17.1 Landuse and Planning

17.1.1 Existing Environment

Twofold Bay has an approximate area of 3,100 ha and a maximum depth of 27 m. The bay is fringed by National Park and State Forest areas, with residential development largely confined to the township of Eden located on the north side of the bay. Some low density residential development exists on the southern and western edges of the bay, with a small number of tourist facilities associated with sandy beaches.

The current land use in the region is diverse and includes fishing, commercial port operations, the timber industry, residential, tourism and agriculture.

The main land use in Bega Valley Shire as reported in 2008 was conservation, which made up 41% of the total Shire area. Agriculture and timber production were the other major landuses comprising some 32% and 26% of the Shire respectively. Bega, Eden, Merimbula, Pambula, Bermagui, Tathra and Tura Beach townships, which cover about 1% of the total Shire area, comprised the majority of the urban land (BVSC 2008).

Between 2004 and 2008, the major landuse change within the Bega Valley Shire was the increase in land under agricultural use, which has increased from 19% to 32% of total Shire area (**Table 17-1**). This is due to bushland being categorised as 'agriculture' in the latest *Regional State of the Environment* reporting period, as no accurate mapping figures on the extent or quality of bushland were available at the time of reporting.

Table 17-1 Bega Valley Shire Landuse as a Percentage of the Total Area

Landuse Category	1997	2000	2004	2008
Agriculture	19%	19%	19%	32.3%
Bushland	13%	13%	13%	*%
Conservation	34%	38%	42%	41%
Quarries	-%	-%	-%	-%
Timber production	33%	28%	24%	25.7%
Urban	1%	1%	1%	1%
Waterbodies	-%	-%	-%	-%

Source: Regional State of the Environment Report – Bega Valley

As a result of the Regional Forest Agreements, the *Forestry and National Parks Estate Act 1998* was enacted. This Act scheduled transfers of State Forests and other Crown lands to national park estate or Aboriginal ownership. As a result, approximately 840 ha of state-owned timber production forest was converted to freehold land under the ownership of the Eden Local Aboriginal Land Council between 2004 and 2008. A further 1500 ha of former State Forest under Crown lease was subject to leasehold interest, but was not dedicated specifically as conservation reserves (BVSC 2008).

The SEFE site is zoned 1(a) Rural General Zone under Part 2 of the *Bega Valley Local Environmental Plan 2002* (LEP). Surrounding land is zoned as 1 (f) Rural (Forestry) Zone (south of the SEFE site) and 8 National Parks and Nature Reserves Zone (east of the SEFE site).

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Figure 17-1 shows the current land use zoning provisions in the vicinity of Twofold Bay.

