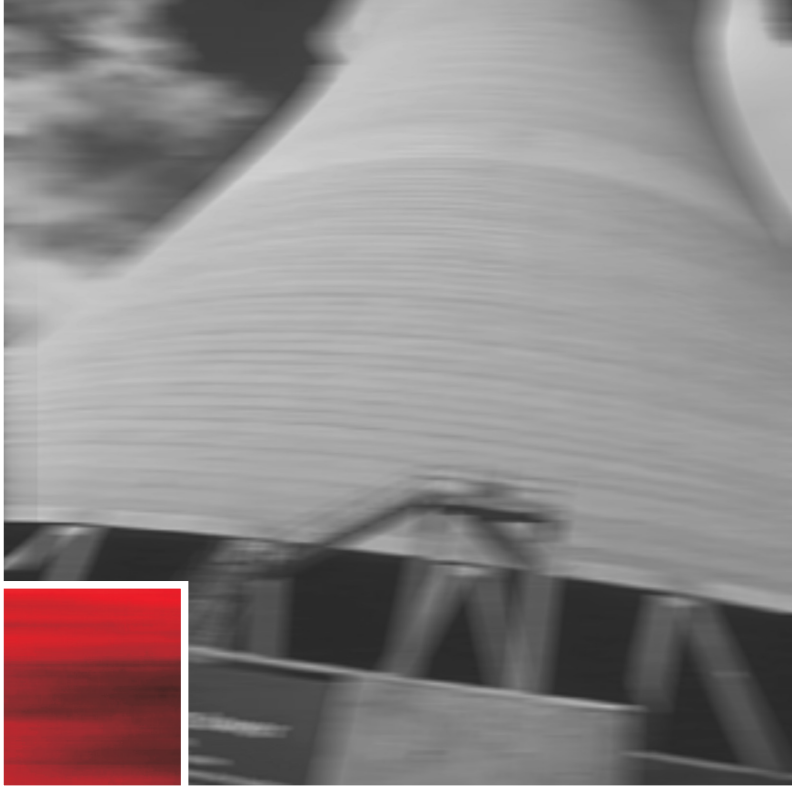
HLA

proposed upgrade



eraring power station

environmental assessment

Environmental Assessment - Proposed Upgrade to Eraring Power Station Rocky Point Road, Dora Creek

May 2006

Prepared for:
Eraring Energy
PO Box 5044
Dora Creek NSW 2264

CERTIFICATION

Submission of Environmental Assessment (EA)
prepared under the Environmental Planning and Assessment Act 1979 Section 75F

EA prepared by name qualifications	Erin Cox Bachelor of Environmental Science Diploma of Urban and Regional Planning	Michael England Bachelor of Arts (Regional and Urban Planning)
	Planner	Senior Principal, National Practice Leader Environmental Planning
address	HLA-Envirosciences Pty Ltd Level 5, 828 Pacific Highway Gordon NSW 2072	HLA-Envirosciences Pty Ltd Level 5, 828 Pacific Highway Gordon NSW 2072
in respect of	*Upgrade to Eraring Power Station comprising the construction and operation of an emergency gas turbine generator and upgrade and expansion of the existing ash dam facility at the Eraring Power Station.*	
project application applicant name applicant address	HLA-Envirosciences Pty Ltd Level 5, 828 Pacific Highway Gordon NSW 2072	
land to be developed lot no., DP/MPS, vol/fol etc proposed project	The proposed project is to be carried out on land shown on the maps included in the EA consisting of Lot 11 DP 1050120, Lots 301 & 302 DP 806475, Lot 3/8 Section L DP 6747, Lots 13/16 Section O & Part Lot 13/16 Section U DP 6747, Lot 7/16 DP 262501, Lot 19 DP 262501,Lot 1 DP 817425, Lots 100 and 101 DP 828283, Lot 211 DP 840670, Lots 50 and 51 DP 840671, Lots 1, 2 and 3 DP 621697, Lot 1 DP 816174 and Lots 20 and 21 DP 734860, Eraring. This land is owned by Eraring Energy. The site also includes additional Crown land to be procured by Eraring Energy known as 'Crown Land adjoining the northern boundary of Lot 11 DP 1050120 to the ridge line.' Map(s) attached	
Environmental Assessment	an Environmental Assessment (EA) is attached	
Certification	I certify that I have prepared the contents of this Environmental Assessment and to the best of my knowledge it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.	
	Signature Name: Erin Cox Date 7/7/06	Signature Name: Michael England Date 7/7/06

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EXECUTIVE SUMMARY

BACKGROUND

Eraring Energy (EE) is a State-Owned Corporation that manages a diverse set of electricity-generating assets located throughout NSW including a coal-fired power station at Eraring, known as Eraring Power Station (EPS). EPS operates four 660 megawatt generating units contributing 14,600,000 MWh of power to the NSW electricity grid in 2003/2004.

EE is proposing to undertake an upgrade to the existing EPS consisting of the installation of an emergency gas turbine generator (EGTG) for black start/peaking capability and improvements to the existing ash disposal facility.

In the past, EPS was provided with black-start capability from the Northern Gas Turbine Station (NGTS), however this plant was decommissioned in 2002, leaving EPS without the means to restart in the event of total or partial loss of electricity supplies. Installation of the proposed EGTG at the EPS would restore the black-start capability previously offered by the NGTS.

The proposed EGTG would not only provide the necessary electrical supply for restarting the power station in the event of a total black-out, it would also supplement the electricity supply during times of peak demand, to provide greater security and reliability of power supplies across the State.

In support of the proposed EGTG, Transgrid's *NSW Power System Restart Capability Strategy Paper* finds that:

- Present restart capability for the North region is not sufficient for reliable system restart; and
- The minimum improvement required is another North region power station with a gas turbine restart source to ensure quick restart of at least two main units.

Under current conditions restart of EPS following a black-out is expected to take a minimum of three hours. The installation of the proposed EGTG at EPS would meet Transgrid's key requirements as set out in the *NSW Power System Restart Capability Strategy Paper*, minimising the time taken to restore the NSW electricity supply.

The second component of EE's upgrade works to EPS involves the expansion of the existing ash disposal facility.

Ash is one by-product of electricity generation produced through the burning of coal. Whilst a large proportion of the EPS ash waste is reused, the remainder is stored in an ash disposal area to the north of the power station.

Despite the extensive reuse of ash at EPS (some 45% of EPS's fly ash is sold), at current disposal rates the existing ash dam will be full by 2011/2012. As the power station has a life beyond 2030, a new method of ash disposal is required to meet the needs of the power station beyond 2011/2012. EE is proposing to alter the method of disposal of ash at the plant to expand the existing ash dam to accommodate the ash disposal needs of the power station long into the future.

The purpose of this application is to seek project approval for the installation of the EGTG at EPS, and to seek concept approval for the expansion of the existing ash dam.

DESCRIPTION OF PROPOSAL

The project comprises two components – the installation of a black-start/peaking generator on the site and the upgrade of the existing ash disposal facility.

The black-start/peaking generator is to be used for:

- Restarting Eraring Power Station's main 660MW units in the event of a "system black" situation
- Operation when there is a shortfall of system electricity supply

The turbine to be used in the generator is to be 42 MW nominal output, which is the minimum size required for black-start purposes at EPS. The turbine would have dual fuel capability (distillate and gas) and will be capable of starting using batteries and its own diesel engine start system. The generator will enable EPS to restart in the event of a State black-out without an external electricity supply and will augment power generation during times of peak demand. The system will also have significant benefits for the State, by reducing the amount of time taken to restore the electricity supply following such an event.

The proposed upgrade to Eraring's ash disposal facility involves the use of dense phase disposal to provide greater efficiency in ash disposal on the site.

EPS's current ash disposal facility involves the use of "lean phase" disposal which comprises a mix of 30% ash and 70% water being pumped into the ash dam. The dense phase disposal method proposed comprises a mix of 70% ash and 30% water and allows for a smaller footprint for ash disposal. This method of disposal also allows for greater control in ash disposal and greater efficiency in terms of land uptake for this purpose as well as providing added environmental benefits associated with reduced water consumption when compared with lean phase disposal. The use of this technology will provide EPS with sufficient ash disposal capacity to accommodate the full life of the power station.

The proposed upgrade will require the acquisition of some 35 hectares of land adjacent to the existing ash dam as well as a range of new infrastructure including storage vessels and pumping facilities.

APPROVALS

Local Planning Matters

The site is located with the Lake Macquarie City Council area where the relevant environmental planning instrument is *Lake Macquarie Local Environmental Plan 2004* (LEP 2004).

The proposed development comprises a *utility installation* under LEP 2004, defined as:

> *'a building or work used for a public utility undertaking, but does not include a building designed wholly or principally as administrative or business premises or as a showroom'.*

The proposed EPS upgrade project involving expansion of the ash disposal facility and the installation of an emergency gas turbine generator falls within the bounds of facilities which are either part of, or ancillary to, the principal functions of Eraring Energy and are therefore adequately defined as a *utility installation*.

Under the provisions of LEP 2004, the subject site is zoned part 4(1) – Industrial (Core) and part 7(2) Conservation (Secondary). In addition, part of the Crown Land to be acquired for the proposed works is zoned 9 Natural Resources.

Within the Industrial (Core) zone, the Conservation (Secondary) zone and the Natural Resources zone utility installations are permissible with Council consent.

Regional Planning Matters

Hunter Regional Environmental Plan 1989 applies to the subject site.

State Planning Matters

EE are seeking Project Approval for the proposed EGTG and Concept Approval for the proposed ash dam expansion under Part 3A of the EP&A Act. The proposed development is classified as a major project under the Act and the Minister for Planning is the consent authority.

State Environmental Planning Policies (SEPP)
The SEPPs applicable to the proposed development are:

- SEPP 2005 – Major Projects;
- SEPP No. 14 – Coastal Wetlands; and
- SEPP No. 55 – Remediation of Land.

State Legislation
The *Protection of the Environment Operations Act 1997* (POEO Act) applies to the proposal. The project may require a variation to the existing environment protection licence applying to the site.

Commonwealth Matters
The project has been assessed against the *Environment Protection and Biodiversity Conservation Act 1999*. The proposal is not expected to impact on matters of NES, and as a consequence the EPBC Act is not triggered and referral to, and approval from, the Commonwealth Minister for Environment and Heritage is not required.

CONSULTATION WITH STAKEHOLDERS

Statutory authority consultation

As part of the environmental impact assessment process, consultation was undertaken with the following authorities:

- Department of Planning;
- Department of Environment and Conservation (DEC);
- Department of Lands;
- Department of Natural Resources; and
- Lake Macquarie City Council.

A Planning Focus Meeting (PFM) was held on 30 September 2005 and comments were subsequently provided in the Director General's Requirements.

Community Consultation

Consultation was also undertaken with representatives from the Koompahtoo Local Aboriginal Land Council, Wonnarua Nation Aboriginal Corporation, Yarrawalk Aboriginal Corporation and the local community.

In 2003, the EPS community forum was established to provide a means of communication between the power station and local community representatives. The community forum meets quarterly and consists of members of local community groups and EE staff.

At the community forum meetings of 17 August 2005 and 2 November 2005 the proposed ash dam expansion project was presented to the members and issues raised were recorded. Each of the issues raised by members of the community related to the proposal has been addressed within this EA.

Issues Identification

The key issues identified by the statutory authorities and the community through the Director General's Requirements and other consultations are listed in **Table 0-1**.

Table 0-1: Issues Identified by Statutory Authorities and Community

Aspect	Issue
Environment	Air quality Ecological impacts Noise and vibration Indigenous and Non-Indigenous Heritage Soil and water
Social	Hazards and Risk
Project	Ash waste disposal – description and alternatives

Potential Environmental Risk Analysis

A potential risk analysis was undertaken of the key issues identified in recognition of the need to recognise that the higher the potential severity of adverse environmental effects and the greater the consequence of those unmanaged effects, the higher the degree of environmental assessment required.

Where a high potential risk was identified, the attribute or issue was allocated a higher priority for assessment.

The risk analysis assesses risk on the basis of the potential severity of environmental effects and the likely consequences of those potential effects if unmanaged.

The risk assessment identified that the prioritisation of environmental issues and therefore the focus of environmental assessment for the proposed project should be as follows:

- High – Ecological issues associated with the proposed ash dam expansion.
- Medium – Air quality issues associated with the EGTG and soil and water issues associated with the ash dam expansion.

- Low – Noise and vibration, heritage.

The issues have been addressed accordingly within this EA and are summarised below.

ENVIRONMENTAL ASSESSMENT

Air Quality

Existing Environment
EE monitors a variety of pollutants at two locations in accordance with their Environment Protection Licence (EPL1429). These are situated to the south of the EPS in Dora Creek (monitors situated in the bowling club off Minnie Street, Dora Creek) and Marks Point (monitors situated in the grounds of the Marks Point Public School).

Pollutants monitored at these two locations are as follows:

- Oxides of Nitrogen;
- Sulfur Dioxide; and
- Meteorological Parameters (wind speed, wind direction and sigma theta at Dora Creek and wind speed, wind direction, sigma theta, ambient temperature and relative humidity at Marks Point).

Results for the monitoring program performed by EE indicate the following:

- Maximum background SO_2 concentrations calculated for Dora Creek and Marks Point are 288$\mu g/m^3$, 174$\mu g/m^3$ and 38$\mu g/m^3$ (10 minute, 1 hour and 24 hour averages respectively). All maximum concentrations comply with DEC assessment criteria of 712$\mu g/m^3$, 570$\mu g/m^3$ and 228$\mu g/m^3$ for 10 minute, 1 hour and 24 hour averages respectively.
- Maximum background NO_2 concentration calculated for Dora Creek and Marks Point was 97$\mu g/m^3$ (1 hour average). The maximum NO_2 concentration complies with assessment criteria of 246$\mu g/m^3$.

The highest background concentrations detailed above have been utilised for this study to ensure the assessment considers the worst possible potential pollutant ground level concentration. Only short term averaging results have been utilised for this study.

Potential Impacts
The pollutants predicted for the type of engine proposed in the EGTG are as follows:

- Carbon Monoxide (CO);
- Oxides of Nitrogen (NO_X);
- Particulate Matter less than 10 microns (PM_{10});
- Sulfur Dioxide (SO_2); and
- Volatile Organic Compounds (VOCs)

The EPS is situated in an area surrounded by pockets of residential development and large scale industrial development (predominantly coal mines). To allow an assessment of the potential impact of the operation of the EGTG on the surrounding receptors, discrete receptors were placed at various locations surrounding the location of the proposed EGTG.
Results of the dispersion modelling for the operation of the EGTG indicate that all assessed air quality pollutants when considered in isolation from the background are below DEC assessment

criteria. Assessed pollutants under worst case dispersion conditions with the EGTG operating continuously are expected to increase background pollutant concentrations by less than 0.5% of each pollutant criteria for assessed pollutants with the exception of NO_2 and PM_{10} which were both less than 4.7% (e.g. SO_2 maximum addition of 3.0 $\mu g/m^3$ (0.4%) of SO_2 criteria of 712$\mu g/m^3$).

Cumulative pollutant concentrations do not result in exceedence of any of the pollutants for which background data exists (SO_2 and NO_2). The pollutants for which background data does not exist are not expected to pose a problem cumulatively due to the low relative contribution of each of the pollutants (PM_{10} expected to contribute a maximum of 1.1$\mu g/m^3$ and Carbon Monoxide less than 0.0028$\mu g/m^3$ toward the ambient environment).

The proposed expansion of the ash dam will involve disturbance of soils due to the required clearing, however this will occur in a staged manner such that exposed soil is minimised. The placement technique used in dense phase disposal inherently reduces dust emissions in comparison to the lean phase technique therefore there are not expected to be significant air quality impacts arising due to dust.

Environmental Safeguards
Given that the emissions resulting from the proposed EGTG are well below the DEC assessment criteria, there is no need for additional environmental safeguards to be implemented, above those built into the design of the EGTG. The introduction of dense phase disposal on the site will, in itself act as a dust control measure as the placement technique used results in a more stable surface, less vulnerable to wind action when compared with lean phase disposal. Dust control measures currently used on the site such as wetting during dry, high wind conditions will be continued to ensure that dust emissions are maintained at an acceptable level.

Conclusion
Dispersion modelling undertaken for the proposed EGTG has demonstrated that under worst-case pollutant emission rates and meteorological conditions, all pollutant concentrations are predicted to be below the DEC assessment criteria for all sensitive receptors surrounding the EPS. Residual air quality impacts associated with dust during construction periods and clearing campaigns are expected to be minimal given the nature of the dense phase ash disposal and the existing dust control measures implemented on the site during times of high risk.

Ecology

Existing Environment
The study area is part of a woodland buffer area maintained by EE, as well as certain Crown land to the north of this which is to be acquired by EE.

A total of 124 vascular plant species have been recorded within the study area which is broadly described as ‘Dry Open Woodland’.

A number of species that are protected by the provisions of the Threatened Species Act 1995 (TSC Act), the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), or species that are considered to be ROTAP species have been identified at the site. The species are listed in the table below.

Table 0-2: Flora Protected by the provisions of the TSC Act

Scientific Name	Common	NSW Status	EPBC Status	ROTAP code
Genoplesium despectans? [c]	Sharp Midge Orchid	Unprotected		2K
Acacia bynoeana [b]	Tiny Wattle	Endangered	Vulnerable	3VC-
Callistemon linearifolius [b]		Vulnerable		2RCi
Hakea bakeriana [a,b,c]		Unprotected		
Bossiaea stephensonii		Unprotected		
Pultenaea tuberculata		Unprotected		
Tetratheca juncea [a,b,c]	Black-eyed Susan	Vulnerable	Vulnerable	3VCa

[a] HLA (2004a) [b] HLA (2004b) [c] Biosis (1999)

A review of the DEC on-line Wildlife Atlas (WA) identified a further three vulnerable species that occur within 10 km of the study area being *Angophora inopina*, *Syzygium paniculatum* and *Grevillea parviflora* subsp. *parviflora*.

Field investigations recorded a total of 94 fauna species, including three arboreal mammals and two small ground dwelling mammals that were trapped. A review of the DEC on-line WA identified 41 threatened species that have been recorded within a 20 km x 20 km grid centred on the study area. Many of these species are marine and do not have habitat within the lands managed by EE.

Bush Rats and Brown Antechinuses (*Antechinus stuartii*) were trapped frequently, with the highest densities recorded in places with high canopy cover and dense ground cover. The trapped arboreal mammals were a Ring-tailed Possum, caught in a cage trap baited with chicken, and a Sugar Glider. There were many trees with scarring from feeding glider species, most likely Sugar Gliders, although it is suspected that the threatened Squirrel Glider is present in forest habitat to the west of the study area.

Six threatened species have been recorded during recent biodiversity studies, with the potential for another 18 to occur within the EE management area. These are listed in **Table 0-3** below.

Table 0-3: Threatened vertebrate species recorded within study area.

Scientific Name	Common Name	Status TSC
Mormopterus norfolkensis	Eastern Little Mastiff-bat	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Miniopterus australis	Little Bent-wing Bat	Vulnerable
Miniopterus schreibersii	Common Bent-wing Bat	Vulnerable
Myotis macropus	Large-footed Mouse-eared Bat	Vulnerable
Petaurus norfolcensis	Squirrel Glider	Vulnerable

It is unlikely that any threatened amphibian species are present, due to the reduced quality of the ash dam and few other aquatic habitats.

There are no endangered populations, ecological communities, critically endangered species or critically endangered ecological communities within the study area.

Potential Impacts

Approximately 52 ha of native vegetation would require clearing to accommodate the expansion. This comprises the majority of the study area and equates to around 20% of the

woodland area of EPS. Impacts associated with the removal of this vegetation include removal of habitat supporting native flora and fauna, such as mature hollow bearing eucalypts, dense shrub understorey, dense ground cover, fallen logs and leaf litter.

The fauna species most likely to be affected by the proposed development are species that utilise this habitat including the small mammal population, arboreal mammals and insectivorous bats that roost in tree hollows.

The disturbed landscape resulting from the proposed clearing would be susceptible to the establishment and spread of weeds and feral animals and also aggressive native species that are adapted to disturbed landscapes. Without the implementation of mitigation measures and strategies to effectively manage the impacts of the proposed clearing, the remaining bushland surrounding the cleared area would suffer from edge effects.

The filling of the dam as a result of the ash dam expansion will also reduce the aquatic habitat available to a variety of aquatic species including Black-winged Stilts, Black Swans and Grey Teals which currently used the existing ash dam. However this aquatic habitat would also be progressively reduced under existing ash disposal activities.

The proposed project will result in the removal of approximately 34 ha of habitat for *Tetratheca juncea*, however 30 per cent of the mapped occurrences occur outside of the project footprint and similar habitat types are likely to occur to the north of the study area. Several hundred specimens of *Tetratheca juncea* are known to occur elsewhere within the EPS lands, while the locations of other threatened species known to occur within the within the EPS lands will not be impacted by the proposed ash dam extension.

Habitat is present within the study area for a further 18 threatened species. Seven-Part Tests were undertaken to determine whether the proposed project would have a significant impact on these species. The tests concluded that, with the implementation of the recommended safeguards, the proposed project would not have significant impacts upon these species.

The proposed action involves clearing approximately 52 ha of native vegetation. Clearing of native vegetation is a Key Threatening Process under Schedule 3 of the TSC Act. The removal of trees would be offset by the proposed safeguards, in particular, the retention of a 20 m buffer zone at the top of the ridge and the installation of artificial nest boxes and roosting boxes within the buffer area.

Environmental Safeguards

In order to minimise the impacts of the proposal upon native flora and fauna, the following safeguards are proposed to be implemented, as recommended by the project ecologist:

- The retention of a buffer zone of a minimum of 20 m along the ridgeline;
- The staging of clearing in increments over a twenty year period, with a rise up the ridgeline of 5 m during the first year, a further 5 m during years 1 to 5, a further 5 m during years 5 to 10 and another 5 m during years 10 to 20;;
- Each stage of clearing would be subject to further ecological assessment and approval by the Department of Planning to allow for ongoing monitoring of the success of mitigation measures;
- Clearing to be timed such that it does not coincide with critical periods in the lifecycles of significant species;

- The installation of artificial nest/roost boxes within nearby woodland and particularly within the buffer zone prior to the first stage of clearing. These nest/roost boxes will replace tree hollows at a ratio of 2:1;
- Monitoring of the condition of artificial nest boxes to be incorporated into the Biodiversity Management Plan being prepared for the EE lands;
- Preparation of a rehabilitation plan that utilises soil and regolith stripped during clearing and, if practicable, the ash deposited as part of the proposed development. Rehabilitation is to utilise a similar community, particularly with regard to nectar producing species, to that which shall be removed as part of the proposed project.

Conclusion
The ecological assessment undertaken in respect of the proposal indicates that there will be no significant impact upon threatened species, populations or ecological communities provided that appropriate safeguards are implemented on site.

Noise

Existing Environment
The existing noise environment at the periphery of the EPS site is dominated by road traffic noise from Wangi Road which runs just south of the power station. Wangi Road is a two-lane, sealed road which connects Wangi Wangi with Morisset and the Sydney-Newcastle Freeway. Attended noise monitoring was undertaken to determine background noise levels in and around the power station.

Potential Impacts

Construction Noise Impact
All construction activities on the EE site would be undertaken during the day time and would be temporary in nature. In light of the fact that the construction noise criteria are widely accepted to be overly stringent, EE would adopt a best management practice approach to managing construction noise impacts. Proposed management details would be provided within a Construction Environmental Management Plan and would be based on the proposed construction program.

Operational Noise Impact
The operation of the proposed new ash disposal facility involves the pumping of ash slurry from the main plant area to the ash dam, using the same processes as the existing ash disposal facility. The operation of the expanded ash dam would therefore not generate significant noise over and above that already occurring as a result of the ash disposal process. As there are no noise monitoring requirements specified in the EPL applying to the site, and no noise complaints have been received by EE in relation to the plant, it can reasonably be deduced that the proposed expanded ash dam will have no significant impact in terms of noise on local receivers.

Predicted noise levels from the proposed EGTG have been based on data obtained from the manufacturer of the turbine. The noise figures for the proposed EGTG indicate that the generator will contribute noise emissions of 85 dBA at a distance of 1 m from the turbine. Drawing on the principle of geographic spreading (i.e. a 6dBA reduction in noise for a doubling of separation distance) as well as the attenuation effects of the adjoining earthern embankment, some assumptions can be made regarding the likely reduction in noise contribution from the EGTG with an increase in separation distance.

At a distance of 1.024 km from the turbine site, the predicted noise level from the EGTG is predicted to be approximately 25 dBA based upon the principle of geographic spreading.

Therefore noise contributions from the EGTG at the nearest sensitive receivers – 6A Border Street (1.25 km from EPS), Eraring Public School (1.5 km from EPS) and 53 Point Piper Road (1.5 km from the EPS) are predicted to be less than 25 dBA which is well below the project specific noise goals identified using the INP.

This indicates that the predicted noise contribution would not be dominant above the current background noise at the receiver and would therefore be imperceptible.

Road Traffic Noise Impacts
Road traffic noise is assessed by the NSW *Environmental Criteria for Road Traffic Noise* (EPA, 1999). The daytime road traffic criteria relevant to residences along Wangi Wangi Road is 60 dB(A) $LA_{eq(1hr)}$ and night time is 55 dB(A) $LA_{eq(1hr)}$.

Based on the predicted increase in traffic volumes along Wangi Wangi Road, the increase in vehicle volumes during construction is not anticipated to represent a perceptible increase in road traffic noise to receivers along Wangi Wangi Road.

Operational Traffic
There will be no net increase in traffic movements during the operational phase of the proposed project and therefore no change in existing road traffic noise impacts as a result of the proposed project.

Environmental Safeguards
Construction
The following mitigation measures would be implemented to mitigate noise as a result of construction:

- construction equipment would be maintained and operated in a proper and efficient manner;
- construction activities would be limited to Monday to Friday, 7:00am to 6:00pm and Saturday, 7:00am to 1:00pm;
- construction activities would not occur on Sundays or public holidays;
- residents in the vicinity of the site would be informed of the proposed works schedule;
- construction activities would be scheduled so that the noisiest works are not undertaken simultaneously; and
- plant and equipment warm-up or idling would not be undertaken outside the restricted hours or at the site boundary.

Operation
The following mitigation measures would be implemented to mitigate noise as a result of plant operation:

- EGTG is to be encased within an acoustic enclosure and fitted with an exhaust silencer and air intake silencer;
- plant and machinery installed would be maintained and operated in a proper and efficient manner;
- the best available technology economically achievable would be installed at the plant;
- noise generating plant equipment would be oriented so that noise emissions are directed away from any sensitive areas, to achieve maximum noise attenuation; and

- post commissioning monitoring would be undertaken to assess the noise predictions made against the actual noise contribution achieved at the residential receivers identified in this assessment.

Road Traffic
The following mitigation measures would be implemented to mitigate noise as a result of traffic:

- loading and unloading of goods would be undertaken in the allocated area, which would be shielded by barriers/fences from noise sensitive receivers;
- deliveries will be scheduled for day time periods;
- the use of reversing alarms and exhaust brakes would be minimised at noise sensitive times of the day; and
- delivery trucks would be well maintained and serviced.

Conclusion
Noise generated from the proposed plant would occur during construction and operational activities. Traffic noise would also be generated from a temporary increase in traffic movements associated with the construction phase of the development.

There are few residential (sensitive) receivers in the vicinity of the noise sources of the proposed works with the nearest residential receiver located approximately 1.25 km away from the project site. A noise increase is expected during the noisiest construction activities, however, the activities generating these noise impacts would be temporary in nature and would be managed in accordance with best practice for construction noise management. A more detailed management approach for construction noise, based on the construction program, would be provided within a Construction Environmental Management Plan.

Operational activities associated with the EGTG would involve the generation of additional noise on the site, however this would be experienced in the context of the existing power station. Due to the distance to the nearest receiver, and the expected attenuation over the distance between the proposed EGTG and nearest receivers, the noise generated from the proposed EGTG is not expected to be perceptible at the nearest sensitive receivers and would not create a significant impact on the surrounding environment.

Indigenous Heritage

Existing Environment
An Aboriginal Heritage Assessment was undertaken to identify any Aboriginal heritage issues associated with the proposed ash dam. An AHIMS search was undertaken, followed by a field survey of the study area, and an extensive consultation process to identify and contact the relevant Aboriginal communities. The aim of the field survey was to identify the archaeological sensitivity of the study area.

The AHIMS search covered a 15 by 15km square area encompassing Eraring Power Station, the ash dam and the proposed study area. The search revealed 97 Aboriginal sites in the general area, with the field surveys, locating only one site near the study area, namely #45-7-0070, a shell midden, which was located on Crooked Creek, south of the ash dam.

The field survey involved a thorough investigation of the study area, which runs along the north and east side of the existing ash dam. The study area consists of upper slopes below a ridgeline to the north and above the shallow sloped edges of the ash dam to the south.

The survey identified no Aboriginal sites with the areas surveyed. Further, the assessment of the landform is gentle to moderate slopes with limited soil profiles and as such the site is unlikely to retain any *in situ* archaeological material.

Potential Impacts

There is no evidence that any Aboriginal or archaeological sites will be impacted from the proposed development. However, it is possible that an Aboriginal or archaeological site could be found during the course of works involved with the ash dam expansion and these sites/artefacts could be damaged by the proposed works should appropriate safeguards not be put into place.

Environmental Safeguards

Should any objects be identified during the course of site works, all works would cease and the DEC (North East Branch, Environment Protection and Regulation Division, Regional Archaeologist) would be contacted with regard to appropriate permit requirements before any further activity is undertaken. In addition, should suspected skeletal material be uncovered during the course of site works, all works would cease and the DEC, the NSW Police and the NSW Coroners office would be contacted immediately, regardless of any existing DEC permits for the proposed works.

Conclusion

No evidence of surface Aboriginal sites were located during the survey and visual observations suggest the potential for subsurface archaeological sites is also low given the lack of a developed or *in situ* soil profile being evident within the study area.

Water and Soils

Existing Environment

A desktop study of the water quality and groundwater, geology, soils and contaminated land within the study area was undertaken by HLA.

Soils

The 1:100,000 soil landscape sheet 9131-9231 for Gosford – Lake Macquarie shows the soils of the site as predominantly comprising the Doyalson erosional landscape. Parts of the site as well as the area of the ash dam are classified disturbed terrain. The geology of the site is of the Narrabeen Group, comprising conglomerate, pebbly sandstone, grey green and grey siltstone and claystone.

The site is already highly disturbed, comprising cleared and excavated areas within and around the existing power station buildings and ash dam, and sites within the vicinity of the EPS are known to be affected by ASS.

Water

A search of the DNR Natural Resources Atlas revealed that there was one groundwater bore onsite, located near the power station. Data from nearby bores (GW052111 and GW053438) indicate that the depth to groundwater ranges from approximately 21 – 16 m below ground level. Surrounding surface water includes Crooked Creek which runs along the southern edge and through the ash dam with Whiteheads Lagoon and Myuna Bay further south, across Wangi Wangi Road.

Potential Impacts

Soils

Approximately 52 ha of land would be required to be cleared to accommodate the proposed expanded ash dam. Potential impacts to the geology, soils and potential ASS from the proposed upgrade works would include:

- temporary impacts during construction works including earthworks and site preparation;
- impacts associated with construction of new access roads related to the expanded ash disposal facility;
- impacts associated with expansion of the ash disposal storage area and pit.

Construction of the EGTG would not impact significantly upon soils as it would require minimal excavation work.

Water
During the construction phase, the potential exists for temporary impacts to water quality as a result of earthworks and increased construction traffic. There will be a large area of exposed soil, causing changes to runoff patterns and potential movement of eroded soil.

Environmental Safeguards
The following safeguards would be implemented to ensure that potential soil and water impacts are minimised:

- Prior to carrying out any development, EE would prepare and subsequently implement a Soil and Water Management Plan.
- The earth works required for the proposed expansion of the ash dam would be undertaken in the presence of a geotechnical engineer/geotechnician.
- The monitoring regime undertaken by EE would be continued and updated in light of the surface water monitoring program to be developed for the proposal.

During operation, neither the EGTG nor the Ash Disposal is expected to impact the water resources at the EPS.

Conclusion
During preparation and construction of the ash dam, provided appropriate design and construction measures are undertaken, together with any required additional hydrological investigations, the issues identified during the desktop review are not expected to be a significant constraint to the project.

Other Environmental Issues

Additional environmental issues were identified, however the impacts resulting from the proposed expansion of the ash disposal facility and the EGTG are predicted to be minimal, and/or confined to the construction period. These additional issues include:

- Energy;
- Landscape character and visual factors;
- Hazards and Risks;
- Non-Indigenous Heritage;
- Waste Management;
- Land use;
- Social and Economic; and
- Traffic and transport.

Each of these issues are discussed in **Table 7-20** and **Table 7-21** of the EA.

STATEMENT OF COMMITMENTS

In accordance with the EA requirements issued under Part 3A of the EP&A Act, a Statement of Commitments (SoC) is provided in Section 8.2 of the EA. The SoC states EE's environmental commitments and details on the environmental management and monitoring of the proposed project during its construction and operational activities.

EE commit to the preparation and implementation of the environmental management and monitoring plans and environmental mitigation measures detailed in the SoC for the proposed improvement works to EPS as detailed in the EA.

RESIDUAL RISK

The Environmental Risk Analysis for the proposed project is based on a process adapted from Australian Standard AS 4369:1999 Risk Management, as well as environmental risk tools developed by other organisations.

Residual Environmental Risk is assessed on the basis of the significance of environmental effects of the proposed project and the ability to confidently manage those effects to minimise harm to the environment.

The analysis of residual environmental risk for issues related to the proposed project is shown in **Tables 0-4 and 0-5**. This analysis indicates the environmental risk profile for the proposed project based on the assessment of environmental effects, the identification of appropriate safeguards, and the Statement of Commitments shown in this EA.

Table 0-4: Risk Profile – Proposed EGTG

Issue	Significance	Manageability	Residual Risk
Air	2	2	Low/Medium (4)
Ecology	1	1	Low (2)
Noise Vibration	2	3	Low/Medium (5)
Indigenous Heritage	2	2	Low/Medium (4)
Soil and Water	1	2	Low (3)
Energy	1	1	Low (2)
Landscape and Visual Factors	1	1	Low (2)
Non-Indigenous Heritage	1	1	Low (2)
Waste Management	1	1	Low (2)
Hazards and Risks	1	1	Low (2)
Land Use	1	1	Low (2)
Social and Economic	1	1	Low (2)
Traffic and Transport	1	1	Low (2)

Table 0-5: Risk Profile – Proposed Ash Dam Expansion

Issue	Significance	Manageability	Residual Risk
Air	2	3	Low/Medium (5)
Ecology	4	3	High/Medium (7)
Noise Vibration	1	2	Low (3)
Indigenous Heritage	2	2	Low/Medium (4)
Soil and Water	3	2	Low/Medium (5)
Energy	1	1	Low (2)
Landscape and Visual Factors	2	2	Low/Medium (4)
Non-Indigenous Heritage	1	1	Low (2)
Waste Management	1	1	Low (2)
Hazards and Risks	1	1	Low (2)
Land Use	1	1	Low (2)
Social and Economic	1	1	Low (2)
Traffic and Transport	1	1	Low (2)

The above residual risk analysis indicates that the proposed EGTG presents an overall low risk in relation to each of the identified environmental issues provided that the recommended mitigation measures are implemented. In relation to the proposed ash dam expansion, ecology is considered to be the greatest environmental risk, however these impacts can be managed with the recommended mitigation measures to reduce this risk. The potential risks in relation to other identified environmental issues are considered to be Medium to Low with the implementation of recommended mitigation measures.

