At present the NSW *Protection of the Environment Operations (General) Regulations 1998* – Reg 57M does not permit native forest bio-material to be burned in any generating work, if that bio-material is waste arising from wood processing carried out at the location of harvesting. In other words current NSW regulation would prohibit SEFE gathering harvesting residues and transporting them to the Power Plant to be used for power generation.

Plate 2-1 Hardwood fines

Plate 2-2 Pine bark

Plate 2-3 SEFE Mill waste (hardwood)

2.4.3 Chain of Custody

SEFE operates a Chain of Custody (CoC) System which is certified to the CoC Standard (AS 4707-2006). This is an inventory control system that tracks the pathway that forest products take from a Defined Forest Area (DFA) or stated source to the final customer. It was created to allow labelling of wood products and assure customers that the product they receive has been produced from sustainably managed forests.

SEFE is committed to the CoC certification and is guided by principles identified within the Standard that provide the necessary support to meet the requirements of the system. These include:

- CoC certification is complementary to both SEFE's Environmental Management System (EMS) certified to ISO 14001:2004 and Forest Management Plan certified to Australian Forestry Standard AS 4708-2007 (AFS). It indicates to SEFE's customers that the products purchased comes from well managed sustainable forests.
- The CoC System is used to track forest products to meet the certification needs of all organisations along the certification chain.
- SEFE has appointed an accredited, independent, third party certification body to verify and audit it's CoC System.
- SEFE is responsible for ensuring the credibility of its CoC System as part of day to day business activities.
- Continual improvement is the basis for SEFE's CoC System.

SEFE obtained EMS certification in August 2004 and AFS certification in September 2006. The estate certified to AFS includes SEFE owned plantations (including areas established under Joint Venture Agreements) as well as native forest that is associated with them. The majority of the wood received by SEFE is obtained from land managed by Vic Forests and Forests NSW. Both of these agencies achieved AFS certification in September 2006. As a result, over 90% of all wood received through SEFE's gate is certified.

2.5 Air Emission Controls

An Electrostatic Precipitator (ESP) will remove dust from the flue gas prior to the flue gas being discharged to atmosphere.

Based on an analysis of the wood waste fuel to be used, the Power Plant will have the following emissions:

- NO_X (calculated as NO_2 with a maximum of 1% N in the fuel) - ≤ 500 mg/Nm^3; and
- particulates (maximum of 1.5% ash in the fuel and calculated on an O_2 content of 11% by volume and dry flue gas) - ≤ 50 mg/Nm^3.

These emissions are valid for the boiler operating between 65% and 100% of full load.

2.6 Waste Management

2.6.1 Wastewater Disposal

Freshwater

Potentially contaminated surface runoff from the area surrounding the Power Plant will be collected via leachate drains and directed to collection pits for pumping to the existing water treatment plant. Boiler blow-down water and waste from the RO plant will also be pumped to the existing treatment system.

Seawater

The power plant will use up to 333 L/s of seawater for cooling. Seawater will be pumped to the condenser and returned to the ocean via intake and outlet structures installed on the existing jetty.

For maintenance purposes provision will be made for mechanical pigging of the delivery and return pipelines. All maintenance water will be collected in a receival pit. Water will be allowed to infiltrate with solids periodically removed to the on-site landfill. No chemicals will be used in the process.

2.6.2 Ash Disposal

The Power Plant will generate around 325 tpa of bottom ash (from the combustion chamber), coarse fly ash (from the boiler and precipitated in multicyclones or other precipitators based on gravitational forces) and fine fly ash (precipitated in electrostatic precipitators). Bottom fly ash usually accounts for 60 to 90% and the coarse fly ash for 2 to 20% of the total ash generated, whereas the fine fly ash fraction amounts to only 2 to 15%.

Within the various ash fractions, the presence of volatile heavy metals due to environmental pollution by heavy metal deposition on the forest ecosystem by air and rain increases with decreasing particle size. Recognising this, the preferred method of ash disposal involves the recycling of bottom ash and coarse fly ash to soils with the heavy metal rich fine fly ash fraction being collected separately and disposed of to landfill within SEFE's mill site (around 32 tpa).

SEFE owns a 200 ha eucalyptus plantation forest at Rockton, around 85 km from the mill site, and the proposed in-forest application strategy will occur at this site.

The bottom and coarse fly ash component of the total ash generated is expected to be around 90% of the volume, or 293 tpa. This represents about 18 truck movements annually.

The bottom and coarse fly ash will be provided in a spreadable particle size (i.e. free of slag and other particles larger than 15 mm), transported to the Rockton plantation, unloaded and stored on the ground prior to spreading. The spreading will be done with equipment similar to that used for lime spreading. Application rates have been determined at 10 t per hectare.

The implications for in-forest application of ash are discussed in **Chapter 17.3**.

2.7 Electrical

Electrical power for the plant will be supplied from the existing on-site substation. A new power line for the generated power will run from the turbine building to the substation. Both of these lines will be underground.

Upgrades to the substation could include a new circuit breaker, busbars and associated equipment. Final details will be resolved with Country Energy.

2.8 Project Cost Estimate

The capital value of the project is approximately $19 million.

2.9 Construction

2.9.1 Site Activities

During the construction period site access will be regulated via SEFE's security gate.

Prior to construction commencing on the site, the contractor would prepare detailed construction programs and methods. Construction activities will generally comprise:

- excavation - there will be little required in the way of excavation. A number of piles will be drilled down to rock using hydraulic augers. The minor amount of soil removed will be disposed of on-site using an existing tip truck. This work will take around one week to complete;
- pouring of concrete slab – a concrete slab will be poured over the piles to support the plant. Around 50 concrete trucks will be required over the two week period required for the pour;

- construction of plant and buildings – where possible, to minimise the construction time, prefabricated components would be imported to the site. Plant and equipment will be mainly delivered by semi-trailer. It is expected that up to two deliveries per day will be required over a ten day period. Large plant items including the boiler package and turbine would be delivered by low-loader. Around six of these deliveries will be required. Mobile cranes would be used to erect and complete the construction of plant items. A 150 t crane will be used for the installation of large items of plant such as the boiler; and

- installation of pipe work along the jetty.

Total construction time is estimated to take up to 15 months.

2.9.2 Marine Activities

Concrete footing will be installed to anchor the three intake pipes and the outlet pipe to the sea floor. Four footings (approximately 2 m^2 x 400 mm high) will be precast on-shore and lowered to the sea floor by crane from the jetty. Divers will be used to position the footings and to attach below sea pipework. Installation is expected to take one day. No construction impacts are anticipated.

2.9.3 Waste Management

Construction activities will generate little in the way of waste materials.

Construction personnel will use SEFE's existing ablution facilities.

2.9.4 Construction Hours

Construction will occur between the hours of 0700 to 1800 Monday to Friday and 0800 to 1300 Saturday. No construction would occur on Sunday or public holidays.

2.10 Employment

The construction workforce will peak at around 40 personnel. Operation of the Power Plant will result in an increase of SEFE's permanent workforce by the equivalent of six personnel.

2.11 Project Timetable

Subject to obtaining all necessary planning approvals, construction is due to commence in late 2010 with commissioning by late 2011.