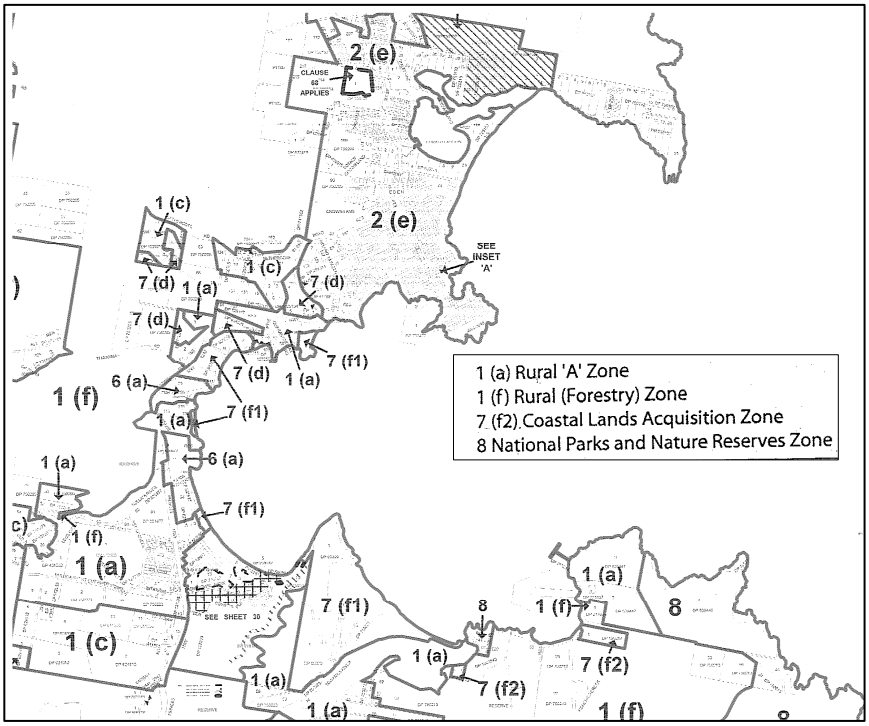

Figure 17-1 Bega Valley Shire LEP Zones 2002

East Boyd State Forest is located to the South of the SEFE site. The last major logging operations were undertaken in 1974, and thinning operations have continued in subsequent years.

Ben Boyd National Park is located to the east of the site and extends along the coast from Red Point to Wonboyn River. The National Park is used for bushwalking and the beaches within the Park are used for swimming and surfing. European heritage sites in the vicinity of the SEFE Mill include Boyd's Tower at Red Point, Edrom Lodge at East Boyd Bay and Davidson Whaling Station at Brierly Point.

It is noted that the Bega Valley Shire Council is preparing a new LEP that will:

- review and rezone land in the Shire as deemed appropriate;
- set out new permitted and prohibited uses in zones; and
- establish new planning requirements and considerations.

The SEFE site is located adjacent to Defences Multi Purpose Wharf and the Naval Munitions Storage Facility. Given the proximity to the proposed Power Plant to these structures, the implications of the Defence safeguarding zones on the Power Plant are discussed separately in **Section 17.2**.

17.1.2 Assessment of Potential Impacts

As discussed in **Section 4.4.3**, within Zone 1(a) the proposed Power Plant is permissible with consent.

Technical studies have demonstrated that, with the exception of noise, any impacts associated with the Power Plant are restricted to the SEFE site. Operation of the Power Plant will increase evening and night time noise levels by 1 dB(A) which is insignificant. It is concluded that construction and operation of the Power Plant would not result in any offsite impacts that impact current landuse practices or would restrict future changes in landuse zonings.

This EA was prepared prior to implementation of the new LEP across the Bega Valley Shire. To take into account local and strategic land use objectives, discussions with Council during the preparation of the EA were initiated. Council indicated that the SEFE site is likely to be rezoned to Industrial.

The adjacent Defence facility was designed to have an operational life of 50 years. Its location within close proximity to the SEFE site also places restrictions on changes to surrounding landuse due to the presence of Safeguarding Zones (**Section 17.2**). In general, if a proposed development in the vicinity of a Defence establishment is considered incompatible, the procedure would be to appeal to the planning authorities based on safety or operational considerations. Controls could be imposed through considerations under the *Environmental Planning and Assessment Act 1979*, or through an amendment to the Bega Valley Local Environment Plan for inappropriate developments (DUAP 2001).

17.1.3 Mitigation Measures

No specific mitigation measures are necessary in terms of land use.

17.2 Defence Safeguarding Zones

17.2.1 Background

Principles to guide the safe storage and transport of explosive ordnance have been developed in international fora using a consequence approach and have been adopted by Defence for use in Australia. The main elements are the NATO safety principles, the Commonwealth *Explosives Act 1961* and its Regulations, and Defence internal instructions. The NATO safety principles provide for the categorisation of explosives according to their potential hazard. The principles also cover the compatibility of different types of explosives, quantity–distance relationships, and 'safeguarding'.

Any building, vehicle or open storage area that contains explosives presents a potential risk of explosion or fire. Such sites present a hazard to other explosives storage sites, as well as to property, people and the environment. Quantity–distance relationships are used to define the distance between explosive sites and other facilities inside and outside an explosives complex so as to ensure that an accidental explosion does not set off another one, and that the risk to life and property is acceptable.