PROJECT JUSTIFICATION

The assessment of the proposal undertaken in the development of this EA has incorporated biophysical, economic and social considerations.

The potential biophysical impacts associated with the proposed development include examination of the following impacts:

- Air quality;
- Ecology;
- Landform, geology and soils; and
- Water quality.

The assessment of the impact of the proposed development on each of the biophysical elements of the environment has concluded that providing management measures and monitoring systems are implemented to mitigate potential impacts, the proposed development would not have a significant impact and is therefore justifiable on environmental grounds.

The proposed project would provide both direct and indirect economic benefits to the local, regional and State economies and would have particular benefits for the State through the improved security and reliability of the State electricity supply.

The potential social impacts of the proposed project include the following key issues:

- Noise;
- Indigenous and Non-Indigenous heritage;
- Amenity; and
- Landscape character and visual impact.

Overall, the project is not considered to have significant impacts on amenity or social impacts on the community, given its location within the EPS site and in respect to sensitive receptors, design and management measures to be implemented in accordance with the Statement of Commitments. The project is therefore justifiable on social grounds.

The proposed project would provide significant benefits in terms of improving the security and reliability of the State electricity supply and the potential environmental impacts of the proposal can be managed through the recommended mitigation measures.

1 INTRODUCTION

Eraring Energy (EE) is a State-Owned Corporation that manages a diverse set of electricity-generating assets located throughout NSW. Over the last five years, EE has maintained a relatively consistent share of the NSW electricity market averaging just over 20%.

EE's portfolio includes a coal-fired power station at Eraring, known as Eraring Power Station (EPS). EPS operates four 660 megawatt generating units that contributed 14,600,000 MWh of power to the NSW electricity grid in 2003/2004.

EE is proposing to undertake an upgrade to the existing EPS consisting of the installation of an emergency gas turbine generator (EGTG) for black start/peaking capability and improvements to the existing ash disposal facility.

1.1 Background

The *Energy Directions Green Paper* (December 2004) prepared by the NSW Government identified that whilst there is currently sufficient electricity generation capacity in NSW to meet demand, the level of maximum demand is increasing by approximately 4% per annum. In the event this trend continues, additional generation capacity or demand management would be required by 2010.

The Green Paper outlined two types of electricity demand as follows:

- *Average demand: Average demand is essentially a measure of the demand that occurs most of the time. Average demand in New South Wales is currently around 8,500MW; and*
- *Peak demand: Typically, periods of peak demand occur when customers use air conditioning or heating at times of very high or very low temperatures respectively. Peak demand reached its highest level to date of 12,838 MW on 19 July 2004.*

Traditionally, the primary electricity supply to meet peak demand was the Snowy Mountains Hydro-electricity Scheme (SMHS) due to its ability to be brought on line and shut down quickly. However, due to a number of factors such as the increasing rate of peak demand, the reduction in New South Wales' share of the SMHS's capacity (from 71% to 50%) and the fact that summer peak demand can last for up to 8 hours, the ability of the SMHS to meet this peak demand is increasingly limited.

Further, Transgrid's *NSW Power System Restart Capability Strategy Paper* finds that:

- Present restart capability for the North region is not sufficient for reliable system restart; and
- The minimum improvement required is another North region power station with a gas turbine restart source to ensure quick restart of at least two main units.

Currently, EPS cannot restart in the event of a system collapse without an external electricity supply. Under current conditions this is expected to take a minimum of three hours after collapse. To meet Transgrid's key requirements as set out in the *NSW Power System Restart Capability Strategy Paper* EE is proposing to install an EGTG which will enable the power station to restart in the event of a system collapse and minimise the time taken to restore the NSW electricity supply. The proposed EGTG will permit restart of two main units at EPS simultaneously thereby advancing unit and system restart by at least three hours.

A separate component of the operations at EPS is the disposal of ash. Ash is one by-product of electricity generation produced through the burning of coal. Currently, of the ash material produced at EPS, approximately 45% of fly ash is sold through an agreement with Fly Ash Australia for use in other production processes, such as concrete manufacturing. All bottom ash, and a proportion of reclaimed bottom ash is sold through an agreement with Blue Circle Ash to be reused as a gravel substitute for use in landscaping and roads. The remainder of the ash by-product is stored in an ash disposal area to the north of the power station.

EPS's current ash disposal facility involves the use of "lean phase" disposal which comprises a mix of 30% ash and 70% water being pumped into a large ash dam. Whilst 45% of EPS's fly ash is sold, at current disposal rates the existing ash dam will be full by 2011/2012. As the power station has a life beyond 2030, a new means of ash disposal is required to meet the needs of the power station beyond 2011/2012.

EE is therefore proposing to expand the existing ash dam and introduce the use of dense phase ash disposal on the site. The expansion would take place on land directly adjacent to the existing dam to the north. Dense phase disposal comprises a mix of 70% ash and 30% water and allows for a smaller footprint for ash disposal. This method of disposal also allows for greater control in ash disposal and greater efficiency in terms of land uptake for this purpose as well as providing added environmental benefits associated with reduced water consumption when compared with lean phase disposal. The use of this technology will provide EPS with sufficient ash disposal capacity to accommodate the full life of the power station.

1.2 Location

The EPS site comprises approximately 1200 hectares of land and is located in a natural dip on the western shore of Lake Macquarie, near the township of Dora Creek, within the Morisset Planning District (see **Figure 1**). The power station footprint covers approximately 150 hectares, with the remaining area including natural ecosystems and water canals.

1.3 The Applicant

EE is a State Owned Corporation operating under the *Energy Services Corporations Act* (1995) and the *State Owned Corporations Act* (1989). EE was formed in August 2000, to administer the electricity generation activities of the corporation formerly known as Pacific Power (http://www.dlwc.nsw.gov.au/care/water/wr/clu_ee.html). EE's facilities include:

- coal fired/thermal power stations (Eraring Power Station);
- wind farms (Blayney Wind Farm, Crookwell Wind Farm);
- hydro sites (Bendeela Station, Kangaroo Valley Station, and Hume, Warragamba, Burrinjuck, Keepit and Brown Mountain Power Stations); and,
- pumped storage schemes (Shoalhaven Scheme – Kangaroo Valley Station).

In total, EE has a combined generating capacity of approximately 3041 megawatts (MW).

1.4 Environmental Assessment Process

The *Environmental Planning and Assessment* (EP&A) *Act 1979* and the *EP&A Regulation 2000* provide a framework for environmental planning in NSW.

Prior to any decision to proceed with a proposal that may have an impact on the environment, a detailed assessment of the likely impacts of the project must be undertaken. The proposed project has been declared by the Minister as a major project under the provisions of the EP&A Act and State Environmental Planning Policy (Major Projects) 2005, and is therefore subject to

the provisions of Part 3A of the EP&A Act (see **Appendix A** for Record of Minister's opinion). Part 3A of the EP&A Act establishes the processes and matters for consideration by the approval authority when determining the impact of a project and whether the project should be approved.

1.4.1 Major Projects

Section 75B(2) of the EP&A Act makes provision for 'major projects' to be identified through various means, including by way of declaration as a listed project in State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005), or by notice in the Gazette.

Schedule 1 of SEPP 2005 identifies classes of development which are major projects. This includes works for the purpose of an electricity generation facility with a capital investment of more than $30 million.

The proposed project comprises improvement works to an electricity generation facility requiring a capital investment of $41 million and is therefore classified as a 'major project' under SEPP 2005 and the Minister for Planning is the approval authority.

1.4.2 Environmental Assessment Requirements

Under section 75F of the EP&A Act, an Environmental Assessment (EA) must be prepared in accordance with the requirements of the Director General of the Department of Planning (DoP). A request for these requirements was made in October 2005.

The Director General's Environmental Assessment Requirements were issued on 19 December 2005. A copy is enclosed as **Appendix B** to this EA.

1.4.3 Planning Focus Meeting

A Planning Focus Meeting (PFM) was held at EPS on 30 September 2005, and was attended by relevant statutory authorities. The PFM provided a forum for discussion and consideration of issues to be included in the Director General's Requirements issued by Department of Planning (DoP), which set out the requirements for the form and content of the EA. These issues are outlined in **Section 5** of this EA.

1.4.4 EA Exhibition

This EA has been prepared under Part 3A of the EP&A Act which specifically lists the matters to be addressed in an EA.

The EP&A Act requires that the EA be placed on exhibition for public review for a minimum period of 30 days.

1.5 Context of this Proposal

The proposed works to the power station fall within the definition of a major project (formerly known as state significant development) under Schedule 1 of SEPP 2005. The proposal is therefore eligible for assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) with the Minister being the decision making authority.

A concept approval under section 75O of the EP&A Act is being sought for the proposed upgrade to the ash dam to allow for further details and environmental assessment to be undertaken once greater certainty of the project is assured. The Minister for Planning authorised

the submission of a concept plan for this component of the project on 20 February 2006. The Minister's letter of authorisation for the concept plan is included as **Appendix C** to this EA.

Full Project Approval is being sought for the black start/peaking generator as this component of the project is less complex and further developed.

A preliminary Environmental Assessment Scoping Report (EASR) was prepared by HLA in September 2005, providing details on the proposed works and identifying the key environmental issues of importance to the project. This EASR was submitted to the DoP for consideration in association with the formal Major Projects Application lodged with the DoP on 7 October 2005.

Similar to the principles of Part 2 of Schedule 3 of the EP&A Regulation (which does not apply to this project) that allow for alterations and additions to existing facilities to be exempted from the need to prepare a high level assessment if the proposed alterations and additions do not result in a significant increase in the environmental impacts of the total development compared with the existing or approved development, the EASR prepared for the project identified that a high level environmental assessment would not be required for this project. This was confirmed in the Director-General's requirements issued for the project on 19 December 2005.

1.6 Purpose of this Report

This EA has been prepared by HLA on behalf of EE for proposed improvements to the existing power station at Eraring.

In accordance with Part 3A of the EP&A Act, the Director-General's Environmental Assessment requirements for the project were issued on 19 December 2005. This EA has been prepared pursuant to those requirements and addresses the matters listed by the Director-General. The purpose of this report is to assess the environmental effects of the proposal and to describe the measures that EE would take to minimise identified adverse environmental effects.

2 THE SITE

2.1 Site Description

EPS is located on Rocky Point Road in the suburb of Dora Creek, some 40 kilometres south-west of Newcastle (see **Figure 1**). The EPS site comprises approximately 1200 hectares of land on the western shore of Lake Macquarie of which 150 hectares is taken up by the power station itself. The remainder of the land is largely undeveloped consisting of open grassland, canals and bushland (see **Figure 2** for site layout).

The power station is separated from surrounding land uses by extensive tracts of land which provide a buffer that minimises adverse visual and acoustic impacts. Surrounding land uses include:

- North – Quarries, coal loading and unloading and railway lines.
- South – Rural and residential lands and Lake Macquarie.
- East – Whiteheads Lagoon (surrounding lands zoned environmental protection) with residential lands to the south-east.
- West – Main northern railway line, Cooranbong Colliery and Muddy Lake wetland. Land is zoned rural and environmental protection.

The power station is sited in a natural dip with ridgelines occurring to the north and east. A ridgeline occurs immediately to the north of the proposed ash dam site from which a series of small creeks drain towards the existing ash dam.

The geology of the site is of the Narrabeen Group, comprising conglomerate, pebbly sandstone, grey green and grey siltstone and claystone. The soils of the site are predominantly the Doyalson erosional landscape. Parts of the site, including the existing ash dam are classified as disturbed terrain. Sites within the vicinity of the EPS are known to be affected by Acid Sulfate Soils (ASS). The site is already highly disturbed, comprising cleared and excavated areas within the existing power station construction works.

The power station footprint is surrounded by some 1,140 hectares of land owned by EE which is home to a large number of plant and animals. To date, a total of 229 plant species have been identified on the site, along with over 100 vertebrate species (mainly birds). The area in which the ash dam expansion is proposed has a vegetative cover comprising native bushland in relatively good condition. **Section 7.2** provides a more detailed discussion of flora and fauna on the site.

2.2 Land Ownership and Legal Description

EE owns and operates the EPS site which comprises the following parcels of land:

- Lot 11 DP 1050120;
- Lots 301 & 302 DP 806475;
- Lot 3/8 Section L DP 6747;
- Lots 13/16 Section O & Part Lot 13/16 Section U DP 6747;
- Lot 7/16 DP 262501;
- Lot 19 DP 262501;
- Lot 1 DP 817425;

- Lots 100 and 101 DP 828283;
- Lot 211 DP 840670;
- Lots 50 and 51 DP 840671;
- Lots 1, 2 and 3 DP 621697;
- Lot 1 DP 816174; and
- Lots 20 and 21 DP 734860.

2.3 Land Acquisition

In addition to the abovementioned land, EE is currently in negotiations with the Department of Lands to procure approximately 32 hectares of land to the north of the existing ash dam, known as:

- Crown Land adjoining the northern boundary of Lot 11 DP 1050120 to the ridge line.

The purchase of this additional land will allow the fly ash to be placed in a controlled manner. EE has received from the Department of Lands a licence over Crown Land for this parcel (Ref. 387605) to allow survey work to be carried out. Discussions have also been held with Centennial Coal which is the holder of a coal lease over the land in question. The discussions with both the Department of Lands and Centennial Coal are continuing to allow EE to procure the land required for the project.

3 PROJECT DESCRIPTION

3.1 Overview of the Project

The project comprises two components – the installation of an EGTG on the site and the upgrade and expansion of the existing ash disposal facility.

The primary purpose of the EGTG is for restarting Eraring Power Station's main 660MW units in the event of a "system black" situation. The EGTG will also operate when there is a shortfall of system electricity supply.

The turbine to be used in the generator is to be 42 MW nominal output, which is the minimum size required for black-start purposes at EPS. The turbine would have dual fuel capability (distillate and gas) and will be capable of starting using batteries and its own diesel engine start system. The generator will enable EPS to restart in the event of a State black-out without an external electricity supply and will augment power generation during times of peak demand to alleviate stress on the system electricity supply. The system will also have significant benefits for the State, by reducing the amount of time taken to restore the electricity supply following such an event.

The proposed upgrade and expansion of Eraring's ash disposal facility involves the use of dense phase disposal to provide greater efficiency in ash disposal on the site in conjunction with an expansion of the ash disposal footprint. Using lean phase disposal, the current Eraring Energy ash dam is expected to be full by 2011/2012. Dense phase disposal requires a smaller footprint and together with an increase in the disposal area footprint, will ensure that Eraring has sufficient disposal capacity to accommodate the full life of the plant beyond 2030. The proposed upgrade will require the acquisition of some 35 hectares of land adjacent to the existing ash dam as well as a range of new infrastructure including storage vessels and pumping facilities.

3.2 Alternatives Considered

3.2.1 Ash Disposal Area

A feasibility study was prepared by CWPPI assessing a range of options for the ash disposal component of the project.

Do Nothing
At the current rate of disposal, Eraring's existing ash disposal facility will be full by the year 2011/2012. EPS has an expected life beyond 2030, therefore if no action is taken, there will be insufficient capacity to dispose of the ash on-site during the power station's operational life. This option was considered to be unacceptable due to the practical implications for the continued operation of the plant.

New Dam on the other side of the ridge
The construction of a new dam on the other side of the ridgeline site using the same 'lean phase' disposal method was considered as an option for accommodating the ash disposal needs of the plant into the future.

This option would involve the use of a substantial area of previously undeveloped land on the site and would utilise a relatively inefficient disposal method which requires a larger footprint and provides lesser capacity.

This option was discounted due to the inefficiencies in both the use of land and the method of disposal.

Continuation of 'lean phase disposal'
The continued use of lean phase disposal on the site would require more land and would be a less sustainable and efficient form of ash disposal. This option was discounted due to these inefficiencies.

Reuse of Ash
Currently, of the ash material produced at EPS, approximately 45% of fly ash is sold through an agreement with Fly Ash Australia for use in other production processes, such as concrete manufacturing. All bottom ash, and a proportion of reclaimed bottom ash is sold through an agreement with Blue Circle Ash to be reused as a gravel substitute for use in landscaping and roads.

In 2003 around 52%, or over 600,000 tonnes, of the ash produced at the EPS was recycled. Fly Ash Australia has indicated that re-use should increase by about 2% per annum.

EE is continuing to seek markets for the sale of ash to increase the reuse of ash produced at EPS. EE put to the market an Expression of Interest (EOI) for the fly ash not being used by Fly Ash Australia in late 2005. Only one response was received to this EOI for the use of the ash in the production of artificial aggregates. This option requires further development and discussions are continuing in this regard.

In addition, Blue Circle Ash has indicated that fly ash may have a possible use in bricks. A trial of this use was carried out in October 2005 and is currently being evaluated.

EE will continue to seek options for the reuse of ash, however, in the meantime it is prudent to assume an appropriate storage/disposal facility is still required on the site. Therefore this option will continue to be used in conjunction with an ash disposal facility.

Expansion of Existing Dam using 'Dense Phase' Disposal
The use of 'dense phase' disposal would facilitate the expansion of the existing dam, rather than the construction of a new dam due to the higher density of the material being disposed.

The proposed "dense" phase high concentration method utilises a mix of 70% ash and 30% water which produces waste material which 'sets' in a solid form, similar to that of concrete. Due to the higher concentration of this material, the disposal method is more efficient and enables the expansion of the existing dam using the adjacent ridgeline as a wall. This was the selected option for the project due to the added efficiency, minimal construction and land required, and subsequent reduction in environmental impact.

Two options for the use of 'dense phase disposal' were considered:

- Using half the dam area and increase the land area north of the dam. This option was considered to have fewer environmental issues and much lower operating costs and was the recommended option in the CWPPI feasibility study.
- Using the full dam including the area previously capped and rehabilitated. Whilst this option would have reduced the area required to be cleared, it was found to have issues related to run off during storm events and air quality impacts associated with dust which outweighed the potential impacts of the preferred option.

  EE has established a Selenium Reduction Program which is aimed at reducing inflows to the ash dam which minimises the potential for discharging ash dam decant water (including selenium) into the environment. Adherence to this program now forms a

requirement of EE's current EPL. The main focus of this program is to divert clean water run-off from the catchment around the ash storage area. Over 120 hectares (30%) of the catchment has now been diverted which is a major factor in reducing the need to discharge to Lake Macquarie. The capped and rehabilitated areas to the east of the ash dam represent 75 hectares of catchment diversions. Therefore, if these areas were used for the ash dam expansion, the whole dam catchment area diversion would be reduced by more than 50%. This decrease in diversion would mean that the total run-off into the dam would increase and potential for discharge to Lake Macquarie would be greater. Using these areas would also increase the total bare ash area exposed, thus increasing the volume of run-off available to leach selenium from the ash deposit.

In addition, static and stability issues would limit the height to which ash deposit could be built up on the capped area. If the ash deposit is raised too high or the containment embankment is located too close to the existing dam wall, this could lead to instability in the ash deposits and the main embankment. Consequently, the additional ash storage gained by utilising the capped areas would be limited and it is unlikely that the area would be large enough to hold all the ash produced.

A further issue associated with the use of these rehabilitated areas is the potential for unplanned discharge via the spillway during extreme storm events. As the ash level rises, it will be necessary to raise the pond operating level to maintain the decant pond which would in turn lead to an increased potential for spillway flood flows.

Finally, the use of these areas would result in greater potential for dust problems due to a greater area of exposed ash surface.

Given the environmental impacts and higher operating costs associated with this option, it was not recommended.

3.2.2 EGTG

Do Nothing

EPS currently has no black-start capability. The 'Do Nothing' option means that the power station requires an external electricity supply in order to restart in the event of a total black-out.

This restart is estimated to take a minimum of three hours within which time the power station cannot contribute to the restoration of the electricity supply to the State grid. Transgrid's *NSW Power System Restart Capability Strategy Paper* acknowledges that present restart capability for the North region is not sufficient for reliable system restart and that the minimum improvement required is another North region power station with a gas turbine restart source.

The 'Do Nothing' option would not meet this key Transgrid requirement to secure the State electricity supply in the event of a total blackout and was therefore considered to be unacceptable. Additionally, the EGTG will allow for the augmentation of power generation during times of peak demand. Without the EGTG, the plant is far less efficient in responding to consumer demand.

Types of EGTG

Numerous types of heavy industrial and aeroderivative types of gas turbine generators have been considered for installation to allow EPS units to black start.

The GE Frame 6B heavy industrial type EGTG was chosen for use at EPS as it is the only commonly available black start gas turbine that could direct on line start of the major auxiliary

plant at the station. The specifications for the GE Frame 6B EGTG are summarised in **Table 3-1** below.

Table 3-1: EGTG Specifications

Criteria	GE Frame 6B (PG6581B)
MW Output	42
Heat Rate (kJ/kWh)	11330
Fuel Consumption at max MW (l/h)	12355
NOx (ppm at 15%O_2)	With water injection - 65 (distillate fuel) 42 (gas fuel)
Exhaust Temp (°C)	546
Exhaust Flow (kg/s)	147
Noise Level (dBA at 1m)	95dBA (standard enclosure) 85dBA (additional enclosure)
Plant Size	30m(L) x 6m(W) x 6m(H) Stack Height – 15m

EE has entered into a contract for the supply of this turbine.

3.3 Existing Development

3.3.1 Eraring Power Station

EPS is a coal-fired power station comprising four, 660MW units with a total capacity of 2,640MW. The first of these generating units came into service in 1982, followed by the second and third units in 1983 and the fourth in 1984.

The four units contain steam driven, tandem compound reheat turbines with single flow high pressure, double flow intermediate pressure and two double flow low pressure exhaust cylinders. The four associated boilers are single-furnace, twin-drum and use natural circulation with divided back pass and balanced draught. A turbine steam by-pass system stabilises boiler firing at low load and enables easy matching of steam to turbine metal temperature during start-up.

Each generator is connected to a pair of generator transformers which raise the generated voltage of 23 kV to the transmission voltage of 330 kV on Units 1 and 2 and to 500 kV on Units 3 and 4. Electricity is transmitted overhead to the 330 and 500 kV switchyards which form part of the interconnected transmission system.

Coal for the EPS is sourced from five different mines in the local area. The plant burns some 5.2 million tonnes per year.

EPS uses saltwater from Lake Macquarie for cooling water. The cooling system is a once-through system where water drawn from Bonnells Bay is directed through the station by the inlet canal. Most of the water flows through the power station condensers, with the remainder used for attemperating the water before flowing back into Lake Macquarie and Myuna Bay.

3.3.2 Black-Start Capability

When a complete collapse of a major portion of the electricity system occurs, the system must be able to be restored to normal operations as quickly as possible. This is called black-start capability.

EPS previously had four 25 MW Frame 5P units at the former Northern GT Station connected to the 132 kV transmission network to provide black-start capability. These were successfully used for black-starting the station from 1982 to 2001. The units were sold in 2001 as there was no black-start contract available from NEMMCO at the time.

Whilst the foundation pads, fuel storage, unloading facilities and power transformers for the previous units still exist at the Northern ST Station site, EPS currently has no black-start capability. As a result, EPS cannot restart following a "System Black" situation without an external electricity supply. Currently, restart of the power station following a black-out is expected to take a minimum of three hours.

3.3.3 Ash Disposal

EPS's existing ash disposal facility is located to the north-east of the main power station, covering an area of approximately 200 hectares (see **Figure 3** for location). The process currently used is termed 'lean phase disposal', involving a 30% ash and 70% water mix. The lean phase ash is piped from the main power station to the ash dam some 4km away. Gradually, the water evaporates, leaving an ash residue which is mixed with the soil before the land is rehabilitated.

The capacity of the existing ash dam is estimated at 29.2 million m^3. EE records show that in 2002 some 16.6 million m^3 had been deposited, leaving capacity of around 12.6 million m^3.

Notwithstanding the current level of reuse of ash and ongoing efforts to identify new reuse options, at the current rate of disposal, the existing ash dam will be full by 2011/2012.

3.4 Proposed Development – EGTG

3.4.1 Purpose

In the event of a total blackout of the electricity grid and the tripping of all generation sources, electricity is needed to re-fire the power station. The proposed EGTG will provide the electricity needed to restart two of the main units within EPS simultaneously to minimise the time taken to restore power to the State grid.

In 2002, the Northern Gas Turbine Station (NGTS), which provided the EPS with black-start capability, was decommissioned and removed. Installation of the proposed EGTG at the EPS would restore the black-start capability previously offered by the now decommissioned NGTS.

The proposed EGTG will provide valuable insurance for electricity supply in NSW in the event of a total or partial loss of electricity supplies throughout the State's transmission system. It will provide the necessary electrical supply for restarting the power station and for powering station ancillaries while the main generating plant is prepared for starting. Furthermore, as the EGTG would be directly connected to the EPS's main switchboards it would provide additional security for in-service unit power supplies.

In addition to providing black-start capability for the coal fired units, the EGTG would be operated to secure the power supplies for essential auxiliaries of two coal fired units when there is a shortfall of electricity supply, as indicated by NEMMCO messages or market pool price excursions.

The primary objectives of the installation of the EGTG are therefore:

- To improve the security and reliability of the NSW electricity supply;
- To reduce the time taken for the restoration of the NSW electricity following a black-out event; and
- To supplement the peak-load when there is a shortfall of system electricity supply.

3.4.2 Siting

The black-start unit should ideally be located close to and directly connected to the main unit switchboard network so as to minimize voltage drop, and to provide better voltage stability.

In consideration of this, the proposed EGTG is to be centrally located within the main station area, close to fuel oil, demineralised water and main electrical systems. The site is also in close proximity to the station's 11 kV switchboard system so that no external switching is required. The proposed location for the EGTG is shown in **Figure 4**.

The location of the EGTG within the existing EPS core area was chosen for a number of reasons including:

- The site is close to terminal points for distillate fuel oil and demineralised water;
- The site is accessible to underground electrical conduit to the EPS 11kV switchboard system;
- Noise generated by the gas turbine would be contained by the earth bank to the east;
- Rainwater run-off from the EGTG can be directed to the EPS existing contaminated water system;
- The site is already highly disturbed, comprising cleared and excavated areas within the existing power station construction works; and
- Temporary maintenance facilities presently occupy the site.

3.4.3 Main Processes

The EGTG proposed to be installed at EPS is the GE Frame 6B heavy industrial unit which is the latest evolution PG6581 rated for nominal 42 MW output (the minimum size required to restart EPS).

The EGTG is a simple (or open/Brayton) cycle generator fuelled by automotive distillate, which will be gravity fed from existing fuel storage tanks at the EPS.

The EGTG is equipped with a conventional lead acid battery bank which will be kept charged by regular AC supplies. When a black-start is required, the batteries are used to start the GT diesel engine, as well as powering all controls and auxiliaries for the unit. The diesel engine, once started, is used to spin the GT rotor to full speed whereupon diesel fuel (or gas, if gas fired) is introduced to the GT combustion chambers and spark ignited. Once ignition occurs, the diesel engine disengages and shuts down and the gas turbine is under governor speed control. Following a short warm-up period, the turbine is ready to accept some load from the generator. The generator will be able to be synchronised to the directly connected Unit 1/2 station

switchboard, from where it will be possible to power any Unit or Station switchboard. The main Unit black-start then requires 2 units essential auxiliaries to be direct on line started in specified order, the boilers fired, then the main turbine being accelerated to synchronous speed ready for loading from the power system network.

The proposed EGTG will have dual fuel capability, utilising both distillate and gas. EE is currently in negotiations with the Mandalong mine gas/coal bed for the use of 1,500 GJ/day of methane gas to run the black-start unit. Gas would be supplied to the site via a pipeline with all necessary approvals for such a pipeline being subject to a separate application/approval.

The EGTG would be air cooled, without the requirement for external water supplies for cooling. In the event that water injection is used for the reduction of NOx, demineralised water from the EPS storage tanks would be used as a fuel diluent.

3.4.4 Physical Form

The proposed EGTG is roughly 40 m long by 6 m wide, with some additional footprint (approximately 5 m by 3 m) for the fan coolers for cooling water. The unit will reach some 15 m in height at the highest point, being the top of the exhaust stack. The unit will be of painted steel construction on concrete foundations. **Plate 1** illustrates an EGTG similar to that proposed.

Plate 1
Indicative Form of EGTG

3.4.5 Construction

Given the existing facilities at the site and the modular set-up of the EGTG, the construction period for the EGTG would be approximately 6 months. It is anticipated the EGTG installation works would be completed in the second half of 2006, given availability of suitable plant once approval is granted.

Construction activities required for the project are likely to include the following:

- minor earthworks;
- installation and diversion of services and infrastructure;

- installation of the EGTG; and
- construction vehicle movements.

3.4.6 Operations

The EGTG will effectively restart two main units at EPS simultaneously, thus assisting with bringing the entire State electricity grid back online in the event of a system collapse. The unit will also be used to increase EPS net export during tight system capacity events.

A typical black-start sequence would take place as follows:

- The EGTG is started by its own diesel engine start system.
- The power from the EGTG is used to start two main coal-fired units within EPS, bringing the station back into operation.
- Key transmission lines between EPS and other areas are energized.
- The power from EPS is used to restart other power plants in the system.
- Power is finally re-applied to the general electricity distribution network and sent to consumers.

The other circumstance in which the EGTG would be activated is during routine testing. Testing is undertaken to ensure that the unit is properly maintained and capable of performing the required task and to train personnel (this is especially important because of the rare need for the service and the resulting inability to get useful on-the-job experience). Routine testing on one of the EPS coal-fired units would take place on an annual basis. The EGTG would also be used to test run, both loaded and unloaded, 12 times per year to maintain its operational condition. Routine testing would total approximately 20 hours per year.

In total, when combined with anticipated running time during shortfalls in supply of electricity, the generator would be expected to be operated for up to approximately 200 hours per year if fired only on diesel fuel.

Negotiations are currently in progress with a local coal mine to procure supplies of coal bed methane gas, which would otherwise be lost to the atmosphere during mine operations. If gas is obtained from this source, the EGTG could be expected to operate up to between 1,000 and 2,000 hours per year.

3.4.7 Environmental Controls

The proposed EGTG will be encased within an acoustic enclosure and fitted with an exhaust silencer and air intake silencer to ensure that noise emissions are maintained at an acceptable level. The EGTG will also be bunded to divert surface water away from the generator avoiding potential contamination of runoff.

3.4.8 Decommissioning

The proposed EGTG would continue operations for the life of the EPS. Decommissioning of the facility would therefore coincide with the decommissioning of EPS.

3.5 Proposed Development - Ash Disposal

3.5.1 Purpose

Ash is produced as a by-product of electricity generation through the burning of coal. Two types of ash are produced, being bottom ash (10-15% of total) and fly ash (85-90% of total). Currently, EE sells approximately 45% of fly ash through a contract with FlyAsh Australia (FAA). All bottom ash produced is sold through a contract with Blue Circle Ash (BCA) and much is reclaimed from the existing ash dam on the site.

Despite this, EPS's existing ash dam will be full in 5-6 years time, at least 19 years before the power station reaches its planned operational life. The primary purpose of the expansion of the existing ash dam on the site is therefore to accommodate the ash disposal needs of the plant for its full operational life, up to 2030. The proposed ash dam expansion and switch to dense phase disposal would increase existing ash disposal capacity by some 10,000 million m³, providing capacity at present rates of deposition to around 2032.

3.5.2 Site Information

The proposed ash disposal area would be located within the EPS site in the area of the existing ash dam (see **Figure 3**). However, as part of the new system for ash placement, the expanded ash disposal area will require an additional 35 hectares of land adjacent to the existing ash disposal area (**Figure 5** shows indicative footprint). EE is currently negotiating with the Department of Lands to procure the additional land.

3.5.3 Main Processes

In the new dense phase plant, EE will collect all ash which is not sold to Fly Ash Australia or other future parties in vessels and pneumatically transfer the ash to intermediate storage silos. These silos will have the facility to load trucks for transportation to other locations for reuse or dispose in the dense phase system.

In the case of conventional lean phase slurry disposal, the ash to water ratio by weight is generally not more than 1:4 and pumping is carried out by centrifugal pumps. 'Dense phase disposal' involves a higher density/concentration slurry with an ash to water ratio of as much as 1:0.5.

The use of dense phase disposal will result in 40% more ash placed per cubic metre than the current lean phase method. The dry ash is wetted in a pug mill and then mixed to the desired dense phase concentration (approximately 70% ash/30% water) before being pumped to the ash dam using piston diaphragm pumps. The discharge line can be moved as the ash level rises thus allowing controlled discharge and clearing of land incrementally, as needed. The disperser pipe will be progressively raised up the ridgeline as the dam is filled until the grade reaches approximately 2% (see **Figure 6**). The dense phase slurry dries to form a solid crust which can then be rehabilitated.

It is anticipated that up to some 750,000 tonnes of ash per annum will be disposed of in this manner. The total capacity of the proposed expanded ash dam is approximately 40 million m³.

3.5.4 Physical Form

The proposed ash disposal facility will comprise an additional area for ash disposal by expanding the existing ash dam as well as new infrastructure to allow for storage and transportation of fly ash, and would include:

- installation of new larger storage vessels on each hopper of each unit (8 per unit);
- additional storage for dry ash;
- new plant for conditioning ash; and
- new pump facility to pump the dense phase slurry to the ash disposal area.

The expansion of the dam would occur through the layering of dense phase slurry in staged increments on top of the existing ash dam. The layers will gradually rise up onto the slope of land to the north of the dam, creating a 2% fall (see **Figure 6**). The existing dam wall will remain unchanged by the proposed works however the new ash disposal facility will result in a change in the landform currently existing in the area.

3.5.5 Construction

The construction period for the ash disposal component is likely to last for up to 24 months, including the initial land clearing and site preparation works, installation of storage facilities and infrastructure.
Construction activities required for the project are likely to include the following:

- earthworks;
- installation and diversion of services and infrastructure;
- construction of the ash disposal pit and storage facilities;
- construction of access roads and transport to ash disposal facility; and
- construction vehicle movements.

3.5.6 Staging

As discussed above, the disperser pipe which discharges the ash slurry into the dam will be raised incrementally as needed over the life of the dam. In this way, ash disposal and ancillary works such as the clearing of land will be undertaken in a progressive and staged manner. The staging of clearing in increments over a twenty year period, with a rise up the ridgeline of 5 m during the first year, a further 5 m during years 1 to 5, a further 5 m during years 5 to 10 and another 5 m during years 10 to 20.

3.5.7 Operations

Use of the existing ash disposal facility would continue until the new system is phased into service during 2008/09. During this time, the proposed ash disposal facility and ‘dense phase’ disposal method would need to be progressed from concept stage to detailed design.

The existing dam wall would remain unchanged and the proposed works and operations at the expanded ash disposal facility would also remain much the same as those existing. However, the dense phase disposal method would involve a different density of slurry, new storage facilities as well as a new plant and pump facility.

3.5.8 Environmental Controls

Clearing of land associated with the expansion of the ash dam will be undertaken in a staged manner over a period of some twenty years to minimise ecological and visual impacts. In addition, artificial nest and roost boxes will be installed at a ratio of 2:1 to existing tree hollows. The placement technique used in dense phase disposal also inherently reduces dust in comparison to the lean phase technique currently used on the site.

As this application seeks concept approval only for the ash dam project, further environmental controls may be incorporated at the detailed design stage.

3.5.9 Decommissioning

EPS has an expected life at least up to 2030. The proposed ash disposal facility would continue operations for the life of the EPS. Decommissioning for the facility would therefore coincide with the decommissioning of EPS.

4 STATUTORY PLANNING

4.1 Local Matters

4.1.1 Lake Macquarie Local Environmental Plan 2004

The site is located with the Lake Macquarie City Council area where the relevant environmental planning instrument is *Lake Macquarie Local Environmental Plan 2004* (LEP 2004).

The objective of LEP 2004 is:

> *'to achieve development of land to which this plan applies that is in accordance with the principles of ecologically sustainable development by:*
>
> *(a) promoting balanced development of that land, and*
>
> *(b) implementing the Lifestyle 2020 Strategy adopted by the Council on 27 March 2000'.*

Definition of the Development
The proposed development comprises a *utility installation* under LEP 2004, defined as:

> *'a building or work used for a public utility undertaking, but does not include a building designed wholly or principally as administrative or business premises or as a showroom'.*

A *public utility undertaking* is defined under LEP 2004 as:

> *'any of the following undertakings carried on or permitted or suffered to be carried on by or by authority of any government department or under the authority of or in pursuance of any Commonwealth or State Act:*
>
> *(a) railway, road transport, water transport, air transport, wharf or river undertakings,*
>
> *(b) undertakings for the supply of water, hydraulic power, electricity or gas or the provision of sewerage or drainage services,*
>
> *and a reference to a person carrying on a public utility undertaking includes a reference to a council, electricity supply authority, Government department, corporation, firm or authority carrying on the undertaking'.*

Eraring Energy is an electricity supply authority authorised under the *Energy Services Corporations Act 1995* (ESC Act) with the following principal functions:

> *(a) to establish, maintain and operate facilities for the generation of electricity and other forms of energy, and*
>
> *(b) to supply electricity and other forms of energy to other persons and bodies*

As an electricity generator, under the ESC Act, Eraring Energy may also:

> *(a) provide facilities or services that are ancillary or incidental to its principal functions, and*

(b) conduct any business (whether or not related to its principal functions) that it considers will further its objectives.

The proposed EPS upgrade project involving expansion of the ash disposal facility and the installation of an EGTG falls within the bounds of facilities which are either part of, or ancillary to, the principal functions of Eraring Energy and are therefore adequately defined as a *utility installation*.

Permissibility of the Development

Under the provisions of LEP 2004, the subject site is zoned part 4(1) – Industrial (Core) and part 7(2) Conservation (Secondary). In addition, part of the Crown Land to be acquired for the proposed works is zoned 9 Natural Resources.

The objectives of the Industrial (Core) zone are to:

(a) provide land for a wide range of employment-generating industries, including manufacturing, processing, assembly, storage and distribution uses, and

(b) provide land for a range of industrial uses that, because of their nature, require large areas of land or separation from more intensive forms of employment generating industries, and

(c) ensure that industries are designed and located so as not to cause unacceptable environmental harm or adversely affect the amenity of the environment, including residential neighbourhoods, and

(d) provide for sustainable water cycle management.

The objectives of the Conservation (Secondary) zone are to:

(a) protect, conserve and enhance land that is environmentally important, and

(b) protect, manage and enhance corridors to facilitate species movement, dispersal and interchange of genetic material, and

(c) enable development where it can be demonstrated that the development will not compromise the ecological, hydrological, scenic or scientific attributes of the land or adjacent land in Zone 7 (1), and

(d) ensure that development proposals result in rehabilitation and conservation of environmentally important land, and

(e) provide for sustainable water cycle management.

The objectives of the Natural Resources zone are to:

(a) provide land that has dual values as an economic natural resource and for environmental protection, and

(b) recognise the dual values of the land and integrate economic use of the land with ecological sustainability, and

(c) acknowledge the economic value of its natural resources, particularly for extraction of coal, gravel and timber, and

(d) acknowledge the long term value of the land for the management and maintenance of biodiversity, threatened species habitat, and corridors by minimising the adverse impacts of resource development, and

(e) rehabilitate disturbed land to a natural state, reflective of its long term value, and

(f) minimise earthworks while enabling productive use of the land, and

(g) permit habitat disturbance to facilitate forestry, surface activities for underground mining and other extraction of mineral and gravel resources and energy generation works, and

(h) acknowledge the multiple use of State forests for tourism, conservation and sustainable harvesting of timber, and

(i) provide for sustainable water cycle management.

The proposal is for an upgrade to existing electricity generation works, an industry which requires large areas of land and separation from more intensive forms of employment generating industries. Land the subject of the proposed works will be rehabilitated upon the decommission of the power plant and environmental safeguards have been incorporated into the design of the proposal to ensure that environmental values of the area are protected as appropriate. The proposal involves some habitat disturbance however, this is for the purpose of electricity generation in accordance with the objectives of the Natural Resources zone. Overall, the proposal is considered to be generally consistent with the objectives of the relevant zones.

Within the Industrial (Core) zone, the Conservation (Secondary) zone and the Natural Resources zone utility installations are permissible with Council consent.

Clause10 of LEP 2004 relates to development by public authorities and states that:

Despite other provisions of this plan, the following are allowed on land to which this plan applies without consent:

(a) the use of existing buildings of the Crown by the Crown, and

(b) activities specified in Schedule 10.

Schedule 10 to the LEP includes development for the purpose of public utility undertakings, being water, sewerage, drainage, electricity or gas undertakings, including:

(a) development of any description at or below the surface of the ground,

(b) the installation of any plant inside a building or the installation or erection within the premises of a generating station or substation established before the appointed day of any plant or other structures or erections required in connection with the station or substation,

(c) the installation or erection of any plant or other structures or erections by way of addition to, or replacement or extension of, plant or structures or erections already installed or erected, including the installation in an electrical transmission line of substations, feeder-pillars or transformer housing, but not including the erection of overhead lines for the supply of electricity or pipes above the surface of the ground for the supply of water, or the installation of substations, feeder-pillars or transformer housing of stone, concrete or brickworks,

(d) the provision of overhead service lines in pursuance of any statutory power to provide a supply of electricity,

(e) the erection of service reservoirs on land acquired or in the process of being acquired for the purpose before the appointed day, provided reasonable notice of the proposed erection is given to the Council,

(f) routine maintenance and emergency works,

(g) any other development, except:

(i) the erection of buildings, the installation or erection of plant or other structures or erections and the reconstruction or alteration of buildings, so as materially to affect their design or external appearance, or

(ii) the formation or alteration of any means of access to a road.

The proposal falls within the definition of development under Schedule 10 and is therefore permissible without Council consent.

4.2 Regional Matters

4.2.1 Hunter Regional Environmental Plan 1989

The Regional Environmental Plan (REP) applying to the subject site is Hunter REP 1989.

The aims of Hunter REP 1989 are:

(a) to promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man made features and so as to meet the needs and aspirations of the community,

(b) to co-ordinate activities related to development in the region so there is optimum social and economic benefit to the community, and

(c) to continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the Department and other agencies.

The Minister is required to give consideration to the content of the background report and the objectives, policies and principles contained in REP 1989 in the assessment of the proposed upgrade works. Whilst many of these are not directly relevant to the specific project proposed, the proposal is considered to be generally in line with the provisions of the plan as they relate to economic development and environmental protection in the region.

4.3 State Matters

There are four state environmental planning policies (SEPPs) of specific relevance to the proposal.

4.3.1 State Environmental Planning Policy 2005 (Major Projects)

State Environmental Planning Policy (Major Projects) 2005 (SEPP 2005) was gazetted on 25 May 2005 and amended on 1 August 2005. It replaces all previous provisions related to former 'State significant development' in planning instruments, directions and declarations.

The primary aim of SEPP 2005 is:

to identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development.

Schedule 1 of SEPP 2005 identifies classes of development which are classified as major development. This includes development for the purpose of an electricity generation facility that:

(a) has a capital investment value of more than $30 million for gas or coal-fired generation, or co-generation, or bioenergy, bio-fuels, waste gas, bio-digestion or waste to energy generation, or hydro or wave power generation, or solar power generation, or wind generation

The proposed EPS upgrade project is a candidate for declaration as a major project under clause 24 of Schedule 1 to SEPP 2005 as it involves:

- a capital investment of more than $30 million. The proposed development is anticipated to involve a capital investment of over $40 million; and,
- is for the purposes of coal-fired and gas electricity generation.

Therefore, under the provisions of clause 24 in Schedule 1 to SEPP 2005, the proposed development meets the criteria for classification as a major development, with the Minister being the approval authority.

4.3.2 State Environmental Planning Policy 14 – Coastal Wetlands

SEPP 14 has the primary aim of protecting coastal wetlands in the environmental and economic interests of the State. A heritage study undertaken by HLA in May 2004 indicates that a wetland listed under SEPP 14 is located on the EPS site, being Eraring Wetland, otherwise known as 'Muddy Lake'.

In relation to listed wetlands, SEPP 14 requires that development for the purposes of clearing, levees, draining or filling is only permitted with the consent of the local Council and the concurrence of the Director. SEPP 14 also requires that the Director of the National Parks and Wildlife Service be consulted in relation to an application for these forms of development on affected land.

Thirty six wetlands within the Lake Macquarie LGA are covered by State Environmental Planning Policy No. 14 (SEPP No.14), occupying approximately 775 hectares. EPS is situated on a small section of the foreshore of Lake Macquarie. Eraring Wetland forms part of the EPS site and is gazetted under State Environmental Planning Policy No.14 – SEPP No.14. The wetlands have been affected by ongoing regional development and the inlet canal, which feeds into the EPS.

Eraring Wetland is located to the west of the site and is within a separate catchment to that of the power station therefore there will be minimal impact upon the wetland in accordance with the aims of SEPP 14.

4.3.3 State Environmental Planning Policy 33 – Hazardous and Offensive Development

The aims of SEPP 33 include the amendment of definitions of hazardous and offensive industries where used in environmental planning instruments and to require development consent for hazardous and offensive development.

The document, *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* was prepared by DUAP in 1994 to provide assistance primarily to councils (but also to industry, consultants and other government agencies) in implementing SEPP 33. The Guidelines recommend a 'risk screening' method for determining whether a proposal is hazardous and provides guidance on assessing potentially offensive development proposals.

The Guidelines include thresholds for the storage of dangerous goods, beyond which a Preliminary Hazard Analysis (PHA) is required to be carried out.

The proposed upgrade of the existing facility does not involve the introduction of new dangerous goods to the site, nor an increase in the volume of dangerous goods to be stored on the site. Given the industrial nature of the site and surrounds it is considered that the site remains suitable for the current use, including the proposed upgrade works to the facility and is not hazardous or offensive development under the provisions of SEPP 33.

4.3.4 State Environmental Planning Policy 55 – Remediation of Land

The objectives of SEPP 55 include the promotion of remediation of contaminated land for the purpose of reducing the risk of harm to human health or another aspect of the environment.

Clause 7 of SEPP 55 requires a consent authority to consider whether the land is contaminated, and whether it is suitable (or can be made suitable) for the proposed development. The site is currently used as a power station and the proposed development is for certain upgrade works to existing power station facilities on the site. Given the nature of the existing and proposed uses, the site is considered to be suitable for the proposed development from a contamination perspective.

4.4 State Legislation

4.4.1 Environmental Planning and Assessment Act 1979

The EP&A Act and the EP&A Regulation provide the framework for environmental planning in NSW and include provisions to ensure that proposals which have the potential to impact the environment are subject to detailed assessment, and provide opportunity for public involvement.

As outlined in **Section 1.4** of this EA, approval is required for the proposed project under Part 3A of the EP&A Act, and the proposed project has been declared a major project under the Act. The Minister for Planning is the consent authority for the proposed upgrade works.

Under Part 3A, a proponent can seek a project approval or a concept approval. Concept approvals allow the project to be considered on the basis of a concept plan with the assessment focussing on the strategic issues. The proponent is then able to obtain approval of the concept project prior to undertaking detailed studies of the various components of the project. Further details can be finalised at a later stage as part of a project approval which may follow the concept approval.

In accordance with the provisions of Part 3A of the EP&A Act, EE is seeking project approval for the proposed installation of the EGTG and concept approval for the upgrade and expansion of the ash dam.

4.4.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations (POEO) Act 1997* prohibits any person from causing pollution of waters, or air and provides for penalties for air, water and noise pollution offences. Schedule 1 of the POEO Act identifies “scheduled activities” which are required to be licensed by the DEC (formerly the EPA).

The subject site benefits from an existing environment protection licence (EPL) issued under the POEO Act (Ref. No. 1429) for the generation of electricity from coal (less than 4,000 Gwh) and ancillary activities including chemical storage, coal works and sewage treatment. The licensed premises comprises Eraring Power Station, 3 & 28 Rocky Point Road and 45 Point Piper Road, Eraring. A copy of this licence is attached at **Appendix B**.

The proposed works comprise an upgrade and expansion of the existing ash disposal facility on the site and the installation of an EGTG. These works are ancillary to the power station and are for the purposes of electricity generation. A variation to this licence under Section 58 of the POEO Act may be required.

4.4.3 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) governs the establishment, preservation and management of national parks, historic sites and certain other areas, and the protection of certain fauna, native plants and Aboriginal relics.

The NP&W Act is relevant to the protection of Aboriginal artefacts and the protection of native flora and fauna. Section 86 of the NP&W Act identifies offences relating to Aboriginal objects, including disturbing land to discover an artefact. Section 87(1) of the NP&W Act requires a permit to be obtained to remove any artefacts, while section 90 (2) of the NP&W Act requires consent from the Director General of DEC to knowingly destroy, deface or damage a relic or Aboriginal place.

An assessment of the impact of the proposed EPS upgrade works on Indigenous Archaeology is included in **Section 7.4** of this EA. This assessment concluded that there are unlikely to be significant impacts on recorded Aboriginal sites. As the proposal is to be assessed under Part 3A of the EP&A Act, it is exempt from the need for a section 87 or section 90 Permit.

4.4.4 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act* (TSC Act) provides for the conservation of threatened species, populations and ecological communities of animals and plants. This is achieved by the following:

- conserving biological diversity and promoting ecologically sustainable development;
- preventing extinction and promoting the recovery of threatened species, populations and ecological communities;
- protecting critical habitat of threatened species, populations and ecological communities;
- eliminating or managing certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities; and
- encouraging the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The TSC Act provides a framework to ensure that the impact of any action affecting threatened species is assessed. Schedule 1 of the TSC Act lists endangered species, populations and ecological communities, Schedule 2 lists vulnerable species and Schedule 3 lists key threatening processes. Part 3 of the TSC Act defines critical habitat.

The impact of the proposal on threatened species is discussed in **Section 7.2** and **Appendix C** of this EA. The assessment concludes that no threatened species would be adversely affected as a result of the proposed project.

4.4.5 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) was assented to on 11 December 2003 and the accompanying regulations commenced on 1 December 2005.

The *NV Act* establishes the following objectives:

> *(a) to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, and*
>
> *(b) to prevent broadscale clearing unless it improves or maintains environmental outcomes, and*
>
> *(c) to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation, and*
>
> *(d) to improve the condition of existing native vegetation, particularly where it has high conservation value, and*
>
> *(e) to encourage the revegetation of land, the rehabilitation of land, with appropriate native vegetation,*
>
> *in accordance with the principles of ecologically sustainable development.*

Part 3 of the NV Act restricts clearing of native vegetation except in accordance with a development consent granted in accordance with the NV Act or a property vegetation plan. However, the Act permits the clearing of vegetation without development consent or a property vegetation plan in the following circumstances:

- where native vegetation is regrowth, but not protected regrowth, as defined in the NV Act;
- where native vegetation is only groundcover if the vegetation comprises less than 50% of indigenous species of vegetation, and not less than 10% of the area is covered with vegetation (whether dead or alive).

Section 25 of the NV Act provides legislative exclusions from the Act for clearing in the following instances applicable to the EE project:

- any clearing of land which is subject to the provisions of State Environmental Planning Policy 44 – Koala Habitat Protection.
- any clearing that is a project under Part 3A of the EP&A Act and for which approval has been granted under that Act.

Accordingly, as the project has been declared by the Minister as a project under Part 3A of the EP&A Act, the provisions of the NV Act do not apply to the proposal.

4.4.6 Heritage Act 1977 (As Amended 1998)

The purpose of the *Heritage Act 1977* (as amended 1998) is to protect and conserve non-Aboriginal cultural heritage, including scheduled heritage items, sites and relics. The Heritage Act is administered by the NSW Heritage Office.

The Heritage Act makes provision for a place, building, work, relic, moveable object, precinct, or land to be listed on the State Heritage Register. If an item is subject of an interim listing, or is listed on the State Heritage Register, a person must obtain approval under section 58 of the Heritage Act for the following works or activities:

- demolition of the building or work;
- damaging or despoiling the place, precinct or land, or any part thereof;
- moving, damaging or destroying the relic or moveable object;
- excavating any land for the purpose of exposing or moving the relic;
- carrying out any development in relation to the land on which the building, work or relic is situated, the land that comprises the place, or land within the precinct;
- altering the building, work, relic or moveable object;
- displaying any notice or advertisement on the place, building, work, relic, moveable object or land, or in the precinct;
- damaging or destroying any tree or other vegetation on or remove any tree or other vegetation from the place, precinct or land.

There are no known items of heritage significance under the Heritage Act on the site subject of the proposed works.

As the project falls under Part 3A of the EP&A Act, any approvals required under Part 4 of the Heritage Act do not apply to the project.

4.5 Commonwealth Matters

4.5.1 Environment Protection and Biodiversity Conservation Act, 1999

The Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act, 1999* requires the approval of the Commonwealth Minister for the Environment and Heritage for actions that may have a significant impact on matters of National Environmental Significance (NES). Approval from the Commonwealth is in addition to any approvals under NSW legislation.

As of 1 January 2004 the EPBC Act also provides for the identification, conservation and protection of places of national heritage significance and provides for the management of Commonwealth heritage places and establishes the Australian Heritage Council.

4.5.2 Matters of National Environmental Significance

The EPBC Act lists seven matters of NES which must be addressed when assessing the impacts of a proposal. A search of the EPBC Protected Matters database was undertaken on 9 December 2005 and is included as **Appendix F** to this EA. An assessment of how the proposal may impact on matters of NES is provided below:

***World Heritage Properties*:** There are no world heritage properties proximate to the proposed development, or that would potentially be affected by the proposal.

National Heritage Places: There are no National heritage properties proximate to the proposed development, or that would potentially be affected by the proposal.

***Wetlands of International Importance*:** The proposal is not expected to have an impact on a Ramsar Wetland.

***Commonwealth-listed Threatened Species*:** The proposal has the potential to impact on certain threatened species listed within Commonwealth legislation. Environmental safeguards

have been proposed to minimise the potential impacts and are outlined in **Section 7.2**. The residual impact is not considered to be significant.

Commonwealth-listed Migratory Species: The proposal is not expected to have an impact on listed migratory species.

Nuclear Action: The proposal would not involve a nuclear action as defined under the EPBC Act 1999.

Commonwealth Marine Areas: There are no Commonwealth marine areas proximate to the proposed development, or that would potentially be affected by the proposal.

Commonwealth Land: The proposed development site is not Commonwealth land, nor would any Commonwealth land likely be affected by the proposal.

Given that the proposal would not have a significant impact on matters of NES, the EPBC Act is not triggered and approval from the Commonwealth Minister for the Environment and Heritage is not required.

5 CONSULTATION AND IDENTIFICATION OF ISSUES

5.1 Formal Procedures for Consultation

5.1.1 New South Wales Formal Procedures

This EA has been prepared in accordance with Part 3A of the EP&A Act and its Regulation. Part 3A of the EP&A Act ensures that the potential environmental effects of a proposal are properly assessed and considered in the decision making process.

In preparing this EA, the requirements of the Director General have been addressed as required by Clause 75F of the EP&A Act. Each of the matters raised by the Director General for consideration in the EA is outlined in **Table 5-1,** together with the relevant section of the EA which addresses that matter. A copy of the Environmental Assessment Requirements issued by the Director-General is provided in **Appendix A**.

Table 5-1: Director-General's Requirements

Matter	Reference in EA
General Requirements	
The EA must include:	
• An executive summary;	Executive Summary
• A description of the proposal, including construction, operation and staging;	Section 3
• Details of the location of the project and environmental planning provisions applicable to the site and the project;	Sections 1.2, 2.1 & 4
• Consideration of alternatives to the project;	Section 3.2
• An assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below;	Section 7
• Proposed mitigation/management measures of residual environmental impacts;	Section 7
• Justification for undertaking the project with consideration of the benefits/impacts of the proposal, and proposed management/mitigation/monitoring;	Section 10
• A draft Statement of Commitments for environmental mitigation, management and monitoring for the project; and	Section 8
• Certification by the author of the Environment Assessment that the information contained in the Assessment is neither false nor misleading.	Certificate at front of EA
Air Quality Impacts	
• An assessment of the air quality implications of the project, particularly in relation to petrochemical smog formation, dust and odour during the construction and operational phases of the development and proposed management measures.	Section 7.1

Matter	Reference in EA
• In relation to the gas turbine, the assessment must also assess local, regional, interregional and cumulative air quality impacts.	Section 7.1
• The air quality assessment must assess relevant parameters and air pollutants in accordance with *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2000) and the draft policy *Assessment and Management of Odour from Stationary Sources in NSW* (EPA, 2001).	Section 7.1
Ash Waste Disposal	
• Outline of the scope of the ash disposal process and any proposed development options, details of any proposed staged implementation of the disposal option, scale of the disposal area, the proposed ash process, the anticipated quantity to be disposed and consideration of options for developing and expanding the beneficial reuse of power station ash as an alternative to land disposal.	Section 3.5
Noise and Vibration	
• An assessment of the predicted noise impacts resulting from the operation of the project and the measures to manage any noise impacts and proposed management measures.	Section 7.3
• The assessment must extend to noise emissions from traffic associated with the project and must identify all noise sources from the project and specify times of operation for all noise producing activities.	Section 7.3
Ecological Impacts	
• An assessment of ecological impact as a result of the proposed development including a description of the type of vegetation in the immediate and surrounding area, an outline of the level of vegetation to be cleared, measures to minimise any impacts such as level of clearing required and any rehabilitation proposed.	Section 7.2
• The assessment must also assess the potential impacts of the proposal on both terrestrial and aquatic critical habitats; threatened species, populations or ecological communities, or their habitats in accordance with section 5A of the *Environmental Planning and Assessment Act 1979.*	Section 7.2
Heritage	
• An assessment of the heritage impact of the development, the site and surrounds, including identification of all areas of archaeological potential as well as the significance and any potential impact on all indigenous, non-indigenous and natural heritage items, draft items and elements of historic/heritage significance (i.e. elements not specifically identified as individual items) on the site.	Section 7.4, Section 7.6
Soil and Water	
• An assessment of the water and soil quality impacts associated with the development, taking into account surface water, stormwater and groundwater.	Section 7.5

Matter	Reference in EA
• Assessment must include an assessment of the potential works within or adjacent to the waterways (including Lake Macquarie) present at the site and the long-term management of these aquatic and riparian ecosystems during site operations.	Section 7.5
• The assessment must also have consideration to the potential impacts on the flooding regime in the locality.	Section 7.5
General Environmental Risk Analysis	
• An environmental risk analysis to identify potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures.	Sections 6 & 9
• An appropriately detailed impact assessment of any additional key environmental impacts identified through the risk analysis.	Section 7
Environmental Planning Instruments	
• An assessment against the relevant heads of consideration in applicable environmental planning instruments, including *State Environmental Planning Policy No. 14 – Coastal Wetlands, State Environmental Planning Policy No. 33 – Hazardous and Offensive Development, State Environmental Planning Policy No. 55 – Remediation of Land, Hunter Regional Environmental Plan 1989 and Lake Macquarie Local Environmental Management Plan 2004.*	Section 4
Other Matters	
• All relevant matters raised in the Brief for the Planning Focus Meeting and at the Planning Focus Meeting of 30 September 2005.	Sections 1, 2, 3, 6 and 7
Consultation	
Consult with the following parties: • NSW Department of Environment and Conservation; • Lake Macquarie Council; • Department of Lands; • Department of Natural Resources; and • Affected residents and relevant community groups.	Section 5

In addition to the above, the EA must include the general requirements for projects under Part 3A of the EP&A Act, as outlined in **Table 5-2** below.

Table 5-2: Statutory Requirements for EA (Including EP&A Regulation Clause 51 Matters)

Requirement	Reference in EA
Executive Summary	Executive Summary
Description of the proposal, including construction, operation and staging	Section 3
Details of the location of the project and environmental planning provisions applicable to the site and the project	Sections 2 & 4
Consideration of Alternatives	Section 3.2
An assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below	Section 7
Proposed mitigation/ management measures of residual environmental impacts	Section 7
Justification for undertaking the project with consideration of the benefits/ impacts of the proposal, and proposed management/ mitigation	Section 10
A draft Statement of Commitments for environmental mitigation, management and monitoring for the project	Section 8
Certification by the author of the Environmental Assessment that the information contained in the Assessment is neither false nor misleading	Certificate at front of EA

5.2 Consultation with Stakeholders and Other Relevant Authorities

5.2.1 Planning Focus Meeting

A Planning Focus Meeting (PFM) was held at Eraring Power Station on 30 September 2005 in order to introduce members of the study team to the statutory and other relevant authorities, and to provide an outline of the project and an opportunity for the regulatory authority representatives to undertake a site visit.

Representatives from the following organisations attended the PFM:

- Department of Planning (DoP); and
- Department of Environment and Conservation (DEC).

5.2.2 Statutory and other relevant authorities

The proposed project is classed as a 'major project' as discussed in **Section 1.4.** As such, written comments from relevant statutory agencies were requested by DoP. In addition, HLA, on behalf of EE, consulted the Department of Natural Resources (DNR), the Department of Lands and Lake Macquarie City Council by letter dated 22 December 2005, requesting any specific requirements for the EA or comments on the proposal. **Table 5-3** below summarises the responses with the full responses provided as **Appendix G** to this EA.

Table 5-3: Government Agency Requirements and EA Reference

Requirement	Reference in EA
Department of Environment and Conservation	
• A comprehensive assessment of air emissions including the contribution of emissions to photochemical smog formation. Please indicate the type(s) of fuel on which the assessment is based and approval is sought.	Sections 7.1 and 3.4
• An assessment of local, regional, interregional and cumulative air quality impacts from the plant.	Section 7.1
• A noise impact assessment in accordance with the NSW Industrial Noise Policy.	Section 7.3
• A review of options for developing and expanding the beneficial reuse of power station ash as an alternative to land disposal.	Section 3.2
• Justification for the proposed ash disposal site to include a review of alternative sites within the existing ash dam catchment area that do not require removal of native vegetation. For example, by constructing the disposal cells on ash already deposited at the eastern end of the ash dam.	Section 3.2
• An assessment of water quality issues associated with the proposed disposal option including any change in the volume of the discharge and the concentration of selenium and other pollutants to Lake Macquarie.	Section 7.5 (Further water quality assessment to be undertaken in respect of the ash dam expansion prior to the granting of project approval).
• Identify the potential for dust generation and provide details of the proposed control measures. Include an assessment of the impact of ash disposal on local air quality, PM_{10} and total suspended solids.	Section 7.1 (Further assessment of dust generation to be undertaken in respect of the ash dam expansion prior to the granting of project approval)
• A flora and fauna impact assessment of the site.	Section 7.2 and Appendix C.
• An Aboriginal cultural heritage assessment of the site.	Section 7.4 and Appendix F.
Department of Natural Resources	
• No legislation administered by the Department of Natural Resources applies to the proposed project, therefore the Department submits no requirements for the EA.	N/A.
Department of Lands	
• With regard to the use or occupation of Crown lands for any purpose associated with the proposed works, the Department of Lands requires that such use of the Crown land is authorised by grant of appropriate tenure prior to any use commencing.	Section 2.3

Requirement	Reference in EA
• While Crown land remains affected, the following issues are required to be addressed: Native Title interests, Aboriginal Land Claims, Land Assessment and owner's consent for the lodgement of a development application.	Section 7.4 Owners consent letter attached as Appendix H.
• A definitive list of affected land (site identification) including Crown land based on a formal status search obtained from the Department's Maitland office following the provision of a detailed location of the proposed works should be provided.	Section 2.2
• Items as specified in Schedule 2 of the EP&A Regulation 2000 should be addressed.	Sections 3, 7, 8 and 9
• Potential impacts of the construction, existence and operation of the works including maintenance of any pipelines on Crown land generally and specifically fire trails or the maintenance thereof should be addressed.	Section 7 (Note: Details of pipelines associated with gas supply would be provided in a separate application)
• Details of mitigation of adverse impacts and access management particularly during construction but also for future maintenance of the works.	Section 7
• Details of stakeholder and public consultation.	Section 5
Lake Macquarie City Council	
• The northward extent of the proposed ash dam works appears to encompass areas zoned 9 – Natural Resources in the Lake Macquarie Local Environmental Plan 2004. The objectives of this zone should be considered.	Section 4.1.1
• Details of the property description and ownership of the land to the north of the ash dam should be provided.	Section 2.2
• The presence of listed endangered ecological communities or regionally significant vegetation communities should be reviewed having regard to the regional vegetation communities mapped by REMS 2003.	Section 7.2 & Appendix E
• Consideration should be given to the provision of compensatory habitat in relation to any clearing associated with the proposal. This should include quantification of the extent of habitat lost and areas of land that can be protected or rehabilitated to compensate for this within a reasonable time frame.	Section 7.2.3, 7.2.4
• The implications of the Native Vegetation Act 2003 for this development that should be reviewed as part of the environmental assessment.	Section 4.4.4
• Further details of EPBC issues should be included in the assessment.	Section 4.5.1
• Flora and Fauna surveys should be undertaken having regard to the *Lake Macquarie Flora and Fauna Survey Guidelines* (July 2001) and the *Lake Macquarie Tetratheca juncea Management Plan* (as amended July 2001).	Section 7.2 & Appendix E

Requirement	Reference in EA
• The regional biodiversity context and habitat connectivity (corridor) implications of the proposed development should be adequately evaluated and documented.	Section 7.2 & Appendix E
• The land management plan for the site should be updated to take into account the proposed development, and a draft of the updated document should be included with the environmental assessment, together with a report on the evaluation of the implementation of the current plan.	Commitment 8, Section 8.2 (Note: The updated land management plan would be provided at project approval stage)
• The impacts of the proposed ash dam extension on the frequency and nature of off-site disharges should be addressed, as well as the impacts of such off-site discharges on receiving waters. In particular, the ecological impacts on the Whiteheads Lagoon and Lake Macquarie associated with altered water quality or quantity.	Commitment 14, Section 8.2 (Note: Further hydrological studies to be undertaken at project approval stage).
• The issue of selenium levels in Lake Macquarie associated with power station operations and other sources should be addressed, with particular attention to the ecological impacts of increased selenium loads as well as any public health issues related to seafood consumption.	Section 3.2.1
• The impacts of the proposed EGTG on greenhouse gas emissions and climate change should be considered (particularly in the context of the emissions goal described in the *Lake Macquarie Greenhouse Action Plan 2004)*.	Section 10.3
• Any loss of visual amenity associated with the proposed ash dam expansion should be addressed.	Section 7.6
• The potential impacts related to the increased capacity of the ash dam should be considered with respect to the stability of the dam wall, especially in relation to an extreme rainfall event.	Commitment 14, Section 8.2 (Note: Further hydrological studies to be undertaken at project approval stage).
• The long-term rehabilitation and land-use of the ash dam facilities should be considered within the scope of the EA. This is of particular significance in reference to the zone objectives (especially objective e) of the areas within the 9 Natural Resources Zone.	Commitment 7, Section 8.2 (Note: A rehabilitation plan shall be prepared at project approval stage).

In addition, the Cultural Heritage Assessment undertaken as part of this EA involved consultation with Koompahtoo Local Aboriginal Land Council, Wonnarua Nation Aboriginal Corporation (WNAC) (which administers an Aboriginal Land Use Agreement in the study area) and their partners, Yarrawalk Aboriginal Corporation. Results of this consultation are summarised in the Aboriginal Cultural Heritage Assessment discussed in **Section 7.4** of this EA.

5.2.3 Community Consultation

In 2003, the EPS community forum was established to provide a means of communication between the power station and local community representatives. The community forum meets quarterly and consists of members of local community groups and EE staff.

At the community forum meetings of 17 August 2005 and 2 November 2005 the proposed ash dam expansion project was presented to the members in attendance including:

Table 5-4: Attendees - Community Forum Meeting 17 August 2005, 2 November 2005

Organisation	Representative
Dora Creek Catchment Group & CCEN Inc	Jenny Windibank
Native Animal Trust Fund	Audrey Koosmen
Coal Point Progress Association & Landcare	Audrey Diggins
Royal Volunteer Coastal Patrol	Margaret Teal
Fishcare	Graham Clarke
Lake Macquarie Landcare Resource Office	John Hughson
Morisset and District Landcare Group	Helen Gould
Hunter Bird Observers Club	Anthony Gooden
Eraring Residents Association	Dennis Lyons
URGE of Lake Macquarie	Sandy McDonald
National Seniors Westlake	Marion Lamb
Southlake Landcare Group	Jim Lamb
Lake Macquarie Landcare Inc	Graham Whitelaw
Lake Macquarie Fish Management Advisory Group	Alan Keft
Southlake Community Alliance	Kathy Mannile, Andrew Waters
Lake Macquarie Combined Fishing Clubs	Allen Stothard
Southlake Neighbourhood Centre Inc.	Karen Lizasoain, Vivienne Bruce
Responsible Fishing Association & Turtle Watch Committee	Alison Dunne
Scouts Australia	Dallas Lock
Good Question Consulting (Facilitator)	Rosalie Amey

The meetings provided the community groups with opportunity to make comment. The issues raised at the meeting of 17 August were then followed up at the meeting of 2 November 2005.

Table 5-5 outlines the issues raised by the community in relation to the ash dam project along with their reference in the EA:

Table 5-5: Issues Raised by Community

Issue	Reference in EA
• Further information on the reuse and recycling of fly ash.	Section 3.2.1
• Aboriginal consultation	Section 7.4.2
• Impact upon fauna in the area	Section 7.2
• Water impacts	Section 7.5
• Timing and Process	Section 1.4 and Section 3

6 ENVIRONMENTAL RISK ANALYSIS

6.1 Issues Identification

6.1.1 Methodology

Consultation with the statutory authorities together with an environmental scoping assessment assisted the identification of issues relating to the project.

6.1.2 The Issues

The key issues identified by the statutory authorities and the community through the Director General's Requirements and other consultations are listed in **Table 6-1**.

Table 6-1: Issues Identified by Statutory Authorities and Community

Aspect	Issue
Environment	Air quality Ecological impacts Noise and vibration Indigenous Heritage Soil and water
Social	Hazards and Risk
Project	Ash waste disposal – description and alternatives

6.2 Potential Environmental Risk

6.2.1 Approach

The assessment of issues for the proposed project is based on the need to recognise that the higher the potential severity of adverse environmental effects and the greater the consequence of those unmanaged effects, the higher the degree of environmental assessment required.

Where a high potential risk was identified, the attribute or issue was allocated a higher priority for assessment.

Table 6-2 provides the Risk Identification Matrix upon which the potential environmental risk identification has been based. This method assesses risk on the basis of the potential severity of environmental effects and the likely consequences of those potential effects if unmanaged. The potential severity and consequence of the environmental effect are each given a numerical value between 1 and 3. The numbers are added together to provide a result which is then ranked and shaded in the matrix by the potential level of risk being High, Medium or Low.