All facilities used for the storage, maintenance or handling of explosives must be sited at calculated distances from each other, and from other buildings and facilities both within and outside the explosives storage area. Safeguarding is the process of defining which land uses are acceptable, or not acceptable, adjacent to an explosive facility. Defence has adopted a series of three coloured lines (purple, yellow and green, in increasing order of sensitivity) to depict 'safeguarding zones' around explosive sites. The uses allowed in the various zones are described in **Table 17-2**.

Table 17-2 Safeguarding Zones used by Defence

Safeguarding line	Explanation
Purple line (outermost line)	Defines the minimum distance from an explosives facility within which large public buildings where many people may congregate, or major community amenities, must be sited from explosive facilities. Examples of uses not considered by Defence as compatible include the following: – public structures or facilities of economic importance or vulnerable construction; – major structures or facilities which attract large populations, e.g. large schools and shopping centres; and – major public infrastructure which would cause considerable inconvenience to the general public if damaged, e.g. bridges and dams.
Yellow line	Defines the minimum distance at which inhabited buildings, general community amenities or major traffic routes, must be sited from explosives facilities. Examples of uses not considered by Defence as compatible include the following: – the structures and facilities not permitted within the Purple Safeguarding Line; – residential housing and associated services; – major public roads; – major electrical transmission lines; and – facilities which serve the needs of the general public, e.g. water, gas and electricity installations.
Green line (innermost line)	Defines the minimum distance public recreation areas must be sited from explosive facilities. Examples of uses not permitted include: – activities and uses listed in the purple or yellow zones; – railroads and public roads of minor to medium importance; and – 'open space' recreational areas to which members of the general public have uncontrolled access.

Source: NSW Department of Urban Affairs and Planning (2001)

17.2.2 Twofold Bay - Defence Safeguarding Zones

Figure 17-2 shows the adjacent Defence Site in relation to the SEFE facility, inclusive of the safeguarding zones applicable to the general area. The safeguarding lines have been determined for the Jetty component of the Defence site, as well as the on-shore ammunitions storage facility.

While part of the SEFE jetty berth is within the Yellow Safeguarding Zone, the terminal is used for woodchip export and does not represent a potentially hazardous interaction as defined in **Table 17-2**.

The EIS prepared for the Multipurpose Wharf and Naval Munitions Storage Facility noted that the SEFE Woodchip Mill along with the Davidson Whaling Station and Edrom Lodge lie within the Purple Safeguarding Zone, however these facilities were assessed as not being of vulnerable construction or classified as structures that attract large populations. These facilities were considered appropriate for the Purple Safeguarding Zone (Woodward-Clyde 1999).

17.2.3 Assessment of Potential Impacts

The Power Plant would not be considered a vulnerable construction and would not be a structure which would attract large populations, and consequently the development is consistent with the Defence Purple Safeguarding Zone.

17.2.4 Mitigation Measures

No specific mitigation measures are necessary in terms of Defence safeguarding lines.