The allocation of risk is based upon the following considerations:

Severity of Risk

Low: localised implications; imperceptible or short term cumulative impacts.

Medium: regional implications; modest or medium term cumulation of impacts.

High: inter-regional implications; serious or long term cumulation of impacts.

Consequences of Unmanaged Effects

Low: minor environmental change; offsets readily available.

Medium: moderate adverse environmental change; offsets available.

High: important adverse environmental change, offsets not readily available.

Table 6-2: Risk Identification Matrix

Severity of Effects	Consequence of Unmanaged Effects		
	3 High	2 Medium	1 Low
1 Low	**4 (Medium)**	**3 (Low)**	**2 (Low)**
2 Medium	**5 (High)**	**4 (Medium)**	**3 (Low)**
3 High	**6 (High)**	**5 (High)**	**4 (Medium)**

6.2.2 Risk Identification Assessment

The assessment of potential environmental risk for each of the identified issues related to the proposed project is shown in **Tables 6-3 and 6-4**. This assessment aims to allow the prioritisation of issues for assessment and does not consider the application of mitigation measures to manage environmental effects.

Table 6-3: Environmental Risk Analysis – Proposed EGTG

Potential Risk	Severity	Consequence	Risk*
Aspect: Air Quality			
• Emissions to the atmosphere with the potential to result in some degradation of air quality in the local area.	2	2	**4**
• Release of greenhouse gases resulting in potential contribution to the greenhouse effect. (Note: Contribution would be relatively insignificant).	2	2	**4**
• Community concern regarding degradation of air quality and contribution to greenhouse effect.	2	2	**4**

Potential Risk	Severity	Consequence	Risk*
• Temporary degradation of local air quality during construction period.	1	1	**2**
Aspect: Ecological Impacts			
• Indirect ecological impacts due to emissions, noise and potential water pollution.	1	1	**2**
Aspect: Noise and Vibration			
• Temporary noise nuisance to local residents during construction.	1	1	**2**
• Noise nuisance to local residents during operation.	1	1	**2**
Aspect: Heritage			
• Damage or removal of Aboriginal artefacts or places.	1	2	**3**
• Detrimental impact upon items of non-indigenous heritage significance.	1	1	**2**
Aspect: Soil and Water			
• Erosion and sedimentation during construction.	1	1	**2**
• Degradation of water quality in the local area.	2	2	**4**

Table 6-4: Risk Identification – Proposed Ash Dam Expansion

Potential Risk	Severity	Consequence	Risk
Aspect: Air Quality			
• Potential degradation of air quality due to dust.	2	1	**3**
• Temporary degradation of local air quality during construction period.	1	1	**2**
Aspect: Ecological Impacts			
• Loss of habitat due to clearing and development.	3	3	**6**
• Reduction in biodiversity due to loss of habitat for native species.	2	3	**5**
• Spread of weeds and feral animals.	2	2	**4**
• Detrimental impact on surrounding bushland due to edge effects.	2	2	**4**
• Impact upon threatened species.	3	3	**6**
• Community concern regarding clearing of land.	3	2	**5**
Aspect: Noise and Vibration			
• Temporary noise nuisance to local residents during construction.	1	1	**2**

Potential Risk	Severity	Consequence	Risk
• Noise nuisance to local residents during operation.	1	1	**2**
Aspect: Heritage			
• Damage or removal of Aboriginal artefacts or places.	1	2	**3**
• Detrimental impact upon items of non-indigenous heritage significance.	1	1	**2**
Aspect: Soil and Water			
• Erosion and sedimentation.	2	2	**4**
• Degradation of water quality in the local area.	2	2	**4**

Tables 6-3 and 6-4 Identify that the prioritisation of environmental issues and therefore the focus of environmental assessment for the proposed project should be as follows:

- High – Ecological issues associated with the proposed ash dam expansion.
- Medium – Air quality issues associated with the EGTG and soil and water issues associated with the ash dam expansion.
- Low – Noise and vibration, heritage.

7 ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Air Quality

7.1.1 Risk

The operation of the expanded ash disposal facility is not expected to generate further air emissions than the existing facility. Expected emissions from the EGTG would be of a similar nature to the emissions from the existing EPS, however of a much lower volume and would include NO_x, SO_x, particulates, CH_4, etc.

There will be an increase in emissions as a result of the installation of the EGTG and certain temporary air quality impacts during the construction period of both the EGTG and the expanded ash disposal facility. However, of greatest significance in relation to air quality impacts is the perceived impact rather than the actual impact. It is anticipated that the community may be concerned about a potential for increased emissions in the local area as well as a perceived greenhouse impact due to the burning of gas and distillate fuel. As such, air quality was considered to be an issue for the project which required a detailed assessment to identify appropriate mitigation measures and alleviate community concerns.

An Air Quality Impact Assessment (AQIA) was therefore conducted as part of the EA to determine the nature and extent of impacts. The proposed EGTG is dual fuelled, using distillate or gas. The emission factors for both fuels were considered to establish the worst-case scenario for emissions, to guide the scope of the air quality assessment. **Table 7-1** below provides the emissions data for both distillate and gas fuel, obtained from the manufacturers specifications for the EGTG.

Table 7-1: Emissions – Distillate vs Gas Fuel

Emission	Gas	Distillate
NOx (ppmvd@ 15% O_2)	42	42
NOx as NO_2 (lb/hr)	81	87
CO (ppmvd)	10	20
CO (lb/hr)	10	20
UHC (ppmvw)	7	7
UHC (lb/hr)	5	5
Particulates (lb/hr)	3	10

The table above shows that the worst-case scenario for emissions from the EGTG would be when using distillate fuel. Therefore, the air quality assessment considered only distillate fuel, as it can reasonably be assumed that emissions using gas fuel would be lower and therefore the potential impacts of the EGTG in relation to air quality would be less.

The full air quality report is included as **Appendix I** to this EA.

7.1.2 Existing Environment

EPS is surrounded by predominantly undeveloped bushland, which serves as a buffer zone between EPS and surrounding residential developments. A number of coalmines are located close to the power station to the north (Awaba Colliery), east (Myuna Colliery) and west (Cooranbong Colliery).

The closest residential centres are Dora Creek (approximately 2 km to the south-west), Wangi Wangi and Arcadia Vale (approximately 5 km to the east) and Awaba and Toronto (approximately 5km and 6 km to the north and north-east respectively).

EE monitors a variety of pollutants at two locations in accordance with its Environment Protection Licence (EPL1429). These are situated to the south of the EPS in Dora Creek (monitors situated in the bowling club off Minnie Street, Dora Creek) and Marks Point (monitors situated in the grounds of the Marks Point Public School).

Pollutants monitored at these two locations are as follows:

- Oxides of Nitrogen;
- Sulfur Dioxide; and
- Meteorological Parameters (wind speed, wind direction and sigma theta at Dora Creek and wind speed, wind direction, sigma theta, ambient temperature and relative humidity at Marks Point).

A summary of data collected between January 2003 and December 2004 (two most recent full calendar years) is shown as **Table 7-2**.

Table 7-2: Monitoring Data Summary for Marks Point and Dora Creek

Location	Year	SO_2 (g/m^3)*			NO_2 (g/m^3)*
		10 Min**	1 Hour**	24 Hour**	1 Hour**
Dora Creek	2003	259.4	151.4	19.5	51.9
	2004	288.2	165.4	30.9	95.2
Marks Point	2003	199.1	164.5	19.1	97.1
	2004	230.3	173.7	37.9	87.7
Criteria		712	570	228	246

* Concentrations calculated at 25^{o}C from directly measured pphm concentration

** All data are maximum concentrations calculated from 10 minute average monitoring data

No background data was available for PM_{10} or VOC.

Results for the monitoring program performed by EE indicate the following:

- Maximum background SO_2 concentrations calculated for Dora Creek and Marks Point are 288μg/m^3, 174μg/m^3 and 38μg/m^3 (10 minute, 1 hour and 24 hour averages respectively). All maximum concentrations comply with DEC assessment criteria of 712μg/m^3, 570μg/m^3 and 228μg/m^3 for 10 minute, 1 hour and 24 hour averages respectively.
- Maximum background NO_2 concentration calculated for Dora Creek and Marks Point was 97μg/m^3 (1 hour average). The maximum NO_2 concentration complies with assessment criteria of 246μg/m^3.

The highest background concentrations detailed above have been utilised for this study to ensure the assessment considers the worst possible potential pollutant ground level concentration. Only short term averaging results have been utilised for this study.

7.1.3 Potential Impacts

The pollutants of concern for this dispersion modelling investigation were based on pollutant emissions data sourced from the National Pollutant Inventory (NPI) publication Emission Estimation Technique Manual (EETM) for Combustion Engines (version 2.3, Oct 2003). Table 2 of the NPi EETM for combustion engines lists predicted pollutants from different engine types. The engine selected as representative of the EGTG was the diesel and natural gas – dual fired (>450kW) engine. The pollutants predicted for this type of engine are as follows:

- Carbon Monoxide (CO);
- Oxides of Nitrogen (NO_X);
- Particulate Matter less than 10 microns (PM_{10});
- Sulfur Dioxide (SO_2); and
- Volatile Organic Compounds (VOCs)

Emission data for the above pollutants has been sourced from two locations. Data for CO and NO_X has been sourced from manufacturer specifications and the remaining pollutant data sourced from published emission factors detailed in the above NPi publication.

One emission source has been assumed for the EGTG operating in accordance with the following:

- Operated for 30 hours per month for summer and winter months (peak loads)
- Operated for up to 3 hours per month for autumn and spring months (off-peak loads)

Tables 7-3 and 7-4 detail the Emissions Inventory used for the modelling scenario.

Table 7-3: EGTG Source Characteristics

Characteristic	Stack ID	Units
Stack Height	15	m
Velocity*	37.9	m/s
Stack Diameter	3.4**	m
Volumetric Flow Rate*	341.1***	m^3/s
Stack Temp*	546	^oC

* Assumed to be Stack Conditions

** (equivalent diameter calculated from stack X-sectional area)

*** Rounding errors result in slight variance in calculated volumetric flow rate from velocity and diameter estimates

Table 7-4: Pollutant Emission Data

Compound	Main Emission Stack		
	mg/m^3	g/s	Emission Data Source
Oxides of Nitrogen	44	15.2	Manufacturer specification
Carbon Monoxide	8	2.8	Manufacturer specification
Sulfur Dioxide*	8.4	2.8**	National Pollutant Inventory
PM_{10} Particulates	16.5	5.6**	National Pollutant Inventory
Volatile Organic Compounds	13.3	4.5**	National Pollutant Inventory

* Sulfur dioxide concentration calculated assuming 500ppm sulfur content in distillate fuel

** Fuel usage of 12335 L/hr used to calculate SO_2, PM_{10} and VOC emissions

A computational dispersion model was used to determine the potential impacts of the proposed EGTG operations on the surrounding environment. The model used was the AUSPLUME (v6.0) dispersion model developed by Victorian EPA for regulatory assessment of projects that emit air pollutants. Details of the model inputs and model justification have been summarised in the air quality assessment report included as **Appendix I** to this EA.

Sensitive Receptors

DEC defines a sensitive receptor as a location where people are likely to work or reside. This may include a dwelling, school, hospital, office or public recreational area. An air quality impact assessment also needs to consider the location of known or likely future sensitive receptors.

The EPS is situated in an area surrounded by pockets of residential development and large scale industrial development (predominantly coal mines). To allow an assessment of the potential impact of the operation of the EGTG on the surrounding receptors, discrete receptors have been placed at various locations surrounding the location of the proposed EGTG. The receptor locations are shown in **Figure 7** and a list of the receptor locations shown below in **Table 7-5**.

Table 7-5: Sensitive Receptor Locations

Receptor Number	Receptor Location
1	Bowling Club, off Gardiner Street, Dora Creek
2	Corner of Gradwells Road and Greenway Street, Dora Creek
3	Corner Awaba Road and Border Street, Eraring
4	Gradwells Road Dora Creek
5	Border Street, Eraring
6	Cross Street, Eraring
7	Corner of Rocky Point Road and Wangi Road off ramp, Eraring
8	Myuna Bay Sport and Recreation Area, Myuna Bay

Receptor Number	Receptor Location
9	Corner of Summerhill Drive and Wangi Road, Myuna Bay
10	Corner of Buttaba Hills Road and Wangi Road, Buttaba

Modelling Results

Dispersion modelling results have been summarised in terms of both the maximum ground level pollutant concentrations predicted by the dispersion model at all points surrounding the facility within the receptor grid (10 km by 7 km grid with the plant located approximately in the centre of the grid) and the concentrations at the sensitive receptors defined above. Predicted increases in pollutant concentrations are detailed below in **Table 7-6** with cumulative concentrations shown in **Table 7-6**.

Table 7-6: Predicted increase in pollutant concentrations at sensitive receptor locations

Receptor No.	SO_2			NO_2	PM_{10}	CO		
	10 Min	1 Hour	24 Hour	1 Hour	1 Hour	15 Min	1 Hour	8 Hour
Units	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	mg/m^3	mg/m^3
Maximum*	3.0	2.1	0.6	11.6	1.1	0.0028	0.0021	0.0013
1	0.7	0.5	0.1	2.5	0.3	0.0006	0.0005	0.0002
2	0.8	0.6	0.2	3.1	0.4	0.0007	0.0006	0.0003
3	0.7	0.5	0.2	2.8	0.4	0.0007	0.0005	0.0003
4	0.7	0.5	0.2	2.9	0.4	0.0007	0.0005	0.0003
5	0.7	0.5	0.1	2.9	0.2	0.0007	0.0005	0.0002
6	1.4	1.1	0.2	5.7	0.4	0.0013	0.0011	0.0004
7	0.8	0.8	0.2	4.5	0.5	0.0011	0.0008	0.0004
8	0.7	0.5	0.3	2.6	0.5	0.0006	0.0005	0.0004
9	1.3	0.9	0.4	5.1	0.9	0.0012	0.0009	0.0007
10	1.1	0.8	0.3	4.4	0.6	0.0011	0.0008	0.0006
% Increase**	0.4	0.4	0.2	4.7	2.2	0.003	0.007	0.013
Criteria	**712**	**570**	**228**	**246**	**50**	**100**	**30**	**10**

All units are in $\mu g/m^3$ with the exception of Carbon Monoxide (CO) which is expressed as mg/m^3

* Maximum results are calculated regardless of location

** Percent pollutant increase expressed as a percentage of criteria

Table 7-7: Predicted cumulative pollutant concentrations at sensitive receptor locations

Receptor No.	SO_2			NO_2	PM_{10}	CO		
	10 Min	1 Hour	24 Hour	1 Hour	1 Hour	15 Min	1 Hour	8 Hour
Units	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	mg/m^3	mg/m^3
Maximum*	291.2	175.8	38.5	108.7	No cumulative concentrations predicted due to lack of background data			
1	288.9	174.2	38.0	99.6				
2	289.0	174.3	38.1	100.2				
3	288.9	174.2	38.1	99.9				
4	288.9	174.2	38.1	100.0				
5	288.9	174.2	38.0	100.0				
6	289.6	174.8	38.1	102.8				
7	289.0	174.5	38.1	101.6	No cumulative concentrations predicted due to lack of background data			
8	288.9	174.2	38.2	99.7				
9	289.5	174.6	38.3	102.2				
10	289.3	174.5	38.2	101.5				
Criteria	***712***	***570***	***228***	***246***	***50***	***100***	***30***	***10***

Results of the dispersion modelling for the operation of the EGTG indicate that all assessed air quality pollutants when considered in isolation from the background are below DEC assessment criteria. Assessed pollutants under worst case dispersion conditions with the EGTG operating continuously are expected to increase background pollutant concentrations by less than 0.5% of each pollutant criteria for assessed pollutants with the exception of NO_2 and PM_{10} which were both less than 4.7% (e.g. SO_2 maximum addition of 3.0 $\mu g/m^3$ (0.4%) of SO_2 criteria of 712$\mu g/m^3$).

Cumulative pollutant concentrations do not result in exceedence of any of the pollutants for which background data exists (SO_2 and NO_2). The pollutants for which background data does not exist are not expected to pose a problem cumulatively due to the low relative contribution of each of the pollutants (PM_{10} expected to contribute a maximum of 1.1$\mu g/m^3$ and Carbon Monoxide less than 0.0028$\mu g/m^3$ toward the ambient environment).

There is the potential for the met data used in the dispersion modelling to produce dispersion patterns slightly different to those that may be generated using measured data. Analysis of the met data suggests that the actual wind speeds in the vicinity of the EPS are lower than those predicted by TAPM. As this could result in higher ground level concentrations closer to the EPS, this needed to be considered as part of the air quality assessment.

Dispersion patterns show the maximum predicted ground level concentrations occur relatively close to the plant to the east, north and south-west. The highest predicted pollutant concentrations all occur within the EPS boundary or adjacent to the Ash Dam to the north of the EPS and if lower winds resulted in worse dispersion conditions, it would be expected that the worst case impacts would be noted closer to the EPS.

The higher proportion of +4m/s wind noted in the TAPM met file have produced concentrations shown in **Table 16** and **17.** Lower proportions of +4m/s, winds as observed in the Ash Dam met

file, are likely to result in higher pollutant concentrations closer to the emission source, which is within the property boundary and hence not considered to be a significant issue.
The predicted pollutant concentrations are based on continuous operation of the generator for all meteorological conditions over a twelve month period. Whilst it is acknowledged that the EGTG will not operate continuously over twelve months, this modelling methodology is aimed at allowing the prediction of worst-case pollutant concentrations under all meteorological conditions. As the actual operation of the EGTG will be limited to a small number of events during the year, the modelling results are considered to be conservative and provide a worst-case estimation of the pollutant dispersion around EPS.

The proposed expansion of the ash dam will involve disturbance of soils due to the required clearing, however this will occur in a staged manner such that exposed soil is minimised. The placement technique used in dense phase disposal inherently reduces dust emissions in comparison to the lean phase technique therefore there are not expected to be significant air quality impacts arising due to dust.

7.1.4 Environmental Safeguards

Given that the emissions resulting from the proposed EGTG are well below the DEC assessment criteria, there is no need for additional specific environmental safeguards to be implemented, above those built into the design of the EGTG. The introduction of dense phase disposal on the site will, in itself act as a dust control measure as the placement technique used results in a more stable surface, less vulnerable to wind action when compared with lean phase disposal. Dust control measures currently used on the site such as wetting during dry, high wind conditions will be continued to ensure that dust emissions are maintained at an acceptable level.

7.1.5 Residual Impacts

There are no residual impacts of significance in relation to air quality and the proposed EGTG. There will be certain minor, temporary air quality impacts during the construction period and clearing campaigns for the expanded ash dam however, these impacts would be largely on-site and existing management measures which have proven to be effective would be put into place to ensure that potential off-site impacts are minimised.

7.1.6 Conclusion

Dispersion modelling undertaken for the proposed EGTG has demonstrated that under worst-case pollutant emission rates and meteorological conditions, all pollutant concentrations are predicted to be below the DEC assessment criteria for all sensitive receptors surrounding the EPS. Residual air quality impacts associated with dust during construction periods and clearing campaigns are expected to be minimal given the nature of the dense phase ash disposal and the existing dust control measures implemented on the site during times of high risk.

7.2 Flora and Fauna

7.2.1 Risk

The proposed expansion of the ash disposal facility requires the clearing of land which will have subsequent impacts upon flora and fauna. Further, the EASR prepared for the PFM identified certain threatened species. The high concentrate method of ‘dense phase’ disposal minimises the amount of land required for ash disposal, however it was anticipated that there would be both community and agency concern with regard to ecological issues.

Flora and fauna was therefore considered to be an issue for the project, requiring a detailed assessment.

A flora and fauna investigation was undertaken by HLA in July 2005, with further targeted surveys carried out in November 2005. The study area is shown in Figure 8 and specific locations of flora and fauna surveys are shown in Figures 9 and 10. The full flora and fauna report is included as **Appendix E** and the results are summarised below.

7.2.2 Existing Environment

Flora

The study area is part of a woodland buffer area maintained by EE, as well as certain Crown land to the north of this which is to be acquired by EE.

A total of 124 vascular plant species have been recorded within the study area which is broadly described as 'Dry Open Woodland' dominated by Scribbly Gum (*E. haemastoma*), Bloodwood (*Corymbia gummifera*), Smooth-barked Apple (*Angophora costata*) and Brown Stringybark (*E. capitellata*) (Biosis 1999). The canopy was described as between 15 m and 20 m high with an understorey to 2 m. The lower shrub layer is described as dominated by *Banksia sp*., *Persoonia levis*, *Dillwynia retorta* and *Lambertia formosa*. The ground cover species that were considered diagnostic included *Themeda australis*, *Entolasia stricta*, *Ptilothrix deusta*, *Lomandra* sp., *Phyllanthus hirtellus* and *Pratia purpurascens*.

The NPWS (2003) completed broad scale vegetation survey and mapping of remnant vegetation for the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS). The study area is mapped as the Coastal Plains Smooth-barked Apple Woodland vegetation community, with Coastal Plains Scribbly Gum Woodland occurring to the north of the ridgeline that forms the northern boundary of the study area. **Figure 11** shows the extent of vegetation communities in the study area.

The Coastal Plains Smooth-barked Apple Woodland is described as dry shrubby forest, the canopy species dominated by *Angophora costata* and *Corymbia gummifera*, with *Eucalyptus capitellata* co-dominating in places. The mid-shrub understorey is characterised by *Allocasuarina littoralis*, *Banksia spinulosa* and *Acacia mrytifolia*, while *Lambertia formosa* and *Dillwynia retorta* occur less commonly. The ground cover is described as dominated by *Entolasia stricta* and *Themeda australis*. Significant species known to occur within this community include the threatened species *Tetratheca juncea*, *Angophora inopina* and *Macrozamia flexuosa* (ROTAP species).

The community is said to be floristically similar to Coastal Plains Scribbly Gum Woodland, however the canopy is lower and more open with differences in the shrub understorey which include *Banksia spinulosa* being replaced by *Banksia oblongifolia*. The ground cover is similar to the Coastal Plains Scribbly Gum Woodland, however *Ptilothrix deusta* is common. Significant species known to occur within this community include the threatened species *Tetratheca juncea*, *Angophora inopina*, *Acacia bynoeana*, and *Cryptostylis hunteriana*.

A number of species that are protected by the provisions of the Threatened Species Act 1995 (TSC Act), the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), or species that are considered to be ROTAP species have been identified at the site. The species are listed in the table below.

Table 7-8: Flora Protected by the provisions of the TSC Act

Scientific Name	Common	NSW Status	EPBC Status	ROTAP code
Genoplesium despectans? [c]	Sharp Midge Orchid	Unprotected		2K
Acacia bynoeana [b]	Tiny Wattle	Endangered	Vulnerable	3VC-
Callistemon linearifolius [b]		Vulnerable		2RCi
Hakea bakeriana [a,b,c]		Unprotected		
Bossiaea stephensonii		Unprotected		
Pultenaea tuberculata		Unprotected		
Tetratheca juncea [a,b,c]	Black-eyed Susan	Vulnerable	Vulnerable	3VCa

[a] HLA (2004a) [b] HLA (2004b) [c] Biosis (1999)

A review of the DEC on-line Wildlife Atlas (WA) identified a further three vulnerable species that occur within 10 km of the study area being *Angophora inopina*, *Syzygium paniculatum* and *Grevillea parviflora* subsp. *parviflora*. Locations of *tetratheca juncea* and other significant flora species are shown in **Figures 12** and **13**.

Fauna

Field investigations recorded a total of 94 species, including three arboreal mammals and two small ground dwelling mammals that were trapped. A review of the DEC on-line WA identified 41 threatened species that have been recorded within a 20 km x 20 km grid centred on the study area. Many of these species are marine and do not have habitat within the lands managed by EE.

Bush Rats and Brown Antechinuses (*Antechinus stuartii*) were trapped frequently, with the highest densities recorded in places with high canopy cover and dense ground cover. The trapped arboreal mammals were a Ring-tailed Possum, caught in a cage trap baited with chicken, and a Sugar Glider. There were many trees with scarring from feeding glider species, most likely Sugar Gliders, although it is suspected that the threatened Squirrel Glider is present in forest habitat to the west of the study area.

Six threatened species have been recorded during recent biodiversity studies, with the potential for another to occur within the EE management area. These are listed in **Table 7-9** below.

Table 7-9: Threatened vertebrate species recorded within study area

Scientific Name	Common Name	Status TSC
Mormopterus norfolkensis	Eastern Little Mastiff-bat	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Miniopterus australis	Little Bent-wing Bat	Vulnerable
Miniopterus schreibersii	Common Bent-wing Bat	Vulnerable
Myotis macropus	Large-footed Mouse-eared Bat	Vulnerable
Petaurus norfolcensis	Squirrel Glider	Vulnerable

During the Biosis (1999) survey the vulnerable Powerful Owl (*Ninox strenua*) was detected in woodland south of the ash dam and there is no reason why the species would not occur in other large areas of woodland that support a significant population of arboreal mammals. Other threatened species recorded during the Biosis (1999) survey included the Eastern Free-tailed Bat (*Mormopterus norfolkensis*), Common Bent-wing Bat (*Miniopterus schreibersii*) and Large-footed Mouse-eared Bat (*Myotis macropus*). All of these species have the potential to forage or fly over the present study area.

The majority of species observed in the EE management area are birds, accounting for 45 out of 80 species observed (HLA 2004b). It is likely that bird species diversity is dependant on flowering of shrubs and trees. Flowers, in addition to providing nectar and pollen, also attract insects and the species of birds that feed upon them. The recent scarring of trees by gliders and the ease of capturing them is indicative of the reduced flowering in the study area. Few trees were observed in flower and the majority of flowering shrubs were the regionally significant *Hakea bakeriana*. Small areas of habitat occur for the endangered Regent Honeyeater, particularly to the west of the power station where the winter flowering Swamp Mahogany (*E. robusta*) occurs.

The Spotted-tailed Quoll (*Dasyurus maculatus* subsp. *maculatus*) has been recorded to the south of the power station along Lake Road (Chris Wood, pers. comm.). Again there is no reason why the species would not occur in large areas of woodland in the area, however, targeted surveys within the study area failed to capture this species. No territorial calls of glider species were heard during the field investigations.

It is unlikely that threatened amphibian species are present, due to the reduced quality of the ash dam and few other aquatic habitats.

There are no endangered populations, ecological communities, critically endangered species or critically endangered ecological communities within the study area.

7.2.3 Potential Impacts

Figure 14 illustrates the approximate area of the proposed ash dam expansion within the study area. Approximately 52 ha of native vegetation would require clearing to accommodate the expansion. This comprises the majority of the study area and equates to around 20% of the woodland area of EPS. Impacts associated with the removal of this vegetation include removal of habitat supporting native flora and fauna, such as mature hollow bearing eucalypts, dense shrub understorey, dense ground cover, fallen logs and leaf litter.

The fauna species most likely to be affected by the proposed development are species that utilise this habitat including the small mammal population, arboreal mammals and insectivorous bats that roost in tree hollows.

The disturbed landscape resulting from the proposed clearing would be susceptible to the establishment and spread of weeds and feral animals and also aggressive native species that are adapted to disturbed landscapes. Without the implementation of mitigation measures and strategies to effectively manage the impacts of the proposed clearing, the remaining bushland surrounding the cleared area would suffer from edge effects.

The filling of the dam as a result of the ash dam expansion will also reduce the aquatic habitat available to a variety of aquatic species including Black-winged Stilts, Black Swans and Grey Teals which currently used the existing ash dam.

With respect to threatened species, as discussed previously, one threatened flora species and five threatened fauna species were detected at the site, as listed below:

- *Tetratheca juncea;*
- the Eastern Freetail-bat (*Mormopteris norfolkensis*);
- the Grey-headed Flying Fox (*Pteropus poliocephalus*);
- the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- the Little Bent-wing Bat (*Miniopteris australis*); and

- the Common Bent-wing Bat (*Miniopteris shreibersii oceanensis*).

The proposed project will result in the removal of approximately 34 ha of habitat for *Tetratheca juncea*, however 30 per cent of the mapped occurrences occur outside of the project footprint and similar habitat types are likely to occur to the north of the study area. Several hundred specimens of *Tetratheca juncea* are known to occur elsewhere within the EPS lands, while the locations of other threatened species known to occur within the EPS lands will not be impacted by the proposed ash dam extension.

Habitat is present within the study area for a further 18 threatened species. Seven-Part Tests were undertaken to determine whether the proposed project would have a significant impact on these species (refer to **Appendix E** for details). The tests concluded that, with the implementation of the safeguards outlined in **Section 7.2.4**, the proposed project would not have significant impacts upon these species.

The proposed action involves clearing approximately 52 ha of native vegetation. Clearing of native vegetation is a Key Threatening Process under Schedule 3 of the TSC Act. The removal of trees would be offset by the proposed safeguards, in particular, the retention of a 20 m buffer zone at the top of the ridge and the installation of artificial nest boxes and roosting boxes within the buffer area. Further safeguards are detailed in **Section 7.2.4** below.

7.2.4 Environmental Safeguards

In order to minimise the impacts of the proposal upon native flora and fauna, the following safeguards are proposed to be implemented, as recommended by the project ecologist:

- The retention of a buffer zone of a minimum of 20 m along the ridgeline;
- The staging of clearing in increments over a twenty year period, with a rise up the ridgeline of 5 m during the first year, a further 5 m during years 1 to 5, a further 5 m during years 5 to 10 and another 5 m during years 10 to 20;
- Each stage of clearing would be subject to further ecological assessment to allow for ongoing monitoring of the success of mitigation measures;
- Clearing to be timed such that it does not coincide with critical periods in the lifecycles of significant species;
- The installation of artificial nest/roost boxes within nearby woodland and particularly within the buffer zone prior to the first stage of clearing. These nest/roost boxes will replace tree hollows at a ratio of 2:1;
- Monitoring of the condition of artificial nest boxes to be incorporated into the Biodiversity Management Plan being prepared for the EE lands;
- Preparation of a rehabilitation plan that utilises soil and regolith stripped during clearing and, if practicable, the ash deposited as part of the proposed project. Rehabilitation is to utilise a similar vegetation community, particularly with regard to nectar producing species, to that which will be removed as part of the proposed project.

7.2.5 Residual Impacts

The proposed project will result in the removal of some 52 hectares of vegetation on the EPS site. This will result in some loss of habitat which supports native flora and fauna and may leave surrounding land susceptible to edge effects.

Alternatives to the proposed ash dam expansion have been discussed in **Section 3.2** of this report, however this option was considered to be the preferred option for its environmental benefits in terms of land take and efficiency.

Whilst the proposal does require the clearing of vegetation, the flora and fauna assessment has found that with the appropriate mitigation measures in place, as described above, the proposal will not impact significantly upon threatened species, populations or ecological communities.

7.2.6 Conclusion

The ecological assessment undertaken in respect of the proposal indicates that there will be no significant impact upon threatened species, populations or ecological communities provided that appropriate safeguards are implemented on site.

7.3 Noise and Vibration

7.3.1 Risk

In considering the risks of the project with regard to noise, the nature and scale of the proposed works were considered in the context of the environmental envelope within which the development is to sit.

The proposed EGTG is to be located within the main power station building complex, adjacent to an earth embankment and some 1.25 km from the nearest sensitive receiver. The nearest residences are separated from EPS by Wangi Road and Rocky Point Road, shown in **Figure 15**. Both roads carry high traffic volumes including heavy vehicle traffic and therefore generate a substantial level of road traffic noise. A vegetative buffer is located around the perimeter of the site.

Existing background noise levels at the site vary in nature and degree, however the EPL does not contain any limit conditions, operating conditions, monitoring and recording requirements, or pollution studies and reduction programs for noise or vibration emissions from EPS.

In consideration of these factors, the EPA's *'NSW Industrial Noise* Policy' (INP) was used for guidance in determining the most appropriate method for assessing the potential noise impacts of the project.

This document is aimed at assessing noise from industrial sources scheduled under the *Protection of the Environment Operations Act 1997* (POEO Act). The policy's focus is on the noise emitted from industrial sites and how this may affect the amenity of nearby receivers. Table 3.1 of the policy summarises the two procedures for determining background noise in noise assessments – long-term and short-term. The long-term method is to be used where there is significant potential for noise impact, e.g. extractive industries and industrial developments, whilst the short-term method is to be used for low risk developments.

Given the relative insignificance of the proposed EGTG in the context of the entire power station, the significant separation of the EGTG from the nearest receiver (1.25 km) and the noise attenuation provided by the power station buildings, the earthern bund adjacent to the location of the proposed EGTG and the vegetative buffer around the perimeter of the site, the proposal was considered to be a 'low risk development'. This is reinforced by the fact that there are currently no noise limits or monitoring requirements specified on the EPL issued in respect of the site.

As the proposed project represents a low risk development, the short-term method of measurement was chosen to establish existing background noise levels.

The short-term procedure involves individual sampling by operator-attended measurements covering the operating times of the development at the most affected noise-sensitive location.

Measurements were taken at six locations in the vicinity of the proposed project development area, as shown in **Figure 16.** Operator attended measurements were taken at these locations on 1 December 2005, when 3 out of 4 turbines at the power station were operational at normal capacity. These are common operating conditions at the plant, but not maximum operating conditions and for the purpose of this assessment are considered applicable for worst-case assessment of potential impacts, i.e. maximum operational noise is not used to mask contributions from the proposed project under typical operating conditions.

Background noise monitoring was undertaken at the nearest receivers and other significant properties in the area, as well as at locations within the boundary of the power station itself as detailed below (numbers refer to references on **Figure 16**):

- 6A Border Street, 1.25 km south of EPS (6);
- Eraring Public School, 1.5 km south-east of EPS main building (4);
- 53 Point Piper Road, adjacent to Eraring Public School (5);
- Just outside main power station building at EPS (1);
- At proposed EGTG location (2); and
- At bund wall to east of EGTG site (3).

7.3.2 Existing Environment

The existing noise environment at the periphery of the EPS site is dominated by road traffic noise from Wangi Road which runs just south of the power station. Wangi Road is a two-lane, sealed road which connects Wangi Wangi with Morisset and the Sydney-Newcastle Freeway.

Table 7-10 presents the results of the attended noise monitoring.

Table 7-10: Attended Noise Monitoring at the nearest receivers

Location	Date/ Weather	Primary Noise Descriptor dB(A)					Description of Noise Emission and Typical Maximum Noise Levels LA_{max}
		LA_{max}	**LA_{min}**	**LA_{10}**	**LA_{90}**	**LA_{eq}**	
6A Border St	1 December 2005 < 3m/s, 10% cloud cover	80.6	47.4	58.4	50.2	59.6	Dominated by traffic from main road
Eraring Public School	1 December 2005 < 3m/s, 10% cloud cover	63.0	35.3	42.2	37.4	42.7	Typical undisturbed environment
53 Point Piper Rd	1 December 2005 < 3m/s, 10% cloud cover	73.0	35.7	56.5	38.7	56.0	Kookaburras influenced reading. Light traffic

Location	Date/ Weather	Primary Noise Descriptor dB(A)					Description of Noise Emission and Typical Maximum Noise Levels LA_{max}
Main PS Building	1 December 2005 < 3m/s, 10% cloud cover	75.7	73.8	74.9	74.3	74.6	Steady power station hum
Proposed turbine site	1 December 2005 < 3m/s, 10% cloud cover	67.4	60.5	65.8	61.6	63.6	Steady power station hum
Bund Wall	1 December 2005 < 3m/s, 10% cloud cover	58.7	56.7	58.1	57.2	57.7	Steady power station hum

7.3.3 Proposed noise generating activities

Construction
The proposed construction period is estimated to occur over some 6 months for the EGTG and 24 months for the ash disposal facility. The hours of the construction program would be limited to between 7am and 6pm, Monday to Friday, and between 7am and 1pm on Saturdays, with no construction activities undertaken on Sundays and Public Holidays.

The proposed construction activities and plant and machinery are detailed in **Table 7-11.**

Table 7-11: Proposed construction activities and equipment

Activity on site	Description of works	Machinery
Site establishment	Delivery of site sheds and containers	Trucks
Earthworks	Some minor excavation	Excavators, loaders, trucks, rollers
Infrastructure	Installation of inground services and infrastructure such as pipelines etc	Excavators, backhoes, bobcats, trucks
Footings	Installation of footings	Excavators, drilling rigs, bobcats
Concrete slabs	Pouring and finishing of slab	Trucks, concrete trucks
Install EGTG	Erection of components	Cranes, boom/scissor lifts, semi-trailers

Operation
The NSW *Industrial Noise Policy* (INP) is used to assess industrial noise impact. The overall aim of the INP is to allow the need for industrial activity to be balanced with the desire for quiet in the community.

The INP sets two separate noise criteria to meet environmental noise objectives: one to account for intrusive noise and the other to protect the amenity of particular land uses.

The Intrusiveness Criterion essentially means that the equivalent continuous noise level of the source should not be more than 5 dBA above the measured background level. The Intrusiveness Criterion for the proposed works is detailed in **Table 7-12** below.

Table 7-12: Intrusiveness Criterion

	Location Reference Number					
	1	**2**	**3**	**4**	**5**	**6**
Measured Background Level L90dB(A)	50.2	37.4	38.7	74.3	61.6	57.2
Intrusiveness Criterion (Background + 5 dBA	55.2	42.4	43.7	79.3	66.6	62.2

Sensitive Receptor Locations External to the EPS Site

The amenity assessment is based on noise criteria specific to land use and associated activities (detailed in Table 2.1 of the INP). The criteria relevant to the subject site are classified as Residence – Urban/Industrial Interface which applies to existing situations, detailed in **Table 7-13** below.

Table 7-13: Amenity Criteria

Time of day	Recommended LAeq Noise Level dB(A)
Day	70
Evening	60
Night	55

The Project Specific Noise level reflects the most stringent noise level requirement from the noise levels derived from both the intrusiveness and amenity criteria, which are the benchmark against which noise impacts and the need for noise mitigation are assessed. The Project Specific Noise Goals (PSNGs) for the proposed works are therefore equivalent to the intrusiveness criteria for sensitive receptor sites external to the EPS provided in **Table 7-12** with the exception of Location 1 where the amenity criteria becomes the PSNG.

The proposed plant could operate up to 24 hours per day, 7 days per week during system emergencies.

In order to estimate the level of noise impact the proposed EGTG would have on the local receivers, operational noise data was obtained from the manufacturers of the turbine. The turbine will be encased within an acoustic enclosure and fitted with an exhaust silencer and air intake silencer to achieve a noise level of 85 dBa at 1 m from the turbine and 85 dBa at the exhaust stack exit.

Road Traffic Noise

Road traffic noise is assessed by the NSW *Environmental Criteria for Road Traffic Noise* (EPA, 1999). The daytime road traffic noise criteria for residences along Wangi Wangi Road, which is

classified as a collector road under the EPA's criteria, is 60 dB(A) $LA_{eq(1hr)}$ for the day period (defined as 7am – 10pm) and 55 dB(A) $LA_{eq(1hr)}$ for the night period (defined as 10pm to 7am). The criteria further provides that where existing noise levels are greater than the road traffic noise criteria the road traffic noise goal is to not exceed the existing noise level by more than 2 dBA.

There would be a temporary increase in traffic to and from the site during the construction period, however vehicle movements during the operational phase of the proposal would remain unchanged from that currently existing. **Table 7-14** shows the vehicle movements anticipated for the construction period of the proposal.

Table 7-14: Proposed vehicle movements

Phase	Number of heavy vehicle movements per day	Number of light vehicle movements per day
Construction	Up to 10 vehicle movements per day during peak times for ash dam works. Up to 20 vehicle movements per day during peak times for EGTG construction.	None Up to 40 vehicle movements per day during peak times for EGTG construction

7.3.4 Potential Impacts

Construction Noise Impact

In NSW construction noise impacts are considered under the NSW *Construction Noise Guideline* (EPA, 1994) which recommends the following limits:

- *For a construction period of 4 weeks and under the LA_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dB(A); and,*
- *For a construction period of 4 weeks and not exceeding 26 weeks the LA_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dB(A).*

The construction of the proposed works is anticipated to take some 6 months for the EGTG and some 24 months for the expansion of the ash dam. It should be noted that the EPA's *Construction Noise Guideline* generally applies only to non-scheduled premises where a long construction time is not likely. Therefore the criteria may not be strictly applicable to the ash dam expansion.

At this stage the final construction details for the proposed works are not known, however, an estimate of the worst-case noise levels as a result of construction follows in order to provide some basis for assessing potential impacts. Construction equipment types are likely to include those listed in **Table 7-15**. Also listed in **Table 7-15** are typical sound power levels nominated for each equipment type, based on measurements provided in Australian Standard 2436-1981 *Guide to Noise Control on Construction, Demolition and Maintenance Sites.*

Table 7-15: Major Construction Equipment Types, Purpose and Nominated Sound Power Levels For Equipment (dBA per unit)

Type	Purpose	Typical Sound Power Level
Bulldozers	Earthworks	110
Compactors	Earthworks	111
Backhoe Excavators	Installation of in-ground infrastructure	105
Graders	Earthworks	109
Trucks	Site establishment, earthworks, installation of in-ground infrastructure and erection of EGTG.	105
Concrete Trucks	Pouring slabs	105
Hand held tools	Installation of EGTG	94
Sum		**116**

The total sound power level at the source for a bulldozer, compactor, backhoe, grader, truck, concrete truck and hand held tools, operating simultaneously is estimated to be 116 dB(A). This is a conservative estimate as different types of equipment would be required at different times during the construction program and would not be all operating at any given time. The total sound power level of 116dBA was obtained by summing the power levels of each of the equipment types.

When attenuation from the source to the nearest residential receiver some 1.25 km away is considered, the construction noise contribution at the nearest residential receivers would be significantly reduced. However, it is likely that over the entire construction period (6-24 months) there may be temporary periods where the noise contribution from construction works exceeds the NSW construction noise policy. It is commonly accepted, and acknowledged by DEC, that the current construction noise criteria is very difficult to achieve. The construction noise policy is currently contained within the NSW Environmental Noise Control Manual. All other aspects of this Manual have been superseded apart from the construction noise criteria and it is understood that the DEC has initiated a review of this criteria with the intention of developing a Construction Noise Policy to replace this criteria. It is further understood that the new policy when it is finalised is likely to adopt a management approach to construction noise rather than solely rely on noise level criteria.

All construction activities on the EE site would be undertaken during the day time and would be temporary in nature. In light of the fact that the construction noise criteria are widely accepted to be overly stringent, EE would adopt a best management practice approach to managing construction noise impacts. Proposed management details would be provided within a Construction Environmental Management Plan and would be based on the proposed construction program.

Operational Noise Impact

The operation of the proposed expansion of the ash disposal facility involves the pumping of ash slurry from the main plant area to the ash dam, using the same route and processes as the existing ash disposal facility. The operation of the expanded ash dam would therefore not generate significant noise over and above that already occurring as a result of the ash disposal process. As there are no noise monitoring requirements specified in the EPL applying to the

site, and no noise complaints have been received by EE in relation to the plant, it can reasonably be deduced that the proposed expanded ash dam will have no significant impact in terms of noise on local receivers.

Predicted noise levels from the proposed EGTG have been predicted based on data obtained from the manufacturer of the turbine. This data has been compared with background noise data obtained during operator attended monitoring to establish whether the noise contribution of the generator would be significant in the wider context of the power station.

As discussed in **Section 7.3.3** the noise figures for the proposed EGTG indicate that the generator will contribute noise emissions of 85 dBA at a distance of 1 m from the turbine. Drawing on the principle of geographic spreading (i.e. a 6dBA reduction in noise for a doubling of separation distance) as well as the attenuation effects of the adjoining earthern embankment, some assumptions can be made regarding the likely reduction in noise contribution from the EGTG with an increase in separation distance.

Using the EGTG noise contribution of 85 dBA and the principle of geographic spreading as a guide, predictions can be made as to the likely reduction in noise contribution of the EGTG at the nearest sensitive receivers, these being some 1.25 km from the plant. These predictions are shown in **Table 7-16**.

Table 7-16: Predicted Noise Levels

Location	Project Specific Noise Goals LAeq dB(A)	Predicted noise contribution LAeq dB(A) at 1 km from source	Existing Background Levels LAeq dB(A)
6A Border St (1.25km from source)	55	25	50.2
Eraring Public School (1.5 km from source)	42.4	25	37.4
53 Point Piper Rd (1.4km from source)	43.7	25	38.7

At a distance of around 1.024 km from the turbine site, the predicted noise contribution from the EGTG is predicted to be approximately 25 dBA based upon the principle of geographic spreading.

Therefore noise contributions from the EGTG at the nearest sensitive receivers – 6A Border Street (1.25 km from EPS), Eraring Public School (1.5 km from EPS) and 53 Point Piper Road (1.5 km from the EPS) are predicted to be less than 25 dBA which is well below the project specific noise goals identified using the INP.

This indicates that the predicted noise contribution would not be dominant above the current background noise at the receiver and would be imperceptible.

Road Traffic Noise Impacts
Road traffic noise is assessed by the NSW *Environmental Criteria for Road Traffic Noise* (EPA, 1999). The daytime road traffic criteria relevant to residences along Wangi Wangi Road is 60 dB(A) $LA_{eq(1hr)}$ and night time is 55 dB(A) $LA_{eq(1hr)}$.

Construction Traffic
Based on the predicted increase in traffic volumes along Wangi Wangi Road, provided in **Table 7-17**, the increase in vehicle volumes during construction is not anticipated to represent a perceptible increase in road traffic noise to receivers along Wangi Wangi Road.

Table 7-17: Predicted Traffic Volumes during Construction

Road	Count Station	Count Location	Existing AADT	Predicted Project Traffic Generation (Construction)
Wangi Wangi Road	V05.510	Morisset at Dora Creek Bridge	10,476	Up to 10 vehicle movements per day for ash dam expansion Up to 60 vehicle movements per day for EGTG installation
Wangi Wangi Road	05.508	Wangi Wangi at Wangi Wangi Creek Bridge	8,514	Up to 10 vehicle movements per day for ash dam expansion Up to 60 vehicle movements per day for EGTG installation

Operational Traffic
Traffic movements during the operational phase of the proposed project are predicted to involve 1 additional delivery of distillate per week. Therefore no change in existing road traffic noise impacts as a result of the proposed project are predicted.

7.3.5 Environmental Safeguards

Construction
The following mitigation measures would be implemented to mitigate noise as a result of construction:

- construction equipment would be maintained and operated in a proper and efficient manner;
- construction activities would be limited to Monday to Friday, 7:00am to 6:00pm and Saturday, 7:00am to 1:00pm;
- construction activities would not occur on Sundays or public holidays;
- residents in the vicinity of the site would be informed of the proposed works schedule;
- construction activities would be scheduled so that the noisiest works are not undertaken simultaneously; and
- plant and equipment warm-up or idling would not be undertaken outside the restricted hours or at the site boundary.

Operation
The following mitigation measures would be implemented to mitigate noise as a result of plant operation:

- EGTG is to be encased within an acoustic enclosure and fitted with an exhaust silencer and air intake silencer;
- plant and machinery installed would be maintained and operated in a proper and efficient manner;
- the best available technology economically achievable would be installed at the plant;
- noise generating plant equipment would be oriented so that noise emissions are directed away from any sensitive areas, to achieve maximum noise attenuation; and
- post commissioning monitoring would be undertaken to confirm the noise predictions made against the actual noise contribution achieved at the residential receivers identified in this assessment.

Road Traffic
The following mitigation measures would be implemented to mitigate noise as a result of traffic:

- loading and unloading of goods would be undertaken in the allocated area, which would be shielded by barriers/fences from noise sensitive receivers;
- deliveries will be scheduled for day time periods;
- the use of reversing alarms and exhaust brakes would be minimised at noise sensitive times of the day; and
- delivery trucks would be well maintained and serviced.

7.3.6 Residual Impacts

The operation of the proposed EGTG and ash dam expansion are not expected to result in any significant residual impacts related to noise and vibration. Despite the environmental safeguards to be implemented during the construction period, there may be some exceedences of the NSW construction noise policy. However, the limitations of this policy are recognised and given the substantial distance of EPS from the nearest sensitive receiver, it is not anticipated that the proposed works will result in noise nuisance to surrounding landowners during construction or operation. As there will be no appreciable change in traffic volumes during operation and only marginal changes during construction, the proposed works are not expected to result in any significant residual traffic noise impacts.

7.3.7 Conclusion

Noise generated from the proposed project would occur during construction and operational activities. Traffic noise would also be generated from a temporary increase in traffic movements associated with the construction phase of the proposed works.

There are few residential (sensitive) receivers in the vicinity of the noise sources of the proposed works. The locations of residential receivers are shown in **Figure 15**, with the nearest residential receiver located approximately 1.25 km away from the project site. A potential increase is expected during the noisiest construction activities, however, the activities generating these noise impacts would be temporary in nature and would be managed in accordance with best practice for construction noise management. A more detailed management approach for construction noise, based on the construction program, would be provided within a Construction Environmental Management Plan.

Operational activities associated with the EGTG would involve the generation of additional noise on the site, however this would be experienced in the context of the existing power station. Due to the distance to the nearest receiver, and the expected attenuation over the distance between the proposed EGTG and nearest receivers, the noise generated from the proposed EGTG is not expected to be perceptible at the nearest sensitive receivers and would not create a significant impact on the surrounding environment. However in order to confirm the predictions made it is proposed that post commissioning monitoring be undertaken after the EGTG is operational to confirm compliance with the INP. In addition a complaints management approach would be adopted within the Operational Environmental Management Plan for the development.

7.4 Indigenous Heritage

7.4.1 Risk

As the proposed EGTG installation will be located within the existing disturbed footprint of the EPS and will also involve minimal earthworks for the purposes of footings, the risk of impact upon Indigenous heritage items or places is considered to be negligible and therefore survey was limited to the area of the proposed ash dam expansion.

A search undertaken on DEC's Aboriginal Heritage Information Management System (AHIMS) revealed that no sites have been previously located in the study area. Furthermore, a survey with the involvement of the relevant Aboriginal communities was undertaken and identified no evidence of Aboriginal sites within the proposed study area.

While effective coverage of the study area was limited due to the dense vegetation, the gentle to moderate slopes that comprise the study area are landforms generally poor in archaeological sites. More often, Aboriginal sites are located on ridge or creek lines, such as those to the north and south (prior to the ash dam). Furthermore, geomorphological investigation revealed minimal potential for subsurface archaeological deposits.

The conclusions of the field investigation reveal no Aboriginal heritage issues within the study area and recommend no further actions are required.

7.4.2 Aboriginal Consultation

As required by DEC's (2005) *Interim Community Consultation Requirements for Applicants*, HLA undertook an extensive consultation process to identify and contact the relevant Aboriginal communities. HLA's consultation process involved contacting a number of agencies (namely DEC, the Local Aboriginal Land Council, Native Title Tribunal, Office of Registrar and Lake Macquarie Council) to identify the relevant groups, as well as advertising the project in the local newspaper, *Lake Macquarie News,* for registrations of interest.

In addition, HLA has undertaken a number of surveys in the general area over the last 18 months including a water pipeline, which crosses to the eastern edge of the ash dam, and has therefore previously worked with the communities in the area.

The consultation process identified three Aboriginal groups that wished to be involved in the process – the Koompahtoo LALC, Wonnarua Nation Aboriginal Corporation (WNAC) and Yarrawalk Enterprises Pty Limited (Yarrawalk). The Koompahtoo LALC is the statutory body for the area, while the latter two were invited due to their involvement in an Indigenous Land Use Agreement (ILUA) with Power Coal Pty Limited covering an area of some 87km^2 ending just north of Eraring. While this proposed development was not directly related to the activities

outlined in the ILUA, the two groups were considered interested parties by HLA and therefore included.

While the Native Title Tribunal did not outline any successful claims (aside from the ILUA discussed above), HLA is aware of a number of failed or discontinued claims in the region (through a search of the Native Title Tribunal website online - www.nntt.gov.au/applications/index.html), specifically by a number of Wonnarua groups; Boongary Clan of the Taurai People; Mr. Stephen Sevier; Mr. Richard Amery; Mr. Jamie Roy Denniss and Charlestown Recreation Reserve Trust. HLA understands that some questions have been raised over the purchase of the study area by an individual undertaking a Native Title Process (Department of Lands pers. comm. 13 January 2006). However, there are currently no registered Native Title Claimants existing in the area and no responses were received to HLA's register of interest advertised in the local media.

The fieldwork was undertaken on 10 January 2006 with Mr. Scott Franks of Yarrawalk and Mr. Rob Lester of WNAC in attendance. While Raymond Smith of Koompahtoo LALC was invited to attend, for logistical reasons he cancelled on the morning of the 10 January 2006 prior to the survey beginning.

Neither of the groups in attendance identified any cultural issues in relation to the study area.

7.4.3 Existing Environment

This section provides background information on the archaeological resource of the area, geomorphological discussions and field observations of the existing environment. General information on the existing environment is discussed in **Section 7.5.1** in relation to geology and soil profiles and in **Section 7.2** in relation to vegetation.

AHIMS Search
An AHIMS search was undertaken on 5 December 2005 over a 15km by 15km square encompassing EPS, the ash dam and the study area (see **Figure 17**). The search revealed 97 Aboriginal sites in the general area, comprising 61 (63%) shell middens, 23 (24%) artefact scatters or isolated finds, 3 (3%) scarred trees, 3 (3%) PADs, 1 (1%) axe grinding groove, 1 (1%) mythological site, and 5 (5%) unidentified sites.

The distribution of known sites reveals that the majority of sites are located along the edge of Lake Macquarie and its major tributaries (such as Dora Creek and Pourmalong Creek). Only one site is found near the study area, namely #45-7-0070, a shell midden, which was located on Crooked Creek, south of the ash dam.

In summary, the most common site type in this region, shell middens, reveal Aboriginal people's one-time reliance on the marine resources of Lake Macquarie and its surrounding watercourses. While Crooked Creek was a large water course prior to the ash dam, as can be seen in aerial photographs preceding the power station's construction in the 1980s, and was probably used by Aboriginals for its water resources, the study area has always been a series of slopes some distance from both Crooked Creek and Lake Macquarie.

Furthermore, at least back to historical times, permanent watercourses such as Dora Creek, Pourmalong Creek and Wyee Creek are likely to have been more attractive to Aboriginal people than the smaller ephemeral creeks in the region, which included Crooked Creek prior to its development into the ash dam. It should also be noted that sites often occur along ridgelines in this region due to the movement of Aboriginal people from Lake Macquarie to the interior, ridgelines being clearer and flatter than the valleys or slopes. For these reasons, it seems unlikely that any sites would be found within the study area.

Field Investigation

The aim of the field survey was to identify the archaeological sensitivity of the study area. This assessment was determined by the criteria outlined in the assessment of archaeological sensitivity provided later in this section.

The presence or absence of archaeological materials and the terrain features and integrity of sites were documented using a specifically designed recording form (see **Table 7-18**). A range of environmental attributes affects the detection of archaeological material during site surveys. Some of these features are vegetation cover, soil type and presence of naturally occurring surface rock. Ground surface visibility is also a major influence of artefact detection. The nature (i.e. size, colour, material type) of the archaeological material also affects the effectiveness of the field survey. To assess the reliability of the survey results the following features were recorded for the site:

- Landform unit;
- Environmental setting within landform unit;
- Fall of slope along transect;
- Type of vegetation cover;
- Visibility levels measured as percentage of soil surface visible per transect;
- Type of ground exposure i.e. erosion or disturbance from mining activities;
- Frequency of exposures i.e. number in each transect;
- Size of exposures;
- Depth of soil erosion;
- Soil type and profile level exposed;
- Evidence of downslope movement of soil and rock particles;
- Presence of naturally occurring rock suitable for artefact production; and
- Presence of archaeological material.

The range of attributes relating to each of these environmental features across the site is reproduced in **Table 7-18**. Terminology for all landscape descriptions was obtained from McDonald *et al* (1998).

Photography was also used to document the environmental and archaeological features of the survey area.

Table 7-18: Terrain recording form

Survey Area					
AMG Reference	Start……		End……		
Landform Unit	Crest	Ridge		Hillock	
	Simple Slope	Upper Slope		Mid Slope	
	Lower Slope	Flat		Open Depression	
	Closed Depression	Stream 1st	2nd	3rd	4th
Slope	Level	Very Gently Inclined		Gently Inclined	
	Moderately Inclined	Steep		Very Steep	
Exposure	Eroded	Aggraded		Human Action	
Geomorphological Agent	*Gravity:*	Collapse	Particle Fall		
	Precipitation:	Soil Creep	Mass Movement	Sheet Wash	
	Stream Flow:	Overbank	Channelled	Flood	Watertable
	Biological	Human	Animal		
Human Action:	Road	Residential	Earthworks	Industrial	Pastoral
	Other……				
Level of Disturbance	1	2	3	4	5 6 7 8
Exposure	No. of exposures……		Exposure area……		
Soil Type			I		
Soil Profile Exposed	Exposed:	A	A2	B	C Vertical Profile: Yes No
Geology					
Locally Available Material	Silcrete	Mudstone	Quartz	Tuff	Quartzite
	Chert	FGS	Pet Wood	Sandstone	
Vegetation	Tall = trees>10m	Mid= shrubs+trees<10m		Low= grasses	
Groundcover	Dense= 70%	Mid-dense=30-70%		Sparse=10-30%	
	Very sparse= 10%	None			
Stone Artefacts	Absent	Present	Number……..		
Raw Materials Used	Silcrete	Mudstone	Quartz	Tuff	Quartzite
	Chert	FGS	Pet Wood	Sandstone	

The aim of the survey and recording methodology was to divide the surveyed site into landscape zones and areas of land use that reflect the potential for archaeological material to exist in these sections. This data would then be able to be assessed against the background information on the site and used to produce archaeological sensitivity areas for the site.

The field survey involved a thorough investigation of the study area, which runs along the north and east side of the existing ash dam. The study area consists of upper slopes below a ridgeline to the north and above the shallow sloped edges of the ash dam to the south. The slopes varied in elevation, but were typically between 3 to 10° with some areas much steeper (in excess of 15°).

HLA Archaeologist, Alan Williams with two Aboriginal community members surveyed the area to both identify surface Aboriginal sites and assess landforms for potential archaeological sites/deposits. The study area was split into a series of five transects (as shown in **Figure 18**) for later interpretation.

The five transects were comparable in their appearance, each consisted of a similar form of landform, namely slopes, with varying degrees of visibility and vegetation cover. Typically, the slopes were relatively uniform across the study area, although the steep slopes were located more frequently in transects 1 and 2. Evidence of ephemeral storm channels were also located within transect 2, which were currently vegetated but revealed evidence of substantial water and soil movements in the past . Where possible soil exposures and transects were investigated to provide an indication of the soil profile across the study area.

As required by DEC's (1997) *Standards and Guidelines Kit*, **Table 7-19** presents a summary of the survey's findings in relation to location, visibility and exposure:

Table 7-19: Survey coverage of the study area

Transect no.	Start Co-ordinate	End Co-ordinate	Landform unit.	Total Area of LF unit (m^2)	Exposure (%)	Area of Exposure (m^2)	Visibility %	Area available for detection (m^2)	% of landform available for site detection
1	36812E, 6342320N	362889E, 6342615N	Slope	18,400	60	11,040	50	5,520	30
2	362889E, 6342615N	363235E, 634289N	Slope	20,650	10	2,065	15	310	1.5
3	363404E, 6342335N	363861E, 6342553N	Slope	27,350	20	5,470	30	1,641	6
4	363861E, 6342553N	364244E, 6342498N	Slope	19,300	10	1,930	15	290	1.5
5	364244E, 6342498N	364439E, 6342259N	Slope	15,350	10	1,535	15	230	1.5
			Average	*20,210*	*22*	*4,408*	*25*	*1,598*	*8*
			Total	**101,050**		**22,040**		**7,991**	

As can be demonstrated from **Table 7-19**, the survey covered some 10 ha. (equivalent to 101,050m^2) of which 8% was effectively covered due to substantial vegetation cover (**Plates 2** and **3**).

Plate 2

Transect 2 looking east. This photograph provides an indication of the poor visibility in some areas of the investigation

Plate 3

Transect 3 looking northeast. This photograph provides an indication of the poor visibility in some areas of the investigation

The survey identified no Aboriginal sites within the areas surveyed. Further, the assessment of the landform is gentle to moderate slopes with limited soil profiles (see below) and as such the site is unlikely to retain any *in situ* archaeological material

Assessment of Archaeological Sensitivity

The archaeological sensitivity of the study area was assessed on four criteria: the presence of known surface archaeological materials, the probability of undetected surface archaeological materials, the probability of subsurface archaeological materials, and the terrain integrity of

each transect area. The presence or absence of surface archaeological materials and the level of effective ground surface visibility were documented during the field survey. The probability of additional surface artefacts occurring was based on these attributes. The assessment of the subsurface archaeological potential of the study area was based on the known patterning of archaeological materials in the Eraring area and field observations of the environmental characteristics and terrain integrity. These characteristics included the availability of stone materials, proximity to water resources, soil depth and landform unit.

Geomorphological implications

Observations during the survey attempted to create a geomorphological model of the landscape in order to better understand its age and the formation processes identified in the survey and the potential of the area to retain archaeological deposits.

Examination of numerous exposures throughout the study area identified residual soil profiles that are truncated and have been subject to heavy erosion. The majority of the study area displayed a truncated clayey B horizon resting on sandstone bedrock, with the complete removal of the topsoil. In some areas the original profile had eroded to bedrock and is now covered with a thin immature A horizon, most likely originating from the decaying organics originating from the abundant vegetation in the area. The original topsoil has most likely been eroded into the creek systems.

Due to these processes, which are accelerated through natural storm events, bushfires, deforestation and development, areas such as ridgelines and crests will be almost devoid of sediments, these having slipped downslope. Indeed areas of bedrock can be seen along the survey on the slopes (**Plates 5** and **7**), exposed through the movement of sediments. Erosion, such as sheetwash (massive amounts of sediments being fluvially transported downslope with surface flow) and deposition of sediments, is promoted by the exposed graded roads and erosion channels (currently re-vegetated) within the study area. The roads provide an indication of the geomorphology of the study area following the removal of vegetation (such as through bushfires, which appear common in the study area) and the subsequent erosion that would have ensued. A common characteristic of this activity is sharp contacts between the shallow topsoil and the subsoil beneath, an *in situ* soil normally revealing a far more diffuse contact (**Plate 6**). **Plates 4, 5** and **6** show that many transects are missing topsoil. The reason for this is the actively eroding landscape. For this reason, attempts at subsurface investigation are likely to be unsuccessful, particularly in regard to archaeological integrity.

Plate 4

Transect 1 looking north. This photograph provides clear evidence of the heavy of erosion that has occurred within the study area. The pale soil exposed here is a B horizon indicating the complete removal of the topsoil and any potential subsurface archaeological deposit. Furthermore, the evidence of rilling and erosion gullies imply substantial and ongoing erosion in this area

Plate 5

Transect 1 looking north. This road reveals the extent of erosion occurring without vegetation cover. Note the rilling down the road. It should be noted that numerous forest fires have occurred in this area, and it is likely that much of the study area would have been cleated and looked similar to this road

Plate 6

Transect 2 looking north. This shows a section of the soil profile towards the base of the moderate to steeper slopes. The upper soil unit is a recent organic layer, most likely developed from decaying organic matter, while the lower unit is the clayey B horizon common in this area. Of note is the sharp contrast between the two units, which indicate that the topsoil has moved from upslope through colluvial process truncating the in situ topsoil, which has now moved downslope

Plate 7

*Similar to **Plate 4**, this photograph shows a heavily eroding road in Transect 5, looking northeast. Note the exposed bedrock in the right foreground, indicating the soil profile in this area is very thin*

This type of geomorphological activity essentially re-deposits archaeological material at the base of slopes and within alluvial flats - or more recently in the ash dam and, preceding this, in Crooked Creek. These types of sites represent lag gravels, which include artefacts and natural gravels, rather than *in situ* knapping floors (single events) or knapping locations (multiple knapping events superimposed/overprinted over one another). The concentration of archaeological material in these locations therefore, represents natural accumulation (patterning) rather than archaeological accumulation. The authors suspect (based on multiple personal observations in the Lake Macquarie region) that much of the 'archaeological' site patterning recorded for Lake Macquarie actually represents natural site formation processes – a fact previously noted and illustrated by Margrit Koettig's model for the Hunter Valley.

In summary, exposed areas within the study area, particularly on moderate to steep slopes, reveal a typical pattern of downslope erosion through mass movement, soil creep and sheetwash. Therefore, a common pattern can be seen across the study area of exposed bedrock and subsoil horizons on crests and slopes following the erosion of their upper soil unit(s) due to a combination of natural storm events, deforestation and clearing. Typically, these latter deposits accumulate at the base of slopes and in creek catchments and become integrated into the pedogenesis of these areas. However, in the case of this study area, these deposits are most likely to have been deposited within the ash dam and/or Crooked Creek before its creation.

7.4.4 Potential Impacts

Following the archaeological investigation, there is no evidence that Aboriginal or archaeological sites will be impacted by the proposed project. However, it is possible that an Aboriginal or archaeological site could be found during the course of works involved with the ash dam expansion and these sites/artefacts could be damaged by the proposed works should appropriate safeguards not be put into place.

7.4.5 Environmental Safeguards

Should any objects be identified during the course of site works, all works would cease and the DEC (North East Branch, Environment Protection and Regulation Division, Regional Archaeologist) would be contacted with regard to appropriate permit requirements before any further activity is undertaken. In addition, should suspected skeletal material be uncovered during the course of site works, all works would cease and the DEC, the NSW Police and the NSW Coroners office would be contacted immediately, regardless of any existing DEC permits for the proposed works.

7.4.6 Residual Impacts

Based upon the survey and assessment undertaken, no residual impacts are considered likely to occur as a result of the proposed works in relation to Aboriginal heritage. However it is possible that Aboriginal or archaeological sites and/or artefacts could be discovered. These could be removed/destroyed subject to appropriate permits being issued by the DEC.

7.4.7 Conclusion

The survey revealed the study area to be composed of medium to densely covered vegetated slopes of gentle, moderate and steep relief. The survey covered about 30 to 40% of the study area and effectively observed about 8% of this area. It is clear from geomorphological interpretations and known sites in the area that the entire study area has a very low potential for archaeological sites and/or deposits.

Known sites reveal a high correlation with the use of water resources, largely marine, and are predominantly middens located on the shoreline of Lake Macquarie or its major tributaries. Based on this evidence, the study area has few characteristics that would appeal to Aboriginal people for settlement, since it is composed of a series of slopes some distance from a main water body.

The geomorphology of the study area reveals a heavily modified landscape. While much of the vegetation is relatively mature, numerous lightening strikes across the study area suggest large storm events occur regularly in this region. Therefore, although direct human impact to this area is still confined (by roads, tracks, etc), widespread erosion is driven by natural events, which are almost certainly exaggerated by anthropogenic impacts. Observations of the study area reveal substantial erosion has lead to the removal of the soil profile (particularly the topsoil), at the same time re-distributing archaeological deposit within the topsoil downslope. This process was identified across the study area, but was particularly obvious on exposed tracks and erosion channels running down the slope to the existing ash dam.

No evidence of surface Aboriginal sites were located during the survey and visual observations suggest the potential for subsurface archaeological sites is also low given the lack of a developed or *in situ* soil profile being evident within the study area.

7.5 Water and Soils

A desktop study of the water quality and groundwater, geology, soils and contaminated land within the study area was undertaken by HLA. More detailed hydrological studies will be undertaken at the project approval stage when detailed designs for the proposed ash dam expansion are available.

7.5.1 Existing Environment

Soils
The 1:100,000 soil landscape sheet 9131-9231 for Gosford – Lake Macquarie shows the soils of the site as predominantly comprising the Doyalson erosional landscape. Parts of the site as well as the area of the ash dam are classified disturbed terrain.

The Doyalson landscape comprises gently undulating rises on Munmorah Conglomerate, and is characterised by high erosion hazard and very low fertility. Slope gradients are less than 10%, with local relief to 30m. Characteristic landscapes include broad crests and ridges and long gently inclined slopes. Areas are predominately cleared eucalypt open forest.

Soils in this landscape include:

- moderately deep Yellow Earths, Yellow Podzolics and Soloths on sandstones and conglomerates;
- moderately deep Yellow Podzolics, Soloths, and some Deep Red Podzolic soils on fine-grained silstones and claystones; and,
- moderately deep to deep Yellow Leached Earths, Grey Earths, Soloths and Gleyed Podzolic Soils along drainage lines.

Limitations to the soils include high erosion hazard, localised foundation hazard, high run-on mine subsidence, seasonal waterlogging, hardsetting, stoniness and strongly acid soils of low fertility.

The areas of disturbed terrain landscape comprise level plain to hummocky terrain, which have been extensively disturbed by human activity including complete disturbance, removal or burial of soil. Local relief and slopes are highly variable. Landfill includes soil, rock, building and waste materials. Soils are highly variable.

Limitations to the areas of disturbed terrain are highly variable depending on the site, and may include mass movement hazard, steep slopes, foundation hazard, unconsolidated low wet bearing strength materials, impermeable soils, poor drainage, erosion hazard, very low fertility and toxic materials.

The geology of the site is of the Narrabeen Group, comprising conglomerate, pebbly sandstone, grey green and grey siltstone and claystone.
Sites within the vicinity of the EPS are known to be affected by ASS.

The site is already highly disturbed, comprising cleared and excavated areas within and around the existing power station buildings and ash dam, with the exception of land adjacent to the ash dam to the north.

Water

A search of the DNR Natural Resources Atlas was undertaken on 6 December 2005. The search revealed that there was one groundwater bore onsite, located near the power station. Data from nearby bores (GW052111 and GW053438) indicate that the depth to groundwater ranges from approximately 21 – 16 m below ground level. Surrounding surface water includes Crooked Creek which runs along the southern edge and through the ash dam with Whiteheads Lagoon and Myuna Bay further south, across Wangi Wangi Road.

Water is used as part of the operation of the existing ash dam. Bottom ash is mixed with recirculated water to form a slurry which is then transported to the ash dam. The bottom ash is recovered by dredging. Water is also applied by spray irrigators to reduce dust from the ash dam.

In periods of high rainfall the existing ash dam can collect large amounts of water. In such conditions, the EPL allows for the water to be discharged to the lake via the EPS outlet canal. In 2004 discharges from the ash dam made up less than 0.1% of water discharged to the lake from the outlet canal.

Water that seeps from the ash dam toe drains is collected in a drain, held in the toe drain pond and pumped back to the ash dam, in accordance with the EPL. Under emergency conditions the toe drain water may be discharged via a designated discharge point, with overflow from the dam discharged to Crooked Creek and an additional discharge point. Discharge from these points would only occur in the event of a large storm event. All discharges are reported to the EPA.