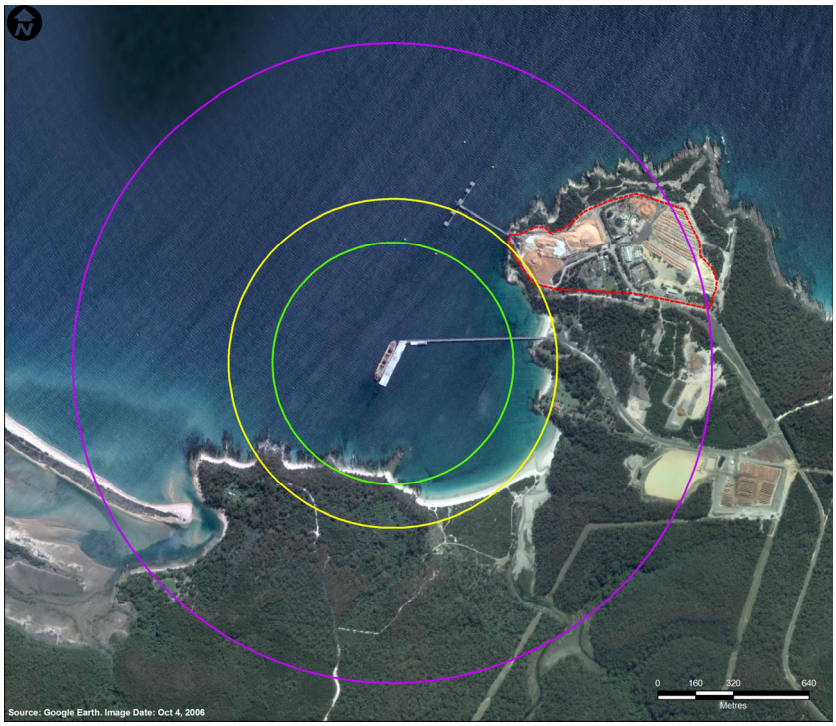

Figure 17-2 Twofold Bay Defence Safeguarding Lines

17.3 In-Forest Application of Furnace Ash

17.3.1 Introduction

The Power Plant will generate around 325 tpa annum 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).

The bottom and coarse fly ash component of the total ash generated is expected to be around 90% of the volume, or 293 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.

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"The ash from burning uncontaminated wood, timber, forestry residues or paper exemption 2006" ("ash exemption") under the POEO (Waste) Regulation 2005 makes it lawful to apply ash to land, provided that certain conditions are met. These conditions include:

- a requirement to test for several heavy metals and electrical conductivity three times per year. The levels of these parameters must be below prescribed concentrations as per Table 2 of the ash exemption; and
- a requirement to test for 24 parameters (as per Appendix I of "Guidelines on Resource Recovery Exemptions (Land Application) (April 2008)") before commencement of land application and then once every three years. These results must be reported to DECCW.

Under the "ash exemption", guidance is also provided on the appropriateness of applying ash to land. The Guidance (Appendix 1) considers that the proposed application site should be assessed against such factors as soil type, slope, proximity to water courses and potable water supplies, depth to groundwater and bedrock, suitability for plants etc. The "ash exemption" also requires that any ash applied must be incorporated into the topsoil.

17.3.2 Existing Environment

The Rockton site is located approximately 8 km north of the Victorian border on the Monaro Highway (**Figure 17-3**). The existing use of this land for plantation timber will continue into the future.