Canals, fencing and gates have been installed to direct the flow of ash and water to appropriate areas. Capping of the ash dam diverts rainwater away from the ash dam and maintains environmental flows of water to Lake Macquarie. The EPL allows uncontaminated surface runoff from the site be discharged to the cooling water system.

7.5.2 Potential Impacts

Soils

Approximately 52 ha of land would be required to be cleared to accommodate the proposed expanded ash dam. Potential impacts to the geology, soils and potential ASS from the proposed upgrade works would include:

- temporary impacts during construction works including earthworks and site preparation;
- impacts associated with construction of new access roads related to the expanded ash disposal facility;
- impacts associated with expansion of the ash disposal storage area and pit.

During construction of the ash dam, potential impacts to soil include erosion, compaction and changes to runoff patterns. These potential impacts result from activities such as removal of vegetation, earthworks, stockpiling of materials and movement of heavy vehicles, and can be exacerbated by factors such as wind and rainfall.

Upon completion of construction works, the area of exposed soil will have increased and therefore, without a vegetative cover there is the potential for erosion and changes to runoff patterns to occur. There are also potential impacts associated with unsealed roads.
Construction of the EGTG would not impact significantly upon soils as it would require minimal excavation work.

Water

During the construction phase, the potential exists for temporary impacts to water quality as a result of earthworks and increased construction traffic. There will be an increased area of exposed soil, causing changes to runoff patterns and potential movement of eroded soil. Suitable erosion and sediment control measures would need to be implemented during the construction works and these are outlined in **Section 7.5.3**.

Design measures would be incorporated into the expansion of the ash dam such that it would not significantly alter the hydrological regime of the area. The existing dam wall will remain unchanged in the development and existing management measures would continue to prevent runoff to nearby watercourses. The development of the Dense Phase Ash Disposal would lead to less demand on water consumption at the EPS.

Due to the depth of groundwater at the site, it is not expected to be a significant constraint to the project.

The proposed EGTG would be bunded to direct surface water around the EGTG to EPS's existing contaminated water system.

7.5.3 Environmental Safeguards

The following safeguards would be implemented to ensure that potential soil and water impacts are minimised:

- Prior to carrying out construction, EE would prepare and subsequently implement a Soil and Water Management Plan in respect of the proposal. This plan would include an Erosion and Sediment Control Plan and a Surface Water Monitoring Program.

- The earth works required for the proposed expansion of the ash dam would be undertaken in the presence of a geotechnical engineer/geotechnician to enable inspection and approval of stripped areas prepared by the earthworks contractor for the placement of fill and confirmation that the earthworks construction techniques are in accordance with specification.

In addition to the above safeguards, the ash dam would continue to act as a sediment trap to prevent the movement of any sediment washed downslope from entering surrounding waterways. Further, the proposed EGTG would be bunded to divert surface water around the turbine and into the existing contaminated water system.

EE analyses the results from 10 discharge and monitoring sites around the facility as well as in Lake Macquarie for emergency discharge, effluent quality and volume, discharge to waters and ambient water monitoring. Limits are imposed so that for each monitoring point, the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified. In addition to temperature and pH, monitoring limits have been set for the following:

- Copper;
- Iron;
- Selenium;
- Cadmium;
- Lead;
- Manganese;
- Nitrate + nitrite (oxidised nitrogen);
- Zinc;
- Phosphorus (total) + Reactive Phosphorus; and
- Total suspended solids.

For the discharge points located within Lake Macquarie, monitoring at these points includes:

- Dissolved Oxygen;
- Temperature;
- Salinity;
- Water clarity; and
- Zooplankton.

This monitoring regime would continue and would be updated in light of the surface water monitoring program to be developed for the proposal. continue.

During operation, neither the EGTG nor the Ash Disposal is expected to impact the water resources at the EPS.

7.5.4 Residual Impacts

It is expected that there will be no off-site residual impacts associated with the proposed works upon implementation of the environmental safeguards. The quality and frequency of water discharged to Lake Macquarie is not expected to change as a result of the proposal and this will be confirmed through the monitoring programs to be implemented once the proposed upgrade

is operational. The area comprising the footprint of the expanded ash dam will undergo change as, in stages, it would be cleared and covered in ash. As this change would not impact soil and water off-site, including groundwater, it is considered that the residual impacts would not impact significantly on the surrounding environment.

7.5.5 Conclusion

This EA has identified that during preparation and construction of the ash dam, there are a number of issues to be considered. However, provided appropriate design and construction measures are undertaken, together with any required additional hydrological investigations, the issues identified are not expected to be a significant constraint to the project.

7.6 Other Environmental Issues

Additional environmental issues were identified, however the impacts resulting from the proposed expansion of the ash disposal facility and the EGTG are predicted to be minimal, and/or confined to the construction period. These additional issues include:

- Energy;
- Landscape character and visual factors;
- Hazards and Risks;
- Non-Indigenous Heritage;
- Waste Management;
- Land use;
- Social and Economic; and
- Traffic and transport.

Each of these issues are discussed below and appropriate mitigation measures are identified in **Table 7-22** where required for inclusion in the Statement of Commitments.

7.6.1 Environmental Risk/Impact

The likely risk and impact profile of each of the abovementioned issues is assessed separately in relation to each component of the project in **Tables 7-20 and 7-21** below.

Table 7-20: EGTG - Other Environmental Issues

Issue	Consideration	Risk/Impact
Energy	• Use of the 42 MW EGTG would be in the order of up to 200 hours per year on diesel fuel and potentially between 1,000 and 2,000 hours per year on mine gas. • EGTG would use up to 2.471 ML of diesel fuel per year, with 550,000 GJ gas being negotiated from a nearby coal mine. • Existing generators at EPS use approximately 6 ML of boiler light fuel oil per year as well as some 5.2 million tonnes of coal per annum.	Low

Issue	Consideration	Risk/Impact
	• When EGTG running for black-start purposes, other units at EPS would not be operational, therefore net fuel consumption would be largely unchanged at these times. • Given the small size of the proposed EGTG and the anticipated operation of up to 200 hours per year with diesel firing, the project would not contribute significantly to the Greenhouse Effect. If mine gas is used for fuel rather than lost to the atmosphere in mine operations, the EGTG could result in certain benefits in terms of emissions related to the greenhouse effect.	
Landscape character and visual factors	• The power station is separated from surrounding land uses by extensive tracts of buffer land owned by EE in an effort to minimise adverse visual and acoustic impacts. • The EGTG is consistent with surrounding land use and is will be easily absorbed by the surrounding power station environment. • The EGTG will not be visible from surrounding residential areas or public places. • Potential social and aesthetic impacts associated with construction and operation of the EGTG would be limited to the site.	Low
Hazards and Risks	• Project is not classified as 'Potentially Hazardous' or 'Potentially Offensive'. • Large quantities of distillate are already stored onsite and volumes will not be increased. • Potential hazards include fire or explosion from the storage and use of diesel and gas in the EGTG. • EGTG will not require the storage of additional diesel fuel or other hazardous materials as substantial stores of fuel are already kept on-site. • EE has an existing OH&S Management system for the site to prevent and manage safety hazards. • Project would not change the risk profile of the EPS.	Low

Issue	Consideration	Risk/Impact
Non-Indigenous Heritage	• There are no known items of heritage significance on the site listed by local government, on the State Heritage Register or the Register of the National Estate (16 August 2005). • The NSW Heritage Office State Heritage Inventory forms, has information on Eraring Wetland as a Heritage site. Eraring Wetland is gazetted under State Environmental Planning Policy No.14 – SEPP No.14 (No 879 & 880), however there is no listing for Eraring Wetland either as a cultural heritage item or a natural heritage item under the EPBC Act. In addition, the wetland is not within the same catchment as the ash dam and therefore the impacts of the proposed project are expected to be minimal.	Low
Waste Management	• During construction of the EGTG the waste materials generated are expected to include offcuts of construction materials, including concrete, metals and pipes, etc. • EE is purchasing a second hand turbine thus promoting the reuse of materials. • Given that the turbine has already been constructed, this would be delivered in a modular form, reducing the amount of construction wastes.	Low

Issue	Consideration	Risk/Impact
Land Use	• Land use at EPS includes the infrastructure associated with electricity generation and ash disposal as well as ancillary works such as transport and service infrastructure and buffer zones. • Under the provisions of LEP 2004, the EPS site is zoned part 4(1) – Industrial (Core) and part 7(2) Conservation (Secondary). The proposed EGTG is permissible with consent in these zones. • Surrounding land uses include: North – Quarries, coal loading and unloading and railway lines. South – Rural and residential lands and Lake Macquarie. East – Whiteheads Lagoon (surrounding lands zoned environmental protection) with residential lands to the south-east. West – Main northern railway line, Cooranbong Colliery and Muddy Lake wetland. Land is zoned rural and environmental protection. • The EGTG would be located within the area of the existing power station. **Section 3.4.4** outlines the components of the proposed EGTG and these are typical of the existing structures. • Construction activities would have a temporary impact on the land use of the EPS. • Operation of the EGTG would not result in a change in the land use. It would comprise an additional building and connections to the existing services and infrastructure. • The proposed EGTG is consistent with existing land use and that in the immediate surrounds.	Low

Issue	Consideration	Risk/Impact
Social and Economic	• The direct social and economic impacts of the proposed EGTG relate to direct or indirect employment impacts and benefits. • Once operational the EGTG and ash disposal facility would not require additional permanent employees at the site. It is anticipated that maintenance visits would be required at the rate of one visit per month. • Construction of the EGTG would require some use of public roads and railway systems for the delivery of equipment and removal of waste, however this would be temporary and would be at a level that would not have a significant impact upon the local road network. • The EGTG will have significant benefits in terms of securing the State's electricity supply by enabling start-up of the system after a black-out and assisting to secure continued supply during peak loads by avoiding load shedding.	Low
Traffic and Transport	• External access to the EPS would remain unchanged. • The site access is not located on a main road and is not considered to be in a sensitive location in relation to traffic and transport. • Transport impacts would be minimal and limited to the site, with a temporary increase in traffic to the site during construction. • Minor traffic increases will occur during the construction phase and would include delivery of raw materials; vehicles associated with construction activities such as excavation; and construction employee vehicles. • There will be a minor increase in traffic to the site during operation of the EGTG due to additional fuel deliveries estimated at 1 truck per week.	Low

Table 7-21: Ash Dam Expansion – Other Environmental Issues

Issue	Consideration	Risk/Impact
Energy	• Vehicles and equipment used during construction works on site would consume petrol and diesel fuel. • Energy associated with the operation of the Ash Dam would include electricity for the pump facility and plant for conditioning ash. • Energy usage during operation of proposed expanded ash dam would be largely the same as existing despite the larger pumps as these would be significantly more efficient than the pumps currently used. • Positive net energy outputs when considered in the context of the power station as a whole.	Low
Landscape character and visual factors	• The power station is separated from surrounding land uses by extensive tracts of buffer land owned by EE in an effort to minimise adverse visual and acoustic impacts. • Proposal is for an expansion to the existing ash dam therefore will not alter the existing character. • Ash dam is consistent with surrounding land use and will be readily absorbed by the surrounding landscape. • Height of ash dam will be increased, however it will not be visible from most surrounding residential areas and public places due to local terrain. • Clearing of land will be visible from distant residential areas on the Morisset Peninsula and the Wallarah Peninsula as well as from Lake Macquarie. Visual impacts will however be attenuated by distance and the gradual nature of the clearing to be carried out in increments over a period of 20 years. The overall impacts are expected to be minimal. • Other potential social and aesthetic impacts associated with construction and operation of the Ash Dam would be limited to the site.	Low

Issue	Consideration	Risk/Impact
Hazards and Risks	• Project is not classified as 'Potentially Hazardous' or 'Potentially Offensive'. • Potential hazards include contaminated runoff entering the local waterways (however this will be unlikely as ash dam will contain runoff); manual handling and ergonomic problems associated with processing work; use of complex machinery; and exposure to agents such as dust, noise and other airborne emissions. • Ash Dam will act as a sediment trap to capture runoff and prevent contaminants from entering local waterways. • EE have an existing OH&S Management system for the site to prevent and manage safety hazards.	Low
Non-Indigenous Heritage	• There are no known items of heritage significance on the site listed by local government, on the State Heritage Register or the Register of the National Estate (16 August 2005). • The NSW Heritage Office State Heritage Inventory forms, has information on Eraring Wetland as a Heritage site. Eraring Wetland is gazetted under State Environmental Planning Policy No.14 – SEPP No.14 (No 879 & 880), however there is no listing for Eraring Wetland either as a cultural heritage item or a natural heritage item under the EPBC Act. In addition, the wetland is not within the same catchment as the ash dam and therefore the impacts of the proposed project are expected to be minimal.	Low
Waste Management	• Construction of the Ash Dam would result in the generation of green waste associated with the clearing of vegetation as well as the construction materials for the pipes, storage vessels and plants. • The operation of the Ash Dam is for the storage of a by-product, or waste from the operation of the coal fired power stations. • EE currently undertake ash recovery and recycling. EE has a commercial agreement with Blue Circle Ash to recover the ash from the Ash Dam by dredging. The ash is then used in landscaping and construction projects. This process would continue with the introduction of the dense phase ash disposal facility. Additionally, EE is investigating new methods of ash recovery and reuse.	Low

Issue	Consideration	Risk/Impact
Land Use	• Land use at EPS includes the infrastructure associated with electricity generation and ash disposal as well as ancillary works such as transport and service infrastructure and buffer zones. • Under the provisions of LEP 2004, the EPS site is zoned part 4(1) – Industrial (Core), part 7(2) Conservation (Secondary) and part 9 Natural Resources. The proposed ash dam expansion is permissible with consent in these zones. • Surrounding land uses include: North – Quarries, coal loading and unloading and railway lines. South – Rural and residential lands and Lake Macquarie. East – Whiteheads Lagoon (surrounding lands zoned environmental protection) with residential lands to the south-east. West – Main northern railway line, Cooranbong Colliery and Muddy Lake wetland. Land is zoned rural and environmental protection. • The expanded ash dam would be located at the site of the existing ash dam, however would require the acquisition of an additional 35 ha of land. The Ash Dam would also require new piping, storage vessels and conditioning plant and pump facility. • Construction activities would have a temporary impact on the land use of the EPS. • Construction of the expansion to the ash disposal facility would result in a direct impact on the existing land use of the area, and would require the clearing of vegetation for the expanded facility and the access roads. • There is the potential for dust and noise to be generated during construction, however these impacts could be managed to ensure that receivers surrounding the site are not be adversely impacted from the construction works. • The proposed new ash dam is consistent with existing land uses and that of the immediate surrounds.	Low

Issue	Consideration	Risk/Impact
Social and Economic	• The social and economic impacts of the expanded ash disposal facility relate to direct or indirect employment impacts and benefits. • Construction of the ash disposal facility is predicted to take up to 24 months, and EE encourages the use of local contractors, where possible, for construction. • The proposed expansion to the ash disposal facility would require some use of public roads for the delivery of equipment and removal of waste, however this would be temporary and would be at a level that would not have a significant impact upon the local road network. • The ash dam would have social and economic benefits in terms of securing the operation of EPS during its scheduled operational life by providing adequate ash disposal facilities.	Low
Traffic and Transport	• External access to the EPS would remain unchanged; however an additional internal access route would be constructed to the proposed expanded ash disposal facility. • The site access is not located on a main road and is not considered to be in a sensitive location in relation to traffic and transport. • Transport impacts would be minimal and limited to the site, with a temporary increase in traffic to the site during construction. • The main traffic increases will occur during the construction phase and would include delivery of raw materials; vehicles associated with construction activities such as excavation; and construction employee vehicles. • No increase in rate of ash generation or disposal, therefore there would be no increase in traffic during operation of the new ash disposal facility.	Low

7.6.2 Environmental Safeguards and Residual Impacts

The following environmental safeguards will be included in the Statement of Commitments and implemented as an integral part of the project. Residual impacts are also listed and further addressed below.

Table 7-22: Environmental Safeguards and Residual Impacts

Issue	Safeguards	Residual Impact
Energy	Limit the use of non-renewable energy sources by: • Utilising modern and well maintained equipment to encourage fuel efficiency; • Minimise idling times on vehicles by switching off when not operational; • Switching off truck and construction equipment engines when waiting to enter or exit a site or during loading and unloading; and • Switching off associated lighting and computer equipment when not in use.	• Some additional use of energy resources during construction and operation.
Landscape character and visual factors	• Clearing of land will be staged over a number of years to minimise visual impacts. • Land will be rehabilitated upon decommission of the ash disposal facility.	• Area and height of ash dam will be increased. • Landform and vegetative cover will be altered.
Hazards and Risks	• All equipment would be regularly serviced and maintained in accordance with the EMP. • All emergencies and incidents are to be handled in accordance with the Eraring Energy's Occupational Health and Safety Management system. • Compliance with EE's Occupational Health and Safety Management system, which complies with Australian regulatory guidelines, Codes of Practice and Standards. It outlines procedures that are aimed at preventing safety hazards, such as appropriate storage and handling of dangerous substances and appropriate handling of equipment.	• None predicted
Non-Indigenous Heritage	• None required.	• None predicted

Issue	Safeguards	Residual Impact
Waste Management	• The construction and operation of the EGTG and Ash Dam would be undertaken in a manner to avoid and minimise waste. Where possible, materials would be reused or recycled to minimise the generation of waste to landfill. • EE has an environmental management system (EMS) which ensures wastes are monitored and reduced.	• Some waste will be produced as a result of construction.
Land Use	• Implementation of management measures to mitigate air quality, noise and impacts associated with vegetation clearing to minimise the potential for the project to adversely affect the surrounding environment.	• None predicted
Social and Economic	• EE will encourage the use of local contractors, where possible, for construction.	• None predicted
Traffic and Transport	• Existing traffic management measures and safety measures would be maintained on the site.	• None predicted

7.7 Cumulative Impacts

Cumulative impacts on the environment can be considered on a project basis, taking into account each element on a locality or regional basis as well as taking into account the interacting impacts of other projects in the immediate locality and the region.

Within the region as well as within the broader area north to the Hunter, there are a number of existing electricity generating power stations. EE is proposing to establish black start capability through the installation of the EGTG. This is at the request of NEMMCO to ensure the continual functioning of the EPS in the event of a system shutdown. There are no known Dense Phase Ash Dams being established in the locality.

As the impacts of the individual environmental factors are minimal, no significant cumulative impact is anticipated from the proposed project provided the safeguards detailed in **Sections 7.14, 7.24, 7.35, 7.45, 7.53 and Table 7-22** are implemented. The cumulative impact of the project with other known projects currently operating in the area has been taken into account since the existing project forms part of the existing environment. There are no known major development proposals in the locality.

8 STATEMENT OF COMMITMENTS

8.1 Introduction

In accordance with the EA requirements issued under Part 3A of the EP&A Act, the following Statement of Commitments (SoC) is provided. The SoC states EE's environmental commitments and details on the environmental management and monitoring of the proposed project during its construction and operational activities.

EE commit to the preparation and implementation of the environmental management and monitoring plans and environmental mitigation measures detailed in the SoC for the proposed improvement works to EPS as detailed below.

8.2 Statement of Commitments

The SoC prepared in respect of the proposed works at EPS has been compiled on an issues basis and is informed by the environmental risk analysis and impact assessment undertaken as part of this EA. The SoC has been written in a format which can be incorporated into any project approval issued to act as the conditions of that approval.

Table 8-1: Statement of Commitments

<table>
<tr><th>Environmental Issue</th><th>Commitment</th></tr>
<tr><td>Air Quality</td><td>1. EE will ensure that air pollution emissions from the development do not cause any exceedances of the criteria listed below at any sensitive receptor:
<table>
<tr><th rowspan="2">Pollutant</th><th colspan="5">Averaging Period</th></tr>
<tr><th>10 minute</th><th>15 minute</th><th>1 hour</th><th>8 hour</th><th>24 hour</th></tr>
<tr><td>Nitrogen Dioxide</td><td>nc</td><td>nc</td><td>246</td><td>nc</td><td>nc</td></tr>
<tr><td>Sulfur Dioxide</td><td>712</td><td>nc</td><td>570</td><td>nc</td><td>228</td></tr>
<tr><td>Carbon Monoxide</td><td>nc</td><td>100</td><td>30</td><td>10</td><td>nc</td></tr>
<tr><td>PM_{10}</td><td>nc</td><td>nc</td><td>nc</td><td>nc</td><td>50</td></tr>
<tr><td>VOC</td><td>nc</td><td>nc</td><td>nc</td><td>nc</td><td>nc</td></tr>
</table>
2. EE shall use all practicable measures to minimise air pollutant emissions from the development.</td></tr>
</table>

Environmental Issue	Commitment
	3. EE shall undertake further air quality assessment in respect of the ash dam expansion addressing the following: • Dust generation from the dense phase emplacement and impacts on ambient air quality by dispersion modelling in accordance with "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales"*, DEC August 2005; and • Description of measures proposed to control dust emissions from the dense phase emplacement. A report detailing the above shall be submitted to the Director-General prior to the issue of Project Approval for the proposed ash dam expansion.
Flora and Fauna	4. EE shall undertake land clearing in a staged manner over a twenty year period at the following approximate rate of vertical rise up the ridgeline: • First Year – 5 m • Years 1 to 5 – 5 m • Years 5 to 10 – 5m • Years 10 to 20 – 5 m Each stage of clearing would be subject to further ecological assessment with a copy provided to the Department of Planning. 5. EE shall retain a buffer zone of a minimum of 20 m from the ridgeline within which there shall be no clearing of land. 6. Prior to commencing the proposed works, EE shall prepare, and then subsequently implement a Flora and Fauna Management Plan for the development which shall be submitted to the Director-General. The Flora and Fauna Management Plan shall include details of the timing of clearing to ensure that it does not coincide with critical periods in the lifecycles of significant species, general safeguards to be installed and monitoring programs to be implemented. The Management Plan shall also include a Vegetation Clearance Protocol incorporating details on:

Environmental Issue	Commitment
	• the delineation of areas of remnant vegetation to be cleared; • progressive clearing; • the identification of fauna management strategies; • the collection of seed from the local areas; • the salvage and reuse of material from the site; and • the control of weeds during clearing activities. • measures to minimise the occurrence of feral pests; • selective planting of native vegetation; and • the provision of roosting/nesting resources for fauna. 7. EE shall take all practicable measures to minimise vegetation clearing during the development. 8. Prior to the first stage of clearing EE shall install artificial nest boxes within nearby woodland, particularly within the buffer area. Artificial nest and roost boxes shall be installed to replace tree hollows at a ratio of 2:1 and their condition shall be regularly monitored. Details of this monitoring program are to be incorporated into the Biodiversity Management Plan being prepared for the EE lands. 9. EE shall prepare and implement a rehabilitation plan which shall be submitted to the Director-General that utilises soil and regolith stripped during clearing in rehabilitation of existing, and if practicable, the ash deposited as part of the proposed development. The rehabilitation of the ash dam shall utilise a similar community to that which is proposed to be cleared, particularly with regard to the nectar producing species. The rehabilitation plan shall describe the measures that would be implemented to revegetate the site including: • measures to control the occurrence of weeds;

Environmental Issue	Commitment
Noise	10. Potentially noisy activities on the site shall be limited to Monday to Friday, 7.00am to 6.00pm and Saturday 7.00am to 1.00pm with no work to be carried out on Sundays or Public Holidays other than in emergency situations. 11. EE shall ensure that construction activities are scheduled such that the noisiest works are not undertaken simultaneously and EE shall inform residents in the vicinity of the site of the proposed works schedule along with the number for the telephone complaints line existing at the site. 12. EE shall ensure that plant and equipment warm-up and idling is not undertaken outside the restricted hours or at the site boundary. 13. The proposed EGTG is to have a 15 m stack height and will be encased within an acoustic enclosure and fitted with an exhaust silencer and air intake silencer to ensure noise emissions are maintained at an acceptable level at site boundaries. 14. EE shall undertake post-commissioning monitoring to confirm the noise predictions made against the actual noise contribution achieved at the residential receivers identified in this EA.
Water and Soils	15. As part of the detailed design of the proposed ash dam expansion, EE shall undertake a hydrological study of the site in order to ensure that the proposed works do not significantly alter site hydrology or the local flooding regime. These details shall be submitted to the Director-General's satisfaction. 16. As part of the detailed design of the ash dam expansion, EE shall undertake surface and groundwater studies addressing the following: • The likely quality and quantity of surface water runoff from the dense phase emplacement area and any impact on receiving waters; • The likely quality and quantity of seepage and leachate from the dense phase emplacement and any impact on receiving ground waters; • Description of control measures proposed to minimise pollution of surface and ground waters from the dense phase emplacement area. A report detailing these studies shall be submitted to the Director-General prior to the granting of Project Approval for the ash dam expansion.

Environmental Issue	Commitment
	17. Except as may be expressly provided by a DEC licence, EE shall comply with Section 120 of the *Protection of the Environment Operations Act 1997* during the carrying out of the development. 18. Prior to carrying out any development, EE shall prepare, and then subsequently implement a Soil and Water Management Plan for the development. This plan must be submitted to the Director-General and shall include: (a) an Erosion and Sediment Control Plan that: • is consistent with the requirements of *Landcom's Managing Urban Stormwater: Soils and Construction* manual; • identifies activities that could cause soil erosion and generate sediment; • describes the location, function and capacity of erosion and sediment control structures; and • describes measures to minimise soil erosion and the potential for the migration of sediments to downstream waters; and (b) a Surface Water Monitoring Program. 19. EE shall take all practicable measures to minimise the erosion and the potential discharge of sediments from the site.
Indigenous Heritage	20. In the event that an Aboriginal site or object is discovered during the carrying out of the development, EE shall cease work immediately and make contact with the Department of Environment and Conservation. 21. EE shall obtain section 90 consents under the *National Parks and Wildlife Act 1974* prior to destroying any Aboriginal sites or objects found during the carrying out of the development.
Landscape and Visual	22. EE will undertake land clearing associated with the development in a staged manner, as described in commitment no. 3. 23. Upon decommission of the ash dam, EE will rehabilitate the land in accordance with a rehabilitation plan approved by the Director General, as described in commitment no. 7.
Hazards and Risks	24. EE shall undertake all works associated with the construction and operation of the EGTG and expanded ash dam in accordance with its Occupational Health and Safety Management system.

Environmental Issue	Commitment
Waste Management	25. EE shall undertake all works associated with the construction and operation of the EGTG and expanded ash dam in accordance with its environmental management system (EMS) for waste to ensure that waste is monitored and reduced. 26. EE shall continue to investigate and pursue opportunities for the reuse of ash. A report detailing the steps undertaken by EE to increase the reuse of ash shall be submitted to the Director-General and DEC every two years from the date of project approval or at such other interval agreed by the Director-General.

9 RESIDUAL RISK ANALYSIS

9.1 Approach

The Environmental Risk Analysis for the proposed project is based on a process adapted from Australian Standard AS 4369:1999 Risk Management, as well as environmental risk tools developed by other organisations. The process is qualitative and is based on the Residual Risk Matrix shown in **Table 9-1**.

Residual Environmental Risk is assessed on the basis of the significance of environmental effects of the proposed project and the ability to confidently manage those effects to minimise harm to the environment.

The significance of environmental effects is given a numerical value between 1 and 5 based on the receiving environment, the level of understanding of the type and extent of impacts, and community response to the environmental consequences of the project. This enables both the actual and perceived impacts to be considered. The manageability of environmental effects is similarly given a numerical value between 1 and 5 based on the complexity of mitigation measures, the known level of performance of the safeguards proposed, and the opportunity for adaptive management. The numerical value allocated for each issue is based upon the following considerations:

Significance of Effects

5. *Extreme*
   Undisturbed receiving environment; type or extent of impacts unknown; substantial community concern.

4. *High*
   Sensitive receiving environment; type or extent of impacts not well understood; high level of community concern.

3. *Moderate*
   Resident receiving environment; type and extent of impacts understood; community interest.

2. *Minor*
   Disturbed receiving environment; type and extent of impacts well understood; some local community interest.

1. *Low*
   Degraded receiving environment; type and extent of impacts fully understood; uncontroversial project.

Manageability of Effects

5. *Complex*
   Complicated array of mitigation measures required; safeguards or technology are unproven; adaptive management in appropriate.

4. *Substantial*
   Significant mix of mitigation measures required; limited evidence of effectiveness of safeguards; adaptive management feasible.

3. *Straightforward*
   Straightforward range of mitigation measures required; past performance of safeguards is understood; adaptive management easily applied.

2. *Standard*
   Simple suite of mitigation measures required; substantial track record of effectiveness of safeguards; adaptive management unlikely to be required.

1. *Minimal*
   Little or no mitigation measures required; safeguards are standard practice; adaptive management not required,

The numbers are added together to provide a result which provides a ranking of potential residual effects of the project when the safeguards identified in this EA are implemented.

Table 9-1: Residual Risk Matrix

Significance of Effects	Manageability of Effects				
	5 Complex	4 Substantial	3 Straightforward	2 Standard	1 Minimal
1 Low	**6 (Medium)**	**5 (Low/Medium)**	**4 (Low/Medium)**	**3 (Low)**	**2 (Low)**
2 Minor	**7 (High/Medium)**	**6 (Medium)**	**5 (Low/Medium)**	**4 (Low/Medium)**	**3 (Low)**
3 Moderate	**8 (High/Medium)**	**7 (High/Medium)**	**6 (Medium)**	**5 (Low/Medium)**	**4 (Low/Medium)**
4 High	**9 (High)**	**8 (High/Medium)**	**7 (High/Medium)**	**6 (Medium)**	**5 (Low/Medium)**
5 Extreme	**10 (High)**	**9 (High)**	**8 (High/Medium)**	**7 (High/Medium)**	**6 (Medium)**

9.2 Analysis

The analysis of residual environmental risk for issues related to the proposed project is shown in **Tables 9-2 and 9-3 and 36**. This analysis indicates the environmental risk profile for the proposed project based on the assessment of environmental effects, the identification of appropriate safeguards, and the Statement of Commitments shown in this EA.

Table 9-2: Risk Profile – Proposed EGTG

Issue	Significance	Manageability	Residual Risk
Air	2	2	Low/Medium (4)
Ecology	1	1	Low (2)
Noise Vibration	2	3	Low/Medium (5)
Indigenous Heritage	2	2	Low/Medium (4)
Soil and Water	1	2	Low (3)

Issue	Significance	Manageability	Residual Risk
Energy	1	1	Low (2)
Landscape and Visual Factors	1	1	Low (2)
Non-Indigenous Heritage	1	1	Low (2)
Waste Management	1	1	Low (2)
Hazards and Risks	1	1	Low (2)
Land Use	1	1	Low (2)
Social and Economic	1	1	Low (2)
Traffic and Transport	1	1	Low (2)

Table 9-3: Risk Profile – Proposed Ash Dam Expansion

Issue	Significance	Manageability	Residual Risk
Air	2	3	Low/Medium (5)
Ecology	3	3	Medium (6)
Noise Vibration	1	2	Low (3)
Indigenous Heritage	2	2	Low/Medium (4)
Soil and Water	3	2	Low/Medium (5)
Energy	1	1	Low (2)
Landscape and Visual Factors	2	2	Low/Medium (4)
Non-Indigenous Heritage	1	1	Low (2)
Waste Management	1	1	Low (2)
Hazards and Risks	1	1	Low (2)
Land Use	1	1	Low (2)
Social and Economic	1	1	Low (2)
Traffic and Transport	1	1	Low (2)

The above residual risk analysis indicates that the proposed EGTG presents an overall low risk in relation to each of the identified environmental issues provided that the recommended mitigation measures are implemented. In relation to the proposed ash dam expansion, ecology is considered to be the greatest environmental risk, however these impacts can be managed with the recommended mitigation measures to reduce this risk. The potential risks in relation to other identified environmental issues are considered to be Medium to Low with the implementation of recommended mitigation measures.

10 PROPOSAL JUSTIFICATION

The proposed improvements to EPS would have numerous benefits including increasing the security and reliability of the State's electricity supply and increasing the efficiency of waste disposal on the site which would have resultant benefits for the local and wider community.

Operational efficiencies on the site resulting from the expansion of the ash dam will enable a greater volume of ash to be safely disposed of without sterilising significant amounts of additional land or increasing environmental impact. The proposed EGTG will address a key Transgrid requirement and a NEMMCO request for improved black-start capability in the Northern region without significantly increasing emissions or other undesirable impacts.

The proposed upgrade works therefore provide greater sensitivity in electricity generation in the wider Region and the State in an environmentally responsible manner.

10.1 Justification

Schedule 2 of the EP&A Regulation and the Director-General's requirements issued for this project require justification for the project to be provided, having regard to biophysical, economic and social considerations together with the principles of Ecologically Sustainable Development (ESD). The assessment of the proposal undertaken in this EA, and in particular in **Chapter 7** has incorporated biophysical, economic and social considerations.

10.1.1 Biophysical

The potential biophysical impacts associated with the proposed project have been assessed in **Chapter 7** of this EA and include examination of the following impacts:

- Air quality;
- Ecology;
- Landform, geology and soils; and
- Water quality.

The proposed works involve the installation of an EGTG which would be used to restart the power station in the event of a collapse of the State electricity supply and to supplement electricity production during times of peak demand. An air quality assessment was undertaken in respect of the proposal and concluded that the works would not result in a significant increase in emissions at the power station.

As discussed in this EA, the proposed project requires the clearing of some vegetation on the site however this will be undertaken in a staged manner over a period of some twenty-five to thirty years thus minimising the impact. The ecological assessment undertaken in respect of the proposed works (summarised in **Section 7.2**) concludes that with the proposed safeguards there will be no significant impact upon threatened species or ecological communities.

The project has the potential to result in impacts upon soils through the excavation and earthworks required. However, as discussed in this EA, due to the nature of the works, there will be minimal earthworks associated with the proposal and therefore the development is not expected to have significant impacts provided that the mitigation measures outlined in **Section 7.5.3** are implemented. Similarly with water quality, the proposal is not expected to have additional water quality impacts over and above those already associated with the existing power station. The proposed ash dam will act as a sediment trap, trapping sediment laden

runoff and preventing it from entering surrounding waterways, thus minimising potential water quality impacts.
The assessment of the impact of the proposed project on each of the biophysical elements of the environment has concluded that providing management measures and monitoring systems are implemented to mitigate potential impacts, the proposed project would not have a significant impact.

As required under Part 3A of the EP&A Act, environmental mitigation, management and monitoring requirements have been compiled and summarised into a Statement of Commitments, which is provided as **Section 8** of this EA.

The project is therefore justifiable in terms of the biophysical elements of the environment.

10.1.2 Economic

The proposed project would provide both direct and indirect economic benefits to the local, regional and state economies. The construction phase of the proposal would generate local employment opportunities and income to local businesses in the Lake Macquarie area. Similarly, the operational phase of the proposed project would provide indirect benefits through maintenance, environmental management and monitoring. The proposed project would also provide economic benefits to the State through the improved security and reliability of the State electricity supply.

Given these benefits, the proposed project is justifiable on economic grounds.

10.1.3 Social

The potential social impacts of the proposed project have been assessed in **Section 7.6** of this EA, and include consideration of a range of issues, including the following key issues:

- Noise;
- Indigenous and Non-Indigenous heritage;
- Amenity; and
- Landscape character and visual impact.