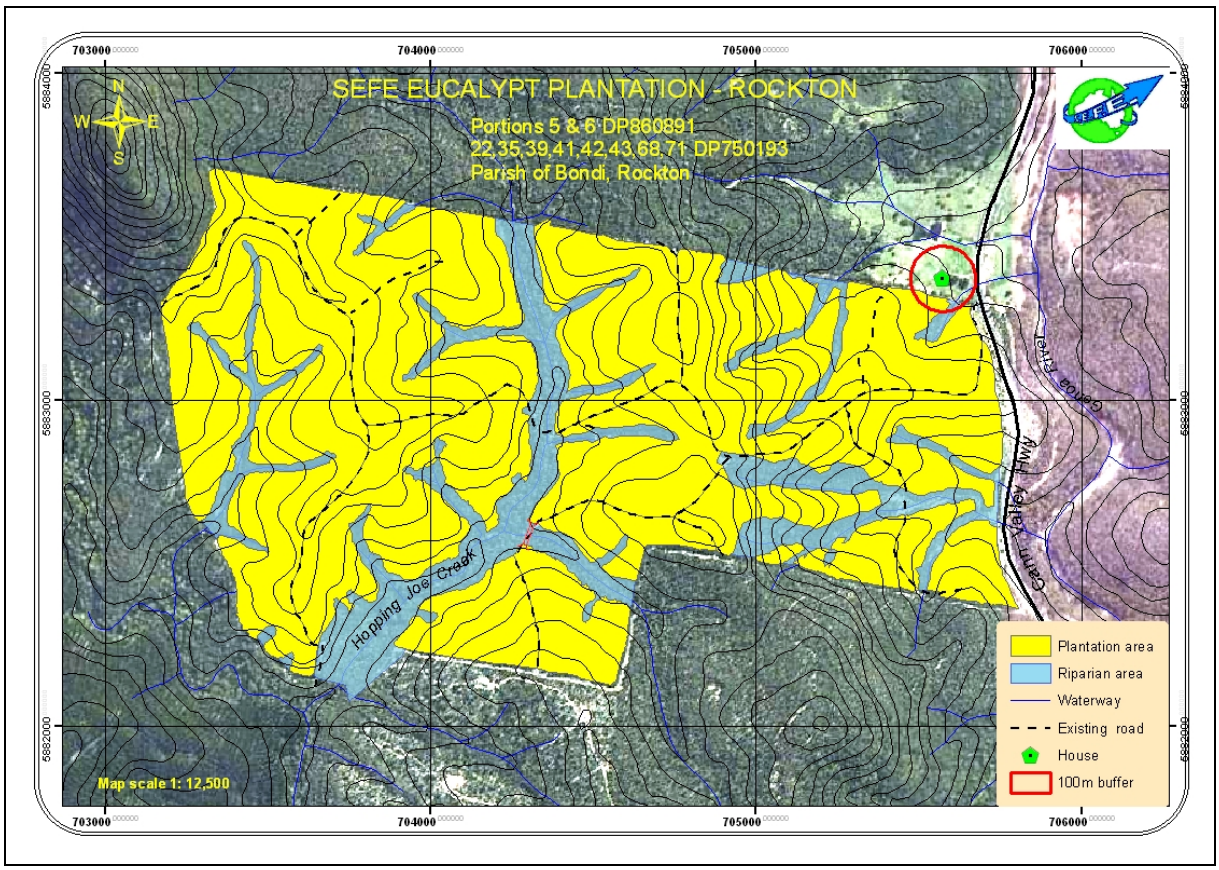

Figure 17-3 SEFE's Rockton Plantation

The site topography can be classed as flat to moderately undulating. Several drainage lines traverse the site with some of these having riparian vegetation buffers. In the 15 years that the property has been owned by SEFE, no above stream bed flow has been observed in Hopping Joe Creek, which flows through the centre of the property.

A search for information about licensed water bores, wells and excavations using the NSW Natural Resource Atlas showed no registered bores within the immediate vicinity of the proposed ash-application site. The closest bore located to the site is approximately 10 km to the north-west of the site, and is listed as a private bore for stock purposes. Details indicate that groundwater at this location is at considerable depth; water bearing zones were intercepted at 22 – 25 m and 38 – 42 m. The record indicates that the water is not saline.

Most of the soils on the Rockton property are derived from Silurian – Devonian granodiorite, part of the Bega Batholith (Beams 1980) and are classified as typically acid yellow to red duplex soils. The granodiorite parent material has large, common quartz crystals, white plagioclase feldspar and only minor (<10%) dark ferro-magnesium minerals.

Weathering of the granodiorite produces two main components:

- Coarse quartz sand.
- Dispersible clay.

Soils are typically poor in organic matter content, with shallow or non-existent 0 horizons. Depth of the coarse sandy A1/A2 horizon varies between 10 and 60 cm depending on topographic location. Usually the grey A1/A2 horizon overlies a yellow to orange sandy clay B horizon of varying depth to the decomposing granite beneath – commonly 75 to 90 cm.

Soil pH is typically in the range of 4.5 to 5.5.