Other social or cultural issues assessed as part of the EA include hazard and risk, social and economic matters, energy, waste and cumulative impacts of the project on the environment.

A number of these issues interrelate with the biophysical and economic impacts of the project, where, as described above, it has been concluded that the project would not have a significant impact provided mitigation measures are implemented, and that the project is justifiable on biophysical and economic grounds.

This EA demonstrates that EE has endeavoured to address the issues raised by DoP and other State Agencies in terms of social impacts. The noise impact assessment predicted that given the significant separation between the power station and the nearest residents, as well as the scale of the works in the context of the wider power station site, there would be no significant adverse noise impacts. Overall, the project is not considered to have significant impacts on amenity or social impacts on the community, given its location within the EPS site and in respect to sensitive receptors, design and management measures to be implemented in accordance with the Statement of Commitments. The project is therefore justifiable on social grounds.

10.2 Ecologically Sustainable Development

The term 'ecologically sustainable development' was introduced by the Commonwealth Government in June 1990, defined as:

> *Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. (ref: Ecologically Sustainable Development: A Commonwealth Discussion Paper)*

ESD Working Groups were subsequently established and involved representatives of government, industry, environment, union, welfare and consumer groups. The ESD Working Groups developed a series of policy directions and recommendations which provided the foundation for development of the *National Strategy for Ecologically Sustainable Development*.

The *National Strategy for Ecologically Sustainable Development* was endorsed by the Council of Australian Governments in December 1992. In addition, the *Intergovernmental Agreement on the Environment* (IGAE) was signed in 1992 by Federal and State Governments, Territories and the Australian Local Government Association, promoting intergovernmental cooperation.

ESD is a concept now firmly entrenched in NSW environmental legislation and government policy. The concept of ESD has been given legal definition in NSW by the Protection of the Environment Administration Act 1991 (NSW). Section 6(1)(a) of that Act requires the NSW DEC (formerly EPA) which was established by the Act, in its role in protecting, restoring and enhancing the quality of the environment in NSW, to have regard to the need to maintain ecologically sustainable development requiring the effective integration of economic and environmental considerations in decision making processes.

Schedule 2 of the EP&A Regulation clearly establishes four guiding principles to assist in achieving ESD, as follows:

- **The precautionary principle** – namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- **Inter-generational equity** – namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- **Conservation of biological diversity and ecological integrity** – namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.
- **Improved valuation and pricing of environmental resources** - namely, that environmental factors should be included in the valuation of assets and services, such as polluter pays, full life cycle costing, and utilising incentive structures/market mechanisms to meet environmental goals.

The EPBC Act also identifies a fifth principle for consideration in environmental impact, namely:

> *Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations.*

These five principles are interrelated and need to be considered both individually and collectively as part of determining whether or not a project would contribute be consistent with the principles of ESD in Australia.

10.2.1 Precautionary Principle

The IGAE in its definition of the precautionary principle advises that both public and private decisions should undertake the following:

- *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and*
- *an assessment of the risk-weighted consequences of various options.*

Eraring Energy has taken on board the 'precautionary principle' for the proposed ash dam and EGTG, as represented by investigation of alternative site locations, alternative ash disposal methods, investigation into different types of EGTG and the investigations undertaken to determine the characteristics of the environment, and the likely impacts associated with the preferred option.

As detailed in **Section 3.2**, the proposed option was considered the most appropriate as it is the most efficient, has minimal construction and land requirements and subsequent minimal environmental impacts.

The identification of potential impacts to the environment through environmental studies undertaken as part of this EA has enabled the proposed project to be designed to avoid significant environmental impacts, and has allowed environmental management measures to be developed to manage potential impacts so that significant adverse environmental impacts are avoided.

Environmental monitoring of the operations and the recommended safeguards would also be undertaken for the life of the project, to ensure that the environmental impacts are appropriately managed and adjustments made to ensure environmental strategies and goals are met for the site. Upon decommissioning, works would be undertaken to rehabilitate the area.

10.2.2 Intergenerational Equity

The principle of 'intergenerational equity' requires that decisions made by the present generation would not result in a degradation of the environment for future generations.

The proposed ash dam and EGTG would have minimal long-term impacts on the environment as a result of detailed planning for the preferred design, ash disposal method and location of the ash dam and EGTG to avoid significant impacts on the environment.

The operational impacts associated with the ash dam and EGTG would be minimal and would be managed through the implementation of environmental management measures. The design and management of the proposed project would allow environmental impacts to be managed during the operational phase and during decommissioning of the ash dam. The ash dam and EGTG would not result in significant long term environmental damage, thereby meeting the principle of 'intergenerational equity'.

10.2.3 Biological Diversity and Ecological Integrity

The principle of 'biological diversity and ecological integrity' requires a full and diverse range of plant and animal species to be maintained and conserved.

Consideration of the impacts of the proposed project on terrestrial ecology has been undertaken as part of development of the project through environmental investigations. A comprehensive flora and fauna survey was undertaken as part of the environmental assessment and concluded

that there is the potential for the project to impact upon certain threatened species and as such, appropriate environmental safeguards have been recommended to minimise these potential impacts.

Monitoring of the environmental safeguards and environmental impacts would be carried out for the lifetime of the project.

With the implementation of the recommended safeguards, it is considered that the project meets the principle of biological diversity and ecological integrity.

10.2.4 Valuation and Pricing of Environmental Resources

The IGAE and POEO Act require improved valuation, pricing and incentive mechanisms to be included in policy making and program implementation. In the context of environmental assessment and management, this would translate to environmental factors being considered in the valuation of assets and services.

Integration of environmental and economic goals is a key principle of ESD, which can be measured undertaking a cost-benefit analysis, that is, by measuring the costs of proceeding with a project against the benefits arising from the project.

Given the different values placed on an environment, and the various components of an environment, it is difficult to assign a monetary value against the environmental costs and benefits associated with the project. Given this, the approach adopted for this project is the management of environmental impacts through appropriate safeguards, and to include the cost of implementing recommended safeguards in the total cost of the project.

Relevant to the consideration of the valuation and pricing of environmental resources are the environmental assessment and alternative options which have been developed during planning of the ash dam and EGTG.

The value of the environment is also managed through the legislative process by imposing financial penalties or requirements to rehabilitate on persons responsible for polluting the environment.

EE would implement the safeguards and monitoring requirements outlined in this EA to minimise environmental impacts caused by the proposed ash dam and EGTG, and to minimise the potential for pollution to occur.

10.2.5 Decision Making Process

The proposed project requires approval under Part 3A of the EP&A Act 1979. As part of this approval, a variation to the existing Environment Protection Licence may be required under the POEO Act, as described in **Section 4.4.1** of this EA.

An assessment of the short, medium and long term impacts of the proposed ash dam and EGTG, taking into account the principles of ESD is described in this EA. The Statement of Commitments, provided in **Section 8**, forms the environmental mitigation, management and monitoring requirements for the project and its proposed operations.

The project approval process prescribed under Part 3A of the EP&A Act and subsequent environmental management frameworks ensure that decision making and monitoring of the project would be undertaken in an integrated manner, having regard to relevant issues associated with the project within its context.

10.3 Climate Change and Greenhouse Effect

The Greenhouse Effect involves certain gases, known as greenhouse gases, capturing heat radiated from the earth and re-radiating heat back to the earth. The thermal balance that is known to control earth's climate is maintained by this mechanism, and is influenced by the steadily increasing concentrations of certain greenhouse gases, with other greenhouse gases including methane, ozone (O_3), NOx and Chloro-Fluorocarbons (CFCs).

The direct amount of CO_2 generated as a result of the proposed EGTG is estimated to be 6,800t per annum.

The *Lake Macquarie Greenhouse Action Plan 2004* prepared by LMCC provides data on existing greenhouse gas emissions in the LGA and sets targets and actions for the reduction of greenhouse gas emissions into the future.

The Action Plan states that in 1995, some 26 million tonnes of greenhouse gases (CO2) were produced in the LGA by community activities, with 60% of this being from industrial sources. The additional 6,800 tonnes per annum of CO2 estimated to be produced by the proposed EGTG therefore represents an increase of 0.03% on this figure and as such is considered to be insignificant.

Overall, the construction and operation of the proposed upgrade works as a whole is not expected to contribute significant levels of greenhouse gases, and would not therefore have a significant impact on the greenhouse effect.

10.4 Consequences of Not Proceeding

The proposed EGTG will be used for black-starting of the Station's coal fired units and for operation during power system emergency conditions. The requirement for an additional North region power station with a gas turbine restart source is identified in Transgrid's *NSW Power System Restart Capability Strategy Paper* which finds that present restart capability for the North region is not sufficient for reliable system restart. Should the proposed installation of the EGTG at EPS not proceed, this requirement would remain unaddressed, with implications for the reliability of the State electricity supply.

The last blackout to occur in NSW was in 1964. Whilst the conditions that require system black-start are fortunately rare, the societal and economic consequences are so great that a reasonable effort is justified in preparing to meet such a contingency. In addition to the black-start process, the EGTG would also be used to supplement the electricity generated by the station during power system emergency conditions brought about by excess demand.

The proposed expansion of the EPS ash dam is critical to the longevity of the power station 's operation as the capacity of the current facility will be exhausted by the year 2011/2012. EPS has an expected life beyond 2030, therefore should the ash dam expansion project not proceed the power station may not be able to operate beyond 2011/2012 unless an alternative method of disposal was identified. Whilst EE is continuing with its attempts to identify alternative methods of ash disposal, particularly reuse, the expansion of the ash dam is a vital contingency to secure the continued operation of the power station into the future. Without this facility, the future of EPS is threatened with serious implications for the reliability and security of the State electricity supply.

10.5 Conclusion

The proposed upgrade works to EPS described in this EA are consistent with the principles of ESD and are justifiable taking into account potential biophysical, economic and social considerations.

11 SUMMARY OF FINDINGS

11.1 Physical and Pollution Effects

The physical and pollution effects of the proposal include the potential for air pollution as a result of the proposed EGTG, the potential for water pollution associated with the ash dam expansion and the potential for noise emissions both during the construction and operation of the two project components.

Section 7.1 of this EA details the air quality modelling which was undertaken as part of the environmental investigations which concludes that the emissions resulting from the proposed EGTG would have a negligible impact upon local air quality.

Similarly **Sections 7.3** and **7.4** of the EA address the potential noise and water/soil impacts of the proposal and conclude that with the use of appropriate safeguards as outlined in the EA, these impacts would not be significant.

Overall, the proposal poses a low risk in terms of physical and pollution effects.

11.2 Biological Effects

The proposed ash dam expansion requires the clearing of some 52 hectares of land over a period of 20 years. Extensive flora and fauna investigations were undertaken as part of this EA as detailed in **Section 7.2**. The assessments undertaken indicated that the loss of this vegetation must be mitigated by a number of measures including the staging and timing of clearing, the installation of artificial nest boxes and roost boxes and maintaining a buffer of 20 m from the ridgeline.

Provided that these mitigation measures are implemented the proposal is considered to be a medium risk in terms of biological effects due to the clearing required to facilitate the ash dam expansion. The potential economic and social benefits of the proposal are considered to outweigh this risk.

11.3 Resource Implications

The subject site is already used for a power station and as such, has access to the necessary infrastructure and services required for the proposed project. The proposal will result in some additional traffic during the construction period and will use some additional fuel during operation however, overall, the resource implications of the project are considered to be negligible.

11.4 Community Effects

The community and social effects of the proposed EGTG and ash dam project are limited to the visual impact of the proposed clearing associated with the ash dam expansion. This clearing would be visible from distant areas across Lake Macquarie however the incremental nature of this clearing and the time scale over which it is to be undertaken (some 20 years) means that the impact will be gradual and minimal.

The potential for noise and traffic to impact upon local amenity has been examined in this EA and was found to be negligible on both accounts.

The project will result in community benefits in terms of providing local employment opportunities, particularly during the construction period as well as increasing the security and reliability of the State electricity supply for the benefit of the general public.

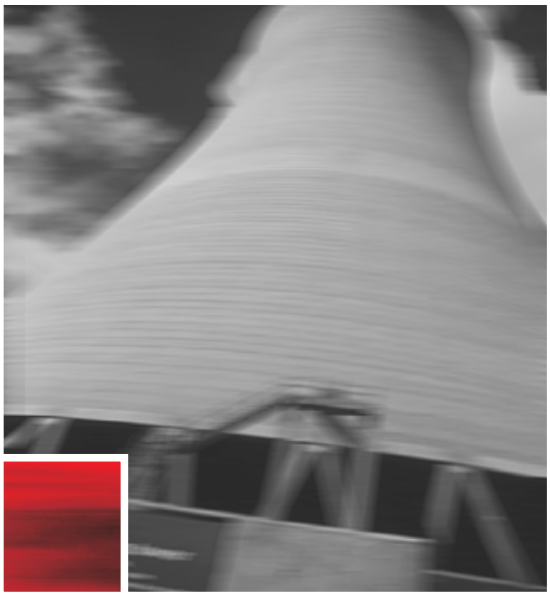
12 CONCLUSION

The proposed project comprises the installation of an EGTG and the expansion of the existing ash disposal dam at EPS.

The purpose of the EGTG is to provide for black-start capability, allowing EPS to re-start efficiently in the event of a total system black-out. The EGTG will also supplement power generation during peak times allowing load shedding to be avoided and therefore increasing the reliability and security of the State electricity supply. The proposed expansion to the ash dam is required to accommodate the full ash disposal needs of the power station for its current operational life.

The applicant is seeking project approval for the installation of the EGTG and concept approval for the expansion of the ash dam. The proposal is identified as a 'Major Project' under SEPP 2005, therefore the Minister for Planning is the approval authority.

The proposal has been subject to environmental assessment in accordance with Part 3A of the *Environmental Planning and Assessment Act 1979* and the requirements issued by the Director General. The environmental assessment undertaken concludes that whilst the project will have certain residual impacts, the mitigation measures recommended will effectively reduce these to an acceptable level of environmental risk. The proposal stands to provide significant public benefit in terms of improved security of the State's electricity supply and these benefits are considered to outweigh the residual environmental impacts identified in this EA.



figures

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

Site Location
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

FIGURE
1

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
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Site Layout and Location of Ash Dam

Eraring Energy

Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

FIGURE

2

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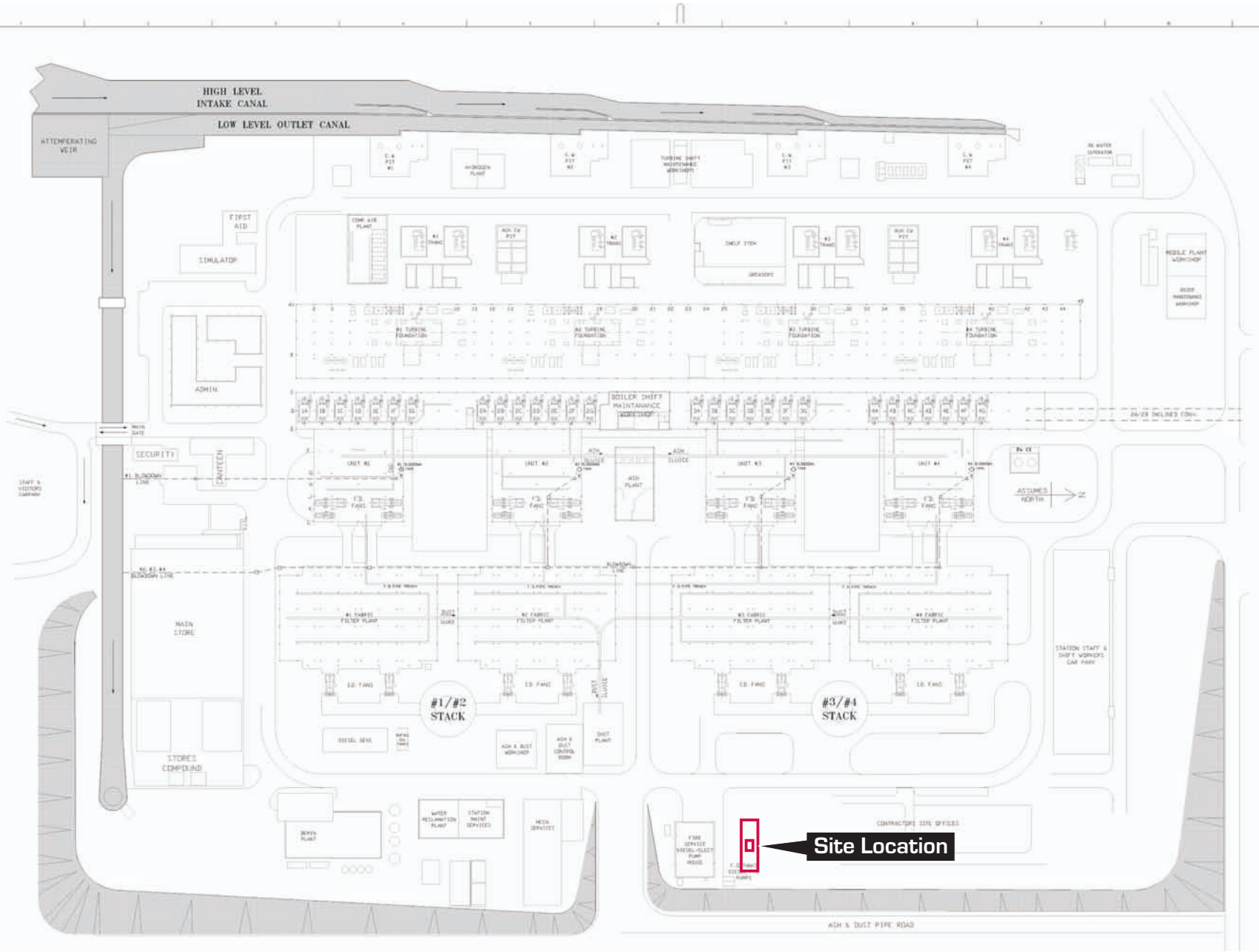
Existing Ash Dam Footprint
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 400m

FIGURE
3



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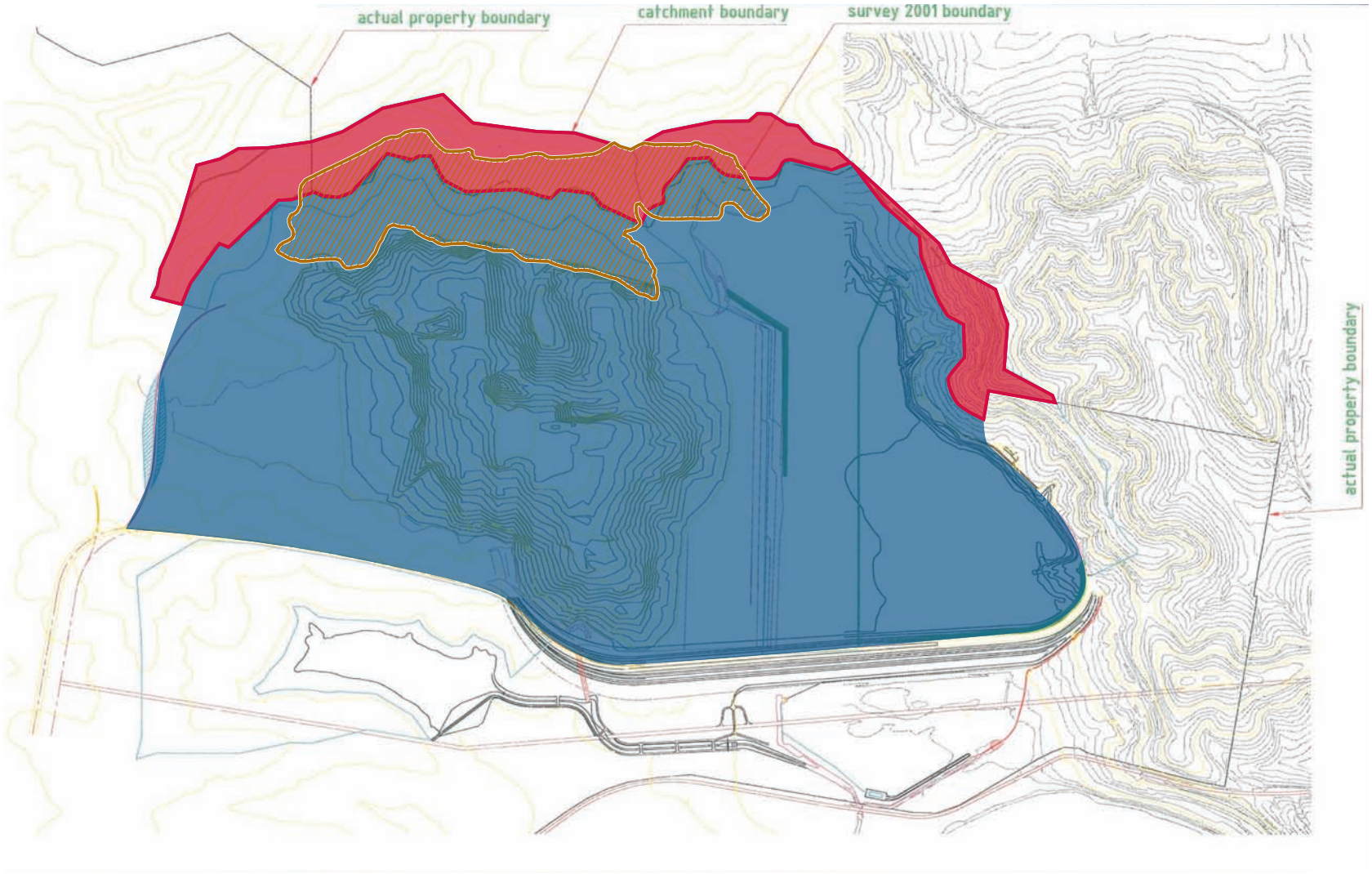
Location of Proposed EGTG
Eraring Energy

Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

FIGURE
4



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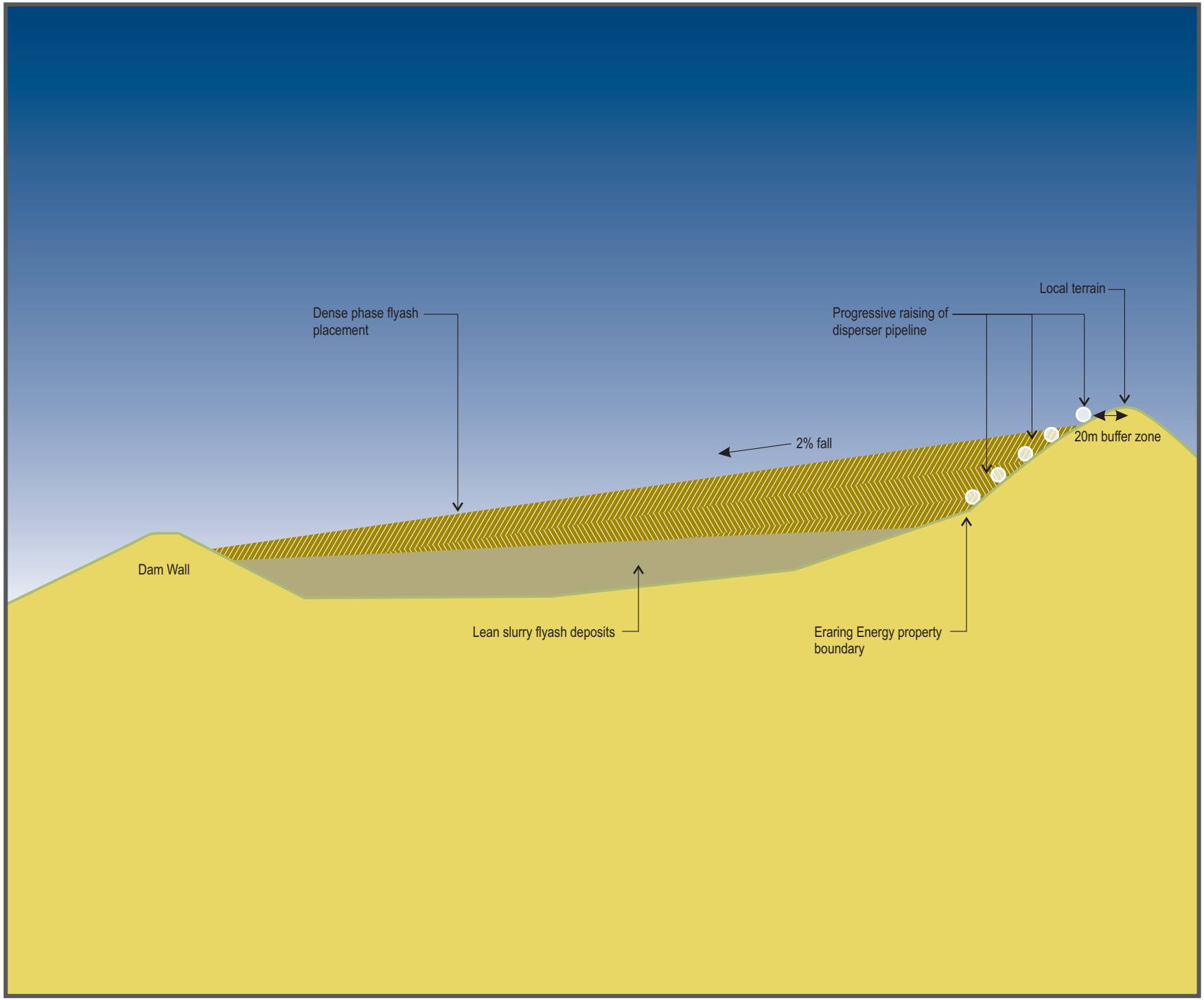
Additional land to be purchased
Existing EPS land
Proposed ash dam expansion

Indicative Footprint of Proposed Expanded Ash Dam
Eraring Energy

Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

FIGURE
5



PROJECT-FILE NAME	**S6036304**
DATE	**3 May 2006**
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Proposed Ash Disposal Method
Eraring Energy

Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

FIGURE
6

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Proposed ash dam expansion

Sensitive receptor

Sensitive Receptor Locations
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 400m

FIGURE 7

PROJECT-FILE NAME	S6036304
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Site boundary

Flora and Fauna Survey Study Area
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

N

0 150m

FIGURE 8

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Site boundary
Surveyed transects
HLA 2005 Survey
HLA 2004 Survey
Biosis 1999 Survey

Location of Flora Surveys
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

N

0 150m

FIGURE 9

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- Site boundary
- Spotlight transect
- Terrestrial A sized Elliot traps (20 per transect)
- B sized Elliot traps - 5 clustered
- 30 minute Bird observation location
- Terrestrial cage traps - 2 per location
- B sized Elliot trap
- Owl callback playback broadcast location
- Echolocation recording
- Echolocation recording (HLA 2004)

Location of Fauna Surveys
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

N

0 150m

FIGURE 10

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Site boundary
Coastal Plains Smooth-barked Apple Woodland
Coastal Plains Scribbly Gum Woodland

Vegetation Community Extents
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 11

PROJECT-FILE NAME	S6036304
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Site boundary
Tetratheca juncea

Location of *Tetratheca juncea*
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 12

PROJECT-FILE NAME	S6036304
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- Site boundary
- *Blandfordia grandiflora*
- *Bossiaea stephensonii*
- *Cymbidium suave*
- *Doryanthes excelsa*
- *Hakea bakeriana*
- *Pultenaea tuberculata*

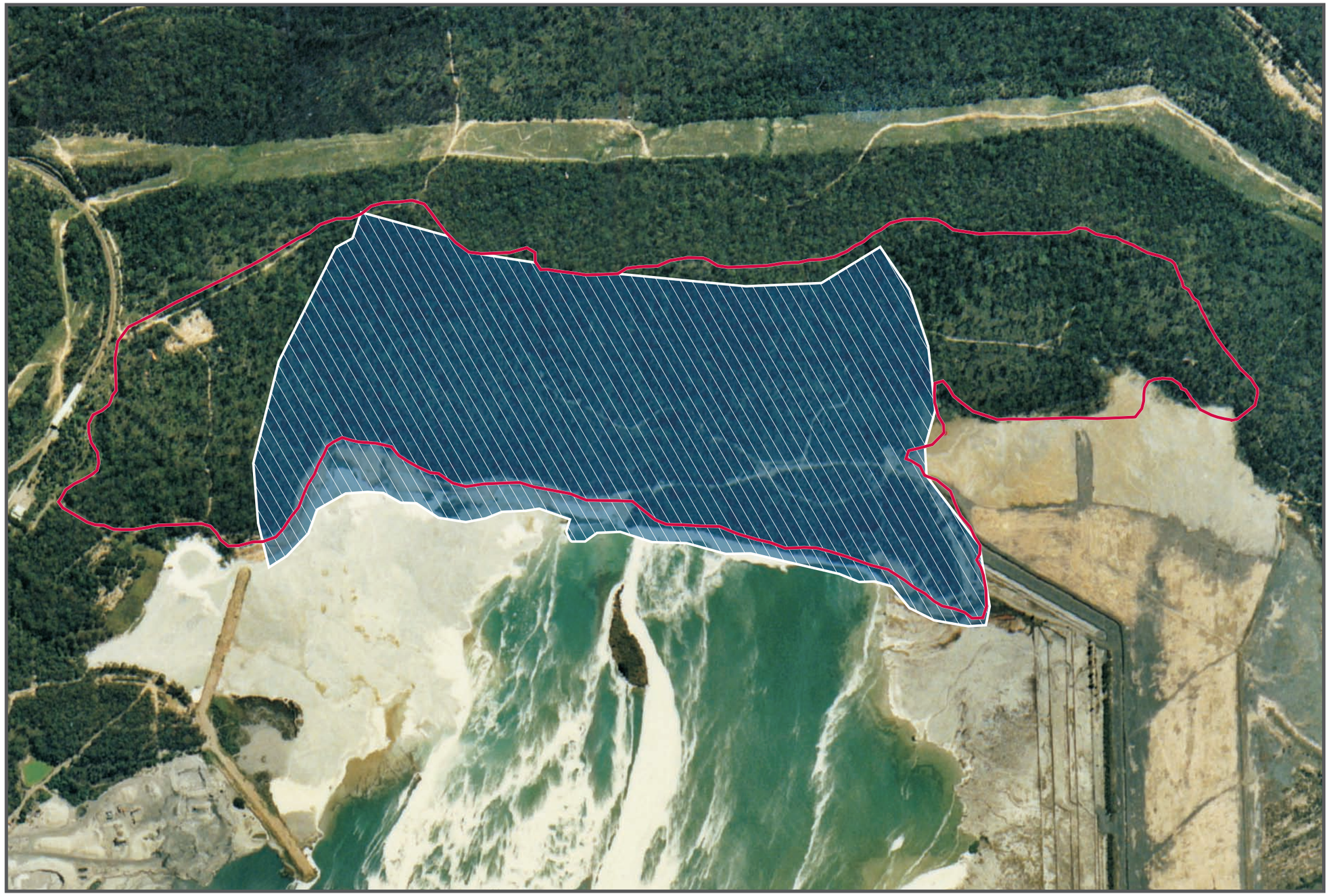
Location of Additional Significant Flora Species
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

N

0 150m

FIGURE 13



PROJECT-FILE NAME	S6036304
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Site boundary

Proposed ash disposal area

Approximate Area of Proposed Ash Disposal
Within Study Area
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 14

PROJECT-FILE NAME	S6036304
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Proposed ash dam expansion

Sensitive receptor location
1 - Eraring Public School
2 - 53 Point Piper Road
3 - 6a Border Street

Nearest Sensitive Noise Receivers
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 400m

FIGURE
15

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
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Proposed ash dam expansion

Sensitive receptor location

Operator Attended Noise Measurement Locations
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 400m

FIGURE 16

PROJECT-FILE NAME	S6036304
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Proposed ash dam expansion
Known archaeological site

Known Archaeological Sites
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 400m

FIGURE
17

PROJECT-FILE NAME	S6036304
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APPROVED	

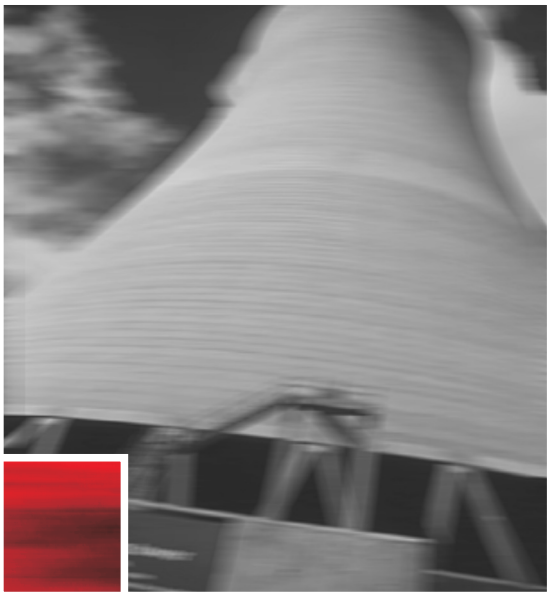
Proposed ash dam expansion
Transect location

Archaeological Transects
Eraring Energy
Environmental Assessment -
Proposed Upgrade to Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 200m

FIGURE
18



appendix a

record of minister's opinion

Record of Minister's authorisation of a Concept Plan under section 75M(1) of the Environmental Planning and Assessment Act 1979

I, the Minister for Planning, authorise the submission of a Concept Plan for the development described in the Schedule below.

Schedule

A proposal to expand the existing ash dam at the Eraring Power Station, generally as described in *Alterations and Additions to the Existing Eraring Power Station, Environmental Assessment Scoping Report*, prepared by HLA-Envirosciences Pty Limited and dated September 2005.

Frank Sartor
Minister for Planning

Date: 26/1/06

NSW GOVERNMENT
Department of Planning

Record of Minister's opinion for the purposes of Clause 6(1) of the State Environmental Planning Policy (Major Projects) 2005

I, the Director-General of the Department of Planning, as delegate of the Minister for Planning under delegation executed on 31 October 2005, have formed the opinion that the development described in the Schedule below, is development of a kind that is described in Schedule 1 of the State Environmental Planning Policy (Major Projects) 2005 – namely Clause 24 "Development for the purpose of an electricity generation facility that has a capital investment value of more than $30 million - and is thus declared to be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies for the purpose of section 75B of that Act.

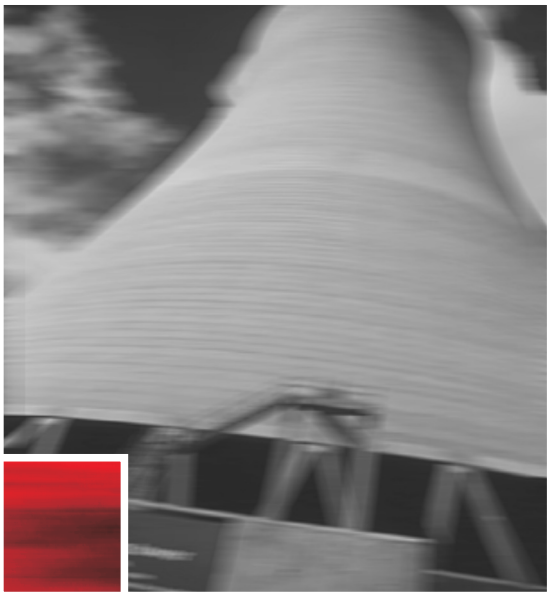
Schedule

A proposal to construct and operate an emergency gas turbine generator and to upgrade and expand an existing ash dam facility at the Eraring Power Station, Rocky Point Road (Lots 301 & 302 DP 806475, Lot 3/8 Section L DP 6747, Lots 13/16 Section O & Part Lot 13/16 Section U DP 6747 and Lot 7/16 DP 262501), Eraring, in the Lake Macquarie Local Government Area, generally as described in a letter dated 7 July 2005 from Eraring Energy to the Department of Planning.