Chemical characteristics of the soils include the following:

- **Base Cations**
  - Calcium (Ca) is only dominant in the A1 horizon and decreases in lower horizons.
  - Magnesium (Mg) is the dominant base cation in the B and C horizons, where Ca:Mg ratios are less than 1.
  - Sodium (Na) increases in lower A2 and B horizons.
  - Aluminium (Al) is often the dominant cation in the B and C horizons, hence the acid subsoils.
  - Potassium (K) is present in only low concentrations throughout the profiles.
- **Total Carbon (C), Nitrogen (N) and Phosphorus (P)**
  - C, N and P are found in low to very low concentrations. Concentrations of C are low in the A1 horizon and are particularly deficient in the A2 horizon.
  - P concentrations are less than 50 mg/kg throughout the soil profiles.
  - Total N is only present in significant amounts in the A1 horizon.

- **Exchangeable Sodium Percent (ESP)**
  - Sodosols are specified as soils with an abrupt texture change and greater than 6% ESP in the upper 0.2 m of the B2 horizon. While none of the sampled sites on the property meet this condition, two sites are close to the limit. Sodic soils are soils where the presence of Na is sufficient to produce adverse soil structural conditions and potential dispersion and erosion problems.
- **Boron (B)**
  - B levels are generally less than 0.15 mg/kg across all soil profiles. B concentrations of less than 0.15 mg/kg have resulted in B deficiency in the current plantation and necessitated the application of B fertilisers to correct the deficiency.

17.3.3 Impact Assessment

Chemical Characterisation

SEFE has tested its ash for the 24 parameters listed in the Guidelines. Results are provided in **Table 17-3**. No limits are specified in the Guidelines.

Table 17-3 SEFE Ash Parameters

Parameter	Concentration[1]	Parameter	Concentration[1]
Antimony	< 10	Nickel	103
Arsenic	19	Selenium	< 10
Beryllium	< 1	Tin	< 10
Boron	328	Vanadium	< 10
Cadmium	1.8	Zinc	125
Cobalt	15	Total organic carbon	< 500
Copper	126	Total nitrogen	< 100
Chromium	163	Total chlorine	740
Lead	69	Total fluorine	179
Manganese	994	Total sulphur	7480
Mercury	< 0.02	Total phosphorus	5764
Molybdenum	< 10	Moisture content	< 0.1[2]

Notes

1 mg/kg on a dry mass basis except for the following.

2 % by weight.

Table 17-4 compares the concentration of heavy metals and electrical conductivity of SEFE ash with the parameters listed in Table 2 of the “ash exemption”.

Table 17-4 SEFE Ash Parameters c.f. Prescribed Concentrations

Parameter	Prescribed maximum concentration as per "ash exemption"[1]	Concentration in SEFE ash
Arsenic	20	19
Boron	60	328
Copper	100	126
Chromium (total)	100	163
Lead	100	69
Electrical conductivity[2]	4	0.812

Notes

1 mg/kg except for the following.

2 dS/m.

The results demonstrate that concentrations of boron, copper and chromium in SEFE ash exceed the prescribed maximum concentration as per the "ash exemption". This means that SEFE cannot automatically apply ash under the exemption but must apply separately to DECCW for approval.

Charred organic matter will make up about 35% of the ash content. This organic matter will boost the very low organic matter levels in the soil and improve the nutrient and water holding capacity.

Calcium Oxide (CaO) makes up almost 50% of the total quantity of ash. Following spreading of the ash, it is expected that the CaO will absorb carbon dioxide (CO_2) from the atmosphere over time and will form Calcium Carbonate ($CaCO_3$). $CaCO_3$ is the main constituent of agricultural lime.

Magnesium Oxide (MgO) makes up approximately 7% of the total ash volume. Magnesium (Mg) is abundant in the soils on the Rockton property. It has been suggested that where the level of Mg exceeds 60% of the Base Cation Exchange Capacity (BCEC) of the soil, this may cause loss of structure in the soil. Given the high proportion of Ca and K in the ash, it is expected that ash application will reduce the current level of Mg, as a percentage of the total BCEC and potentially bring some improvement to overall soil structure.