S Haddad

Sam Haddad
Director-General

Date: 6/12/2005.



appendix b

environment assessment requirements

NSW GOVERNMENT
Department of Planning

Contact: Chris Ritchie
Phone: (02) 9228 6413
Fax: (02) 9228 6466
Email: chris.ritchie@dipnr.nsw.gov.au

23 DEC 2005

Our ref: 9040403
Your ref:

Mr Michael England
Senior Principal, National Practice Leader
Environmental Planning
HLA Envirosciences
PO Box 726
PYMBLE NSW 2073

Dear Mr England

Proposed Emergency Gas Turbine Generator and Expansion of the Ash Dam Facility, Eraring Power Station, – Lake Macquarie Local Government Area

I refer to your correspondence of 7 October 2005, in which you sought the Environmental Assessment requirements under Part 3A of the *Environmental Planning and Assessment Act 1979* for the above project.

Pursuant to section 75(3) of the Act, you are hereby notified of the Director-General's Environmental Assessment requirements for the proposed remediation project, which are provided in the attachment to this letter.

It should be noted that the Director-General's requirements have been prepared based on the information provided to date. Under section 75F(3) of the Act, the Director-General may alter or supplement these requirements if necessary and in light of any additional information that may be provided prior to the proponent seeking approval for the project.

You should ensure that you consult with the Department prior to submission of a draft Environmental Assessment to determine:

- fees applicable to the application;
- relevant land owner notification requirements;
- consultation and public exhibition arrangements that will apply; and
- number and format (hard-copy or CD-ROM) of the Environmental Assessments that will be required.

Once you have lodged the Environmental Assessment, the Department will consult with the relevant authorities to determine the adequacy of the Environmental Assessment. Following this review period the Environmental Assessment will be made publicly available for a minimum period of 30 days.

You should keep the contact officer for this project, Chris Ritchie ((02) 9228 6413, chris.ritchie@dipnr.nsw.gov.au), up to date with the progress of preparation of the Environmental Assessment, and seek clarification of any issues that may be unclear or may arise during this process.

Yours sincerely

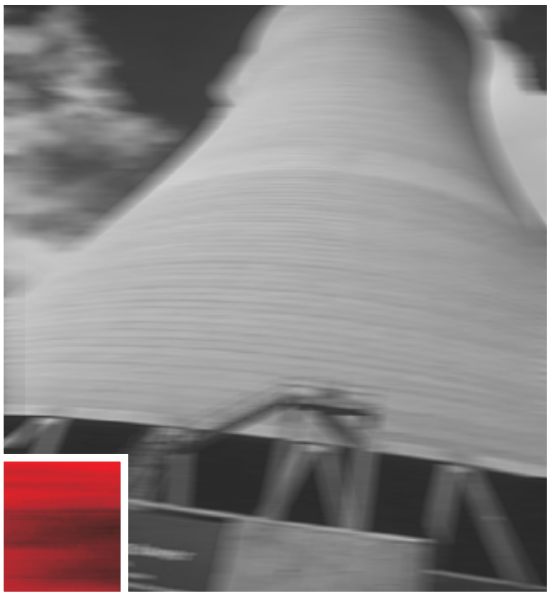
19.12.05

Chris Wilson
A/ Deputy Director General

ENVIRONMENTAL ASSESSMENT REQUIREMENTS UNDER PART 3A OF THE *ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979*

Project	The construction and operation of an emergency gas turbine generator and upgrade and expansion of the existing ash dam facility at the Eraring Power Station.
Site	Lots 301 & 302 DP 806475, Lot 3/8 Section L DP 6747, Lots 13/16 Section O & Part Lot 13/16 Section U DP 6747 and Lot 7/16 DP 262501, Eraring, in the Lake Macquarie Local Government Area
Proponent	Eraring Energy
Date of Issue	19 December 2005
Date of Expiration	19 December 2007
General Requirements	The Environmental Assessment must include: • an executive summary; • a description of the proposal, including construction, operation and staging; • details of the location of the project and environmental planning provisions applicable to the site and the project; • consideration of alternatives to the project; • an assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below; • proposed mitigation/ management measures of residual environmental impacts; • justification for undertaking the project with consideration of the benefits/ impacts of the proposal, and proposed management/ mitigation/ monitoring; • a draft Statement of Commitments for environmental mitigation, management and monitoring for the project; and • certification by the author of the Environment Assessment that the information contained in the Assessment is neither false nor misleading.
Key Assessment Requirements	The Environmental Assessment must include assessment of the following key issues: • **Air Quality Impacts** – the Environmental Assessment must include an assessment of the air quality implications of the project, particularly in relation to petrochemical smog formation (including details of the types of fuel on which the assessment is based), dust and odour during the construction and operational phases of the development and proposed management measures. In relation to the gas turbine, the assessment must also assess local, regional, interregional and cumulative air quality impacts. The air quality assessment must assess relevant parameters and air pollutants in accordance with *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2000) and the draft policy *Assessment and Management of Odour from Stationary Sources in NSW* (EPA, 2001). • **Ash Waste Disposal** – the Environmental Assessment must outline the scope of the ash disposal process and any proposed development options, details of any proposed staged implementation of the disposal option, scale of the proposed disposal area, the proposed ash process, the anticipated quantity to be disposed and consideration of options for developing and expanding the beneficial reuse of power station ash as an alternative to land disposal. • **Noise and Vibration** – the Environmental Assessment must include an assessment of the predicted noise impacts resulting from the operation of the project and the measures to manage any noise impacts and proposed management measures. The noise assessment must be undertaken in accordance with the *Industrial Noise Policy* (EPA, 1999) and *Environmental Criteria for Road Traffic Noise* (EPA, 1999). The assessment must extend to noise emissions from traffic associated with the project, and must identify all noise sources from the project and specify the times of operation for all noise producing activities; • **Ecological Impacts** - the Environmental Assessment must include an assessment of ecological impact as a result of the proposed development including a description of the type of vegetation in the immediate and surrounding area, an outline of the level of vegetation to be cleared, measures to minimise any impacts such as level of clearing required and

	any rehabilitation proposed. The ecological assessment must also assess the potential impacts of the proposal on both terrestrial and aquatic critical habitats; threatened species, populations or ecological communities, or their habitats in accordance with section 5A of the *Environmental Planning and Assessment Act 1979*. • **Heritage** - include an assessment of heritage impact of the development the site and surrounds, including identification of all areas of archaeological potential as well as the significance and any potential impacts on all indigenous, non-indigenous and natural heritage items, draft items and elements of historic/heritage significance (i.e. elements not specifically identified as individual items) on the site. • **Soil and Water** – the Environmental Assessment must include an assessment of the water and soil quality impacts associated with the development, taking into account surface water, stormwater and groundwater. This must include an assessment of the potential works within or adjacent to the waterways (including Lake Macquarie) present at the site and the long-term management of these aquatic and riparian ecosystems during site operations. The assessment must also have consideration to potential impacts on the flooding regime in the locality; • **General Environmental Risk Analysis** – notwithstanding the above key assessment requirements, the Environmental Assessment must include an environmental risk analysis to identify potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of these additional key environmental impacts must be included in the Environmental Assessment. • **Environmental Planning Instruments** – the Environmental Assessment must include an assessment of the project against the relevant heads of consideration in applicable environmental planning instruments, including the *State Environmental Planning Policy No. 14 0 Coastal Wetlands, State Environmental Planning Policy No.33 – Hazardous and Offensive Development, State Environmental Planning Policy No.55 – Remediation of Land, Hunter Regional Environmental Plan 1989 and Lake Macquarie Local Environmental Management Plan 2004*. • **Other matters** - all relevant matters raised in the Brief for the Planning Focus Meeting and at the Planning Focus Meeting of 30 September 2005.
Consultation Requirements	You must consult with the following parties during the preparation of the Environmental Assessment: • NSW Department of Environment and Conservation; • Lake Macquarie Council; • Department of Lands; • Department of Natural Resources; and • affected residents and relevant community groups.
Deemed refusal period	Pursuant to clause 8E(2) of the *Environmental Planning and Assessment Regulation 2000*, the deemed refusal period for the project will be 60 days.



appendix c

letter of authorisation for concept plan

NSW GOVERNMENT
Department of Planning

Contact: Scott Jeffires
Phone: 02 9228 6426
Fax: 02 9228 6466
Email: scott.jeffires@dipnr.nsw.gov.au

Mr Michael England
Senior Principal, National Practice Leader
Environmental Planning
HLA Envirosciences Pty Limited
PO Box 726
PYMBLE NSW 2073

Our ref: 9040403
Your ref:

Dear Mr England

Authorisation of a Concept Plan for the Extension of an Existing Ash Dam, Eraring Power Station, Lake Macquarie LGA

Please find attached a record of the Director-General's opinion under delegation of the Minister of Planning, which indicates that the abovementioned project is declared to be a project to which Part 3A of the *Environmental Planning and Assessment Act, 1979* (as amended) applies.

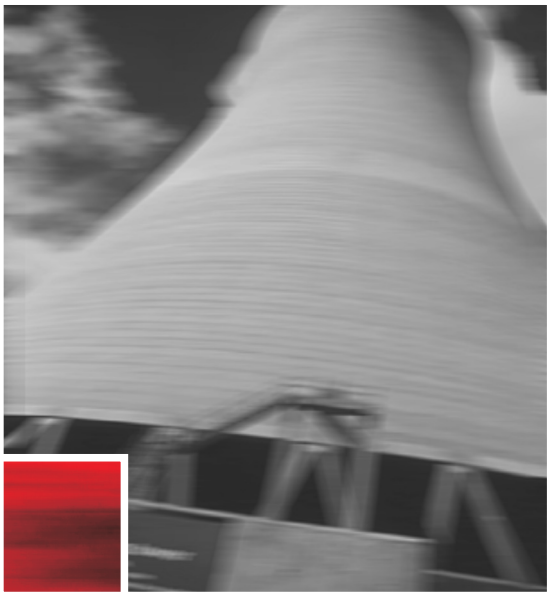
The Minister has also authorised the submission of a Concept Plan for the development, as indicated in the attached record.

If you have any queries regarding the above, please contact me on (02) 9228 6426 or via email scott.jeffries@dipnr.nsw.gov.au.

Yours sincerely

20/02/06

Scott Jeffries
Manager, Critical Infrastructure and Special Projects
Office of Sustainable Development Assessments and Approvals



appendix d

eps environment protection licence

Archived: 16-Feb-2005

Environment Protection Authority

Environment Protection Licence

Section 55 Protection of the Environment Operations Act 1997

- Licence number: 1429
- File number: 270758
- Licence Anniversary Date: 31-December
- Review date not later than 01-Jul-2005

Licence Type
Premises

Licensee
ERARING ENERGY
PO BOX 5044
DORA CREEK NSW 2264

Licensed Premises
ERARING POWER STATION
3 & 28 ROCKY POINT ROAD AND 45 POINT PIPER ROAD
ERARING NSW 2264

Fee Based Activity	Scale
Electricity Generation - Generation of electrical power from coal (34[a])	> 4000 - Gwh generated

EPA Region
Hunter
Ground Floor, NSW Govt Offices, 117 Bull Street
NEWCASTLE WEST NSW 2302
Phone: 02 49086800
Fax: 02 49086810

PO Box 488G NEWCASTLE
NSW 2300

Information about this licence

Dictionary

The licence contains a dictionary, which defines terms used in the licence. It is found at the end of the licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- Ensure persons associated with you comply with this licence, as set out in section 64 of the Act.
- Control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act).
- Report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Transfer of licence

Transfer of the licence to another person may be requested by the licensee using the form for this purpose available from the EPA.

Variation of licence conditions

Variations to the conditions of this licence may be requested by the licensee using the form for this purpose available from the EPA. The EPA may also vary a licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 3 years after the issue of the licence, as

set out in Part 3.6 of the Act. You will receive advance notice of the licence review. For licences held immediately before 1 July 1999, the first review will take place before 1 July 2002.

Fees and annual return to be sent to the EPA

The licence requires you to forward to the EPA an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints).

The Annual Return must be submitted within 60 days after the end of each reporting period. Where a licence is transferred, surrendered or revoked, a special reporting period applies.

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Usually the licence fee period is the same as the reporting period.

See condition R1 and the accompanying form regarding the Annual Return requirements.

The EPA publication "A Guide to Licensing" contains information about how to calculate your licence fees.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications
- licence conditions and variations
- statements of compliance

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

Licence anniversary date

31-December

This licence is issued to

ERARING ENERGY
PO BOX 5044
DORA CREEK NSW 2264

subject to the conditions which follow:

1 Administrative conditions

A1 What the licence authorises and regulates

A1.1 Not applicable.

A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity
Electricity Generating Works

Fee Based Activity	Scale
Electricity Generation - Generation of electrical power from coal (34[a])	> 4000 - Gwh generated

A1.3 Not applicable.

A2 Premises to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
ERARING POWER STATION
3 & 28 ROCKY POINT ROAD AND 45 POINT PIPER ROAD
ERARING
NSW
2264
LOTS 301 & 302 DP 806475; LOT 3/8 SECTION L DP 6747; LOT 13/16 SECTION O & PART LOT 13/16 SECTION U DP 6747 AND LOT 7/16 DP 262501

A3 Other activities

A3.1 This licence applies to all other activities carried on at the premises, including:

Chemical Storage Facilities
Coal Works
Sewage Treatment Systems

A4 Information supplied to the EPA

A4.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

(a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
(b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to air and water and applications to land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Description of Location
11	Air emissions monitoring Discharge to air	Air emissions monitoring Discharge to air	Boiler 1 discharge to stack as shown on site plan ER328067A
12	Air emissions monitoring Discharge to air	Air emissions monitoring Discharge to air	Boiler 2, discharge to stack as shown on site plan ER328067A
13	Air emissions monitoring Discharge to air	Air emissions monitoring Discharge to air	Boiler 3 discharge to stack as shown on site plan ER328067A
14	Air emissions monitoring Discharge to air	Air emissions monitoring Discharge to air	Boiler 4 discharge to stack as shown on site plan ER328067A
15	Ambient air monitoring		Ambient air monitoring station at Marks Point primary school
16	Ambient air monitoring		Ambient air monitoring station at Dora Creek
18	Ambient air monitoring		Depositional dust monitoring at not less than six sites located within 1 kilometer of coal handling operations having regard to seasonal wind conditions and any sensitive receptors.

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

P1.3 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

EPA identi-fication no.	Type of monitoring point	Type of discharge point	Description of location
1	Effluent quality and volume monitoring Discharge to waters	Effluent quality and volume monitoring Discharge to waters	Cooling water outlet canal to Myuna Bay
2	Emergency discharge to waters	Emergency discharge to waters	The emergency ash dam outlet at the culvert under Main Road 217
3		Discharge to utilisation area	Utilisation area adjacent to sewage treatment works
4	Ambient water monitoring		The waters of Lake Macquaire located at the cooling water inlet to Eraring Power Station
5	Ambient water monitoring		The waters of Lake Macquaire located at the outlet of the cooling waters from Eraring Power Station
6	Ambient water monitoring		The waters of Lake Macquaire located at the Eraring/Vales Point mixing zone
7	Ambient water monitoring		The northern waters of Lake Macquarie
8	Water monitoring		Inlet canal of the cooling water intake from Lake Macquaire
10	Effluent quality and volume monitoring		Ash dam return canal, below the siphon pond.
17	Effluent quality monitoring Emergency discharge to waters	Effluent quality monitoring Emergency discharge to waters	Emergency discharge to toe drain collection pond

3 Limit conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Load limits

L2.1 The actual load of an assessable pollutant discharged from the premises during the reporting period must not exceed the load limit specified for the assessable pollutant in the table below.

Note: An assessable pollutant is a pollutant which affects the licence fee payable for the licence.

L2.2 The actual load of an assessable pollutant must be calculated in accordance with the relevant load calculation protocol.

Assessable Pollutant	Load limit (kg)
Benzo(a)pyrene (equivalent) (Air)	
Coarse Particulates (Air)	
Fine Particulates (Air)	

Assessable Pollutant	Load limit (kg)
Fluoride (Air)	
Nitrogen Oxides (Air)	
Salt (Estuarine Waters)	1
Selenium (Estuarine Waters)	
Sulfur Oxides (Air)	
Total suspended solids (Estuarine Waters)	

L2.3 The number 1 appearing against the item Assessable Pollutants (Salt Estuarine Waters) in table L2.2 is to indicate that there is no load limit for salt specified for estuarine waters.

L3 Concentration limits

L3.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L3.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L3.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table/s.

Air

POINTS 11,12,13,14

Pollutant	Units of measure	100 percentile concentration limit
Cadmium	mg/m3	1.0
Chlorine	mg/m3	200
Mercury	mg/m3	1.0
Nitrogen Oxides	g/m3	2.5
Hydrogen chloride	mg/m3	100
Solid Particles	mg/m3	100
Sulfuric acid mist and sulfur trioxide (as SO3)	mg/m3	100
Total Fluoride	mg/m3	50
Hazardous substances	mg/m3	10

POINT 1

Pollutant	Units of Measure	50%Limit	90%Limit	98.5%Limit	100 percentile Concentration Limit
Copper	ug/L				5
Iron	ug/L				300
Selenium	ug/L				2
Temperature	oC			35	37.5

POINT 2

Pollutant	Units of Measure	50%Limit	90%Limit	98.5%Limit	100 percentile Concentration Limit
pH	pH				6.5-9.5
Total suspended solids	mg/L				50

L3.4 The reference basis for the air pollutants specified in condition L3.3 for points 11, 12, 13 and 14 are as follows:

For Solid particles, dry, 273 K, 101.3 kPa, corrected to 12% CO_2 or equivalent oxygen percentage.

For Sulphuric acid mist (H_2SO_4) and/or sulphur trioxide (SO_3), chlorine (Cl_2), Hydrogen chloride (HCl), Total Fluoride, Hazardous substances, Cadmium (Cd) and Mercury (Hg): dry, 273 K, 101.3 kPa.

L4 Volume and mass limits

L4.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:

(a) liquids discharged to water; or;

(b) solids or liquids applied to the area;

must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of measure	Volume/Mass Limit
1	ML/day	11000
2	ML/day	150
3	kL/day	250

L5 Waste

L5.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L5.2 This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.

L5.3 The following wastes generated on the premises may be disposed of to the ash dam or within the ash dam catchment:

(i) ash;
(ii) dead sea grass and silt, natural lake silt and shells, silt removed from settlement basis on the premises, coal, fines from settlement basins and conveyor wash-down on the premises, boiler chemical cleaning residues and rinse water, saline solutions from the water reclamation plant (including ferrous chloride used for phosphorous removal), water polishing plant residues and rinse waters, de-oiled fresh water, used fabric filters, mine dewatering from Awaba State Mine;
(iii) any material approved in writing by the EPA to control dust emission from the ash dam; and
(iv) any material approved in writing by the EPA.

L6 Noise Limits

L6.1 Not applicable.

L7 Potentially offensive odour

L7.1 No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

4 Operating conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.

This includes:
(a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
(b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
(a) must be maintained in a proper and efficient condition; and
(b) must be operated in a proper and efficient manner.

O3 Effluent application

O3.1 Effluent application must not occur in a manner which causes surface runoff.

O3.2 Spray from effluent application must not drift beyond the boundary of the premises.

O3.3 Adequate notices, warning the public not to drink or otherwise use the treated effluent, must be erected on the site. These notices must be legible English and in any other languages as may be necessary, and must indicate at least that the water in use is "Reclaimed Water - Unfit for Drinking".

O4 Management of utilisation area

O4.1 The quantity of effluent/solids applied to the utilisation area must not exceed the capacity of the area to effectively utilise the effluent/solids.

For the purpose of this condition, 'effectively utilise' include the use of the effluent/solids for pasture or crop production, as well as the ability of the soil to absorb the nutrient, salt, hydraulic load and organic material.

O5 Water - Operational conditions

O5.1 The anti-foaming agent DEAIREX 8042, DEAIREX 7055 or Defoamer PS may be added to the outlet canal at a rate of up to 500 litres per day.

O5.2 Except under emergency conditions, any overflow from the ash dam must be discharged via the cooling water outlet canal, Discharge Point 1.

O5.3 Ferrous chloride may be added to the condenser cooling water.

O5.4 Sawdust derived from untreated timber may be added to the condenser cooling water at a rate not exceeding 10 cubic meters per year.

O5.5 Boiler blowdown may be discharged to the cooling water system.

O5.6 Uncontaminated surface runoff from the site may be discharged to the cooling water system.

O5.7 Overflow from the coal fines settling pond as a result of rainfall may discharge to the cooling water system.

O5.8 Under emergency conditions the overflow from the ash dam may be discharged via Crooked Creek and Discharge Point 2. Any such discharge must be reported to the EPA.

O5.9 Water from the ash dam toe drains must be collected and returned to the ash dam. Under emergency conditions the toe drain water may be discharged via Discharge Point 17. Any discharge must be reported to the EPA.

O6 Fuels – Operating conditions

O6.1 Coal and alternative liquid fuels must not be burnt in the electricity generating works unless they comply with the specification in the tables below:

COAL

Impurity	Units of measure	100 percentile Concentration Limit (Monthly Average, 8% H_2O)
Sulphur	% by weight	0.5

LIQUID FUELS

Impurity	Units of measure	100 percentile Concentration Limit (Monthly Average)
Sulphur	% by weight	0.5

O6.2 The following fuels may be used in the power station for station start-up and combustion support provided that they comply with the specification set out in this licence:

- Distillate / heating oils
- Distillate / heating oils blended with refined oil additives

O6.2.1 The licensee must sample and analyse sufficient samples of fuel received on the premise to assess whether the fuel complies with the specifications in this licence.

O6.2.2 Fuel oils containing Polychlorinated biphenyls (PCB's) are not permitted to be used in the power station.

O7 Specifications

Distillate / heating oil and distillate refined oil blends burnt in the power station must comply with the specifications in Table 1.

Table 1

Characteristic of Fuel	Limit	Test Method
Ag	less than 10 ppm by weight	
As	less than 10 ppm by weight	Pre-treatment method USEPA
Be	less than 10 ppm by weight	200.2(waters)
Cd	less than 5 ppm by weight	
Cr (total)	less than 30 ppm by weight	Pre-treatment Method
Co	less than 10 ppm by weight	HNO3/H2O2 (Oils/Organic
Cu	less than 50 ppm by weight	matrices)
Hg	less than 10 ppm by weight	
Mn	less than 50 ppm by weight	
Mo	less than 50 ppm by weight	
Ni	less than 50 ppm by weight	Analysis
Pb	less than 50 ppm by weight	APHA 20 th Ed under part 3000
Sb	less than 15 ppm by weight	
Se	less than 15 ppm by weight	
Sn	less than 40 ppm by weight	
V	less than 40 ppm by weight	
Polychlorinated biphenyls	less than 2 ppm by weight	USEPA 8081A
Energy	10 - 48 MJ per Kg	AS1038.5
Sulphur (total)	less than 0.5% by weight	AS1038.6.2
Fluorine (total)	less than 0.05% by weight	AS1038.10.4D (2001)
Chlorine (total)	less than 0.50% by weight	AS1038.8.2

O8 Source Emission Testing - Alternative Fuel Burning Trials

Any distillate / heating oil or distillate refined oil blend that complies with the specification in Table 2 may be burnt for the purpose of undertaking emission monitoring trials in accordance with monitoring specified in this licence.

Table 2

Characteristic of Fuel	Limit	Test Method
Ag	less than 10 ppm by weight	
As	less than 50 ppm by weight	Pre-treatment method USEPA
Be	less than 50 ppm by weight	200.2(waters)
Cd	less than 20 ppm by weight	
Cr (total)	less than 100 ppm by weight	Pre-treatment Method HNO3/H2O2
Co	less than 50 ppm by weight	(Oils/Organic matrices)
Cu	less than 100 ppm by weight	
Hg	less than 20 ppm by weight	
Mn	less than 250 ppm by weight	
Mo	less than 200 ppm by weight	Analysis
Ni	less than 250 ppm by weight	APHA 20 th Ed under part 3
Pb	less than 200 ppm by weight	
Sb	less than 50 ppm by weight	
Se	less than 50 ppm by weight	
Sn	less than 100 ppm by weight	
V	less than 150 ppm by weight	
Polychlorinated biphenyls	less than 2 ppm by weight	USEPA 8081A
Energy	10 - 48 MJ per Kg	AS1038.5
Sulphur (total)	less than 1.10% by weight	AS1038.6.3 2
Fluorine (total)	less than 0.05% by weight	AS1038.10.4 (2001)
Chlorine (total)	less than 0.50% by weight	AS1038.8.2 (1996)

5 Monitoring and recording conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
(a) in a legible form, or in a form that can readily be reduced to a legible form;
(b) kept for at least 4 years after the monitoring or event to which they relate took place; and
(c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

(a) the date(s) on which the sample was taken;
(b) the time(s) at which the sample was collected;
(c) the point at which the sample was taken; and
(d) the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Copper	ug/L	Quarterly	Grab sample
Iron	ug/L	Quarterly	Grab sample
Selenium	ug/L	Quarterly	Grab sample
Temperature	oC	Continuous	In line instrumentation

POINT 2

Pollutant	Units of measure	Frequency	Sampling Method
Selenium	mg/L	Each overflow event	Grab sample
Total suspended solids	mg/L	Each overflow event	Grab sample
pH	pH	Each overflow event	Grab sample

POINT 8

Pollutant	Units of measure	Frequency	Sampling Method
Copper	ug/L	Quarterly	Grab sample
Iron	ug/L	Quarterly	Grab sample
Selenium	ug/L	Quarterly	Grab sample
Temperature	oC	Daily	In line instrumentation

POINT 10

Pollutant	Units of measure	Frequency	Sampling Method
Cadmium	ug/L	Quarterly	Grab sample
Copper	ug/L	Quarterly	Grab sample
Iron	ug/L	Quarterly	Grab sample
Lead	ug/L	Quarterly	Grab sample
Manganese	ug/L	Quarterly	Grab sample
Nitrate + nitrite (oxidised nitrogen)	ug/L	Monthly	Grab sample
Phosphorus (total)	ug/L	Monthly	Grab sample
Reactive Phosphorus	ug/L	Monthly	Grab sample
Selenium	ug/L	Quarterly	Grab sample
Total suspended solids	ug/L	Monthly	Grab sample
Zinc	ug/L	Quarterly	Grab sample
pH	pH	Quarterly	Grab sample

POINTS 11,12,13,14

Pollutant	Units of measure	Frequency	Sampling Method
Carbon dioxide	%	Yearly	TM-24
Carbon monoxide	ppm	Yearly	OM-1
Chlorine	mg/m3	Yearly	TM-7 & 8
Copper	mg/m3	Yearly	TM - 12, 13 & 14
Dry gas density	kg/m3	Yearly	TM-23
Hazardous substances	mg/m3	Yearly	TM - 12, 13 & 14
Moisture	%	Yearly	TM-22
Molecular weight of stack gases	g/g-mole	Yearly	TM-23
Nitrogen Oxides	g/m3	Continuous	CEM-2
Solid Particles	mg/m3	Yearly	TM-15
Sulphur dioxide	mg/m3	Continuous	CEM-2
Temperature	oC	Yearly	TM-2
Total Fluoride	mg/m3	Yearly	TM-9
Undifferentiated Particulates	mg/m3	Continuous	CEM-1
Velocity	m/s	Yearly	TM-2
Volatile organic compounds	ppm	Yearly	TM-2
Volumetric flowrate	m3/s	Yearly	TM-2

POINT 15

Pollutant	Units of measure	Frequency	Sampling Method
Nitrogen Oxides	pphm	Continuous	AM-12
Sulphur dioxide	pphm	Continuous	AM-20

POINT 16

Pollutant	Units of measure	Frequency	Sampling Method
Fluoride	ug/m3	Continuous	AM-8
Nitrogen Oxides	pphm	Continuous	AM-12
Sulphur dioxide	pphm	Continuous	AM-20

POINT 17

Pollutant	Units of measure	Frequency	Sampling Method
Cadmium	ug/L	Quarterly	Grab sample
Copper	ug/L	Quarterly	Grab sample
Iron	ug/L	Quarterly	Grab sample
Lead	ug/L	Quarterly	Grab sample
Manganese	ug/L	Quarterly	Grab sample
Nitrate + nitrite (oxidised nitrogen)	ug/L	Monthly	Grab sample
Phosphorus (total)	ug/L	Monthly	Grab sample
Selenium	ug/L	Quarterly	Grab sample
Zinc	ug/L	Quarterly	Grab sample
pH	pH	Quarterly	Grab sample

POINT 18

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	g/m2/month	Continuous	AM-19

M3 Testing methods - concentration limits

M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:

(a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or

(b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or

(c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

Note: The Clean Air (Plant & Equipment) Regulation 1997 requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

Note: Testing methods - load limit

Note: Clause 18 (1) and (2) of the Protection of the Environment Operations (General) Regulation 1998 requires that monitoring of actual loads of assessable pollutants listed in L2.1 must be carried out in accordance with the testing method set out in the relevant load calculation protocol for the fee-based activity classification listed in condition A1.2.

M4 Recording of pollution complaints

M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M4.2 The record must include details of the following:
(a) the date and time of the complaint;
(b) the method by which the complaint was made;
(c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
(d) the nature of the complaint;
(e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
(f) if no action was taken by the licensee, the reasons why no action was taken.

M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M5 Telephone complaints line

M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M5.3 Conditions M5.1 and M5.2 do not apply until 3 months after:
(a) the date of the issue of this licence or
(b) if this licence is a replacement licence within the meaning of the Protection of the Environment Operations (Savings and Transitional) Regulation 1998, the date on which a copy of the licence was served on the licensee under clause 10 of that regulation.

M6 Requirement to monitor volume or mass

M6.1 For each discharge point or utilisation area specified below, the licensee must monitor:

(a) the volume of liquids discharged to water or applied to the area;
(b) the mass of solids applied to the area;
(c) the mass of pollutants emitted to the air;

at the frequency and using the method and units of measure, specified below.

POINT 1

Frequency	Unit Of Measure	Sampling Method
Continuous	ML/day	By Calculation (volume flow rate or pump capacity multiplied by operating time)

POINT 10

Frequency	Unit Of Measure	Sampling Method
Daily	ML/day	In line instrumentation

POINT 17

Frequency	Unit Of Measure	Sampling Method
Continuous	ML/day	No method specified

Note: The licensee is currently constructing a V-notch weir or equivalent primary flow control structure at discharge point 17 and will install flow monitoring equipment at this point on or before 30 April 2004.

M7 Laboratory accreditation

M7.1 Samples taken pursuant to a requirement in this licence to monitor the volume, mass or concentration of pollutants, must be analysed and reported in accordance with the laboratory accreditation requirements set out in section 2.1.3 of the Load Calculation Protocol.

The Load Calculation Protocol is the Protocol referred to in clause 18 of the Protection of the Environment Operations (General) Regulation 1998. A copy of the Protocol was published in the Government Gazette on 25 June 1999 and can be purchased from the EPA or viewed at http://www.epa.nsw.gov.au.

M8 Environmental monitoring

M8.1 Not less than ten water quality surveys must be conducted in Lake Macquarie during each reporting period and the surveys must be scheduled to include at least two surveys in each season. For each of the points specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in column 1. The licensee must use the sampling method and sample at the frequency specified opposite in the other columns.

POINTS 4,5,6,7

Pollutant	Frequency	Sampling method
Dissolved Oxygen	At least 10 times per year	Measured at 0.1 metres below the surface, 0.5 metres below the surface and thereafter at 1.0 metre intervals to the bottom
Temperature	At least 10 times per year	Measured at 0.1 metres below the surface, 0.5 metres below the surface and thereafter at 1.0 metre intervals to the bottom
Salinity	At least 10 times per year	Measured at 0.1 metres below the surface, 0.5 metres below

		the surface and thereafter at 1.0 metre intervals to the bottom
Water clarity	At least 10 times per year	Using a Secchi disk
Zooplankton - total count	At least 10 times per year	Samples may be preserved and counted annually. Samples must be preserved and retained for species identification if required by the EPA.

M9 Meteorological monitoring

M9.1 For each monitoring point specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the parameter specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns:

POINT 16

Parameter	Units of measure	Averaging period	Frequency	Sampling Method
Wind speed @ 10 m	m/s	1 hour	Continuously	AM-2 & AM-4
Wind direction @ 10 m	°	1 hour	Continuously	AM-2 & AM-4
Sigma Theta @ 10 m	°	1 hour	Continuously	AM-2 & AM-4
Ambient Temperature @ 2 m	°C	1 hour	Continuously	AM-4
Ambient Temperature @ 10 m	°C	1 hour	Continuously	AM-4
Rainfall	mm/hr	1 hour	Continuously	AM-4
Solar Radiation	W/m²	1 hour	Continuously	AM-4
Additional Requirements				
Siting				AM-1 & AM-4
Measurement				AM-2 & AM-4

6 Reporting conditions

R1 Annual return documents

What documents must an Annual Return contain?

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
(a) a Statement of Compliance; and
(b) a Monitoring and Complaints Summary.
A copy of the form in which the Annual Return must be supplied to the EPA accompanies this licence. Before the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

Period covered by Annual Return

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee,
(a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
(b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on
(a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
(b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

Deadline for Annual Return

R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

Notification where actual load can not be calculated

R1.6 Where the licensee is unable to complete a part of the Annual Return by the due date because the licensee was unable to calculate the actual load of a pollutant due to circumstances beyond the licensee's control, the licensee must notify the EPA in writing as soon as practicable, and in any event not later than the due date. The notification must specify:

(a) the assessable pollutants for which the actual load could not be calculated; and
(b) the relevant circumstances that were beyond the control of the licensee.

Licensee must retain copy of Annual Return

R1.7 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

Certifying of Statement of Compliance and Signing of Monitoring and Complaints Summary

R1.8 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
(a) the licence holder; or
(b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R1.9 A person who has been given written approval to certify a certificate of compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review of this licence.

Further requirements the Annual Return must contain

R1.10.1 **Exceedence report**

For any specified pollutant required to be continuously monitored for points 11,12,13 and 14 the licensee must produce an air emission exceedence report if the concentration of that pollutant at any time exceeds the following level.

Pollutant	Exceedence limit
Sulphur dioxide	600 ppm

Within seven (7) days of the licensee becoming aware of the exceedence of the limits specified in this condition, a written report must be sent to the EPA's Regional Manager Hunter and must include the following;

(a) details of the date and time of the exceedence;
(b) the duration of the exceedence; and
(c) the reason(s) for the exceedence.

R1.10.2 Mass Emission

A mass emission and production report indicating the total mass of particulate matter, sulphur dioxide carbon dioxide, oxides of nitrogen and fluoride emitted to atmosphere and total energy production and coal consumption.

R2 Notification of environmental harm

Note: The licensee or its employees must notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.1 Notifications must be made by telephoning the EPA's Pollution Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
(a) where this licence applies to premises, an event has occurred at the premises; or
(b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,

and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
(a) the cause, time and duration of the event;
(b) the type, volume and concentration of every pollutant discharged as a result of the event;
(c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event; and
(d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
(e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
(f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event;
(g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

General conditions

G1 Copy of licence kept at the premises

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

Pollution studies and reduction programs

U1.1 On or before **30 June 2006** the licensee must complete a program of civil diversion works to divert stormwater runoff away