Potassium Oxide (K_2O) makes up approximately 6% of the total ash volume. Following the establishment of the current plantation, a blended fertiliser, including K was applied to the site due to the low K levels in the soil. The application of ash will eliminate the need to apply K to the plantation in the form of artificial fertiliser in future.

Phosphorus Pentoxide (P_2O_5) makes up just over 2% of the ash content. P_2O_5 is a component of phosphate fertiliser. The Rockton soils are low in P and initial and follow-up fertilisation of the plantation has included the use of P fertiliser. It is expected that application of the ash would reduce, if not eliminate, the need for use of phosphorus based fertilisers on subsequent plantation rotations.

Small amounts of B and Cu in plant available form will be beneficial to the Rockton plantation. Inadequate amounts of B in particular currently results in poor tree form and reduced plantation productivity. Plant available B and Cu in the ash will reduce the need to apply B and C based fertilisers in future.

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The ash has a pH of 12 to 12.5. There will be an increase in the pH of the soils treated with the ash. This will eliminate the need to apply lime to address pH issues and the ash will significantly improve plantation productivity.

At an application rate of 10 tonnes per hectare, the fertilising value of the ash, based on actual fertiliser prices and the average nutrient content, is calculated at about $400.00 per tonne.

Overall it is concluded that the application of ash will result in a beneficial outcome for the Rockton plantation.

Ash Application

Ash will be stored at the mill until sufficient volume is available for field spreading. 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.

The plantation is currently being harvested. All harvesting residue is being retained on the site to protect the soil and to boost the levels of organic matter in the soil over time. It is likely that the plantation will be re-established prior to the commencement of spreading of the ash. Trees will be spaced to ensure there is ongoing access within the plantation for the spreading.

Ash will be spread during the drier months of the year to minimise the risk of ash entering any drainage feature and to protect soils within the plantation from rutting. Following spreading, the ash will be incorporated into the organic matter and the upper level of the A1 Horizon by light scarification using a 3-point linkage mounted attachment.

The drainage features in the plantation are protected by native vegetation buffers. Ash spreading will stop at least 5 m away from any unprotected drainage feature.

Ash spreading rates will be set to ensure that any heavy metals applied to the soil do not build up to unacceptable levels.

It is anticipated that the Rockton property will provide sufficient area to cater for ash spreading for six to eight years. During this period, a property with similar geology will be harvested and replanted to allow for ash spreading. SEFE owns over 4,000 ha of plantation land, so ongoing beneficial application of furnace ash on a sustainable basis can continue for the life of the Power Plant.

Effect on Neighbours

The Rockton site is surrounded by native vegetation on adjoining State Forest and private property, with the exception of a pasture area adjacent to the north east corner of the property. There is an occupied house approximately 50 m from the north east boundary of the property. It is proposed that spreading operations will be kept at least 100 m from this dwelling and at least 15 m from all other property boundaries.

Alternative Land Uses

It is the intention of SEFE to use the land for long term plantation crops. However, if the land was to be used for alternative agricultural pursuits, the application of ash and the increase in soil pH will have beneficial effects. For example, current soil pH and consequently the level of plant available aluminium precludes the growing of improved clover pastures and crops such as wheat.

17.3.4 Mitigation Measures

Recommended mitigation measures are detailed in **Table 17-5**.

Table 17-5 Mitigation Measures

Mitigation Measure	Project Stage		
	Pre construction	Construction	Operations
SEFE will obtain approval from DECCW to apply ash.	✓		
Soil samples will be collected and analysed three years after the initial application to confirm application rates and to determine whether additional applications of ash can be made to treated sites.			✓
There would be at least 6 years between treatments, unless soil testing shows that shorter return periods are possible, without adversely affecting the site.			✓
Spreading operations will be kept at least 100 m from any nearby dwelling and at least 15 m from all other property boundaries.			✓
Ash will be incorporated into the upper level of the A1 Horizon by light scarification.			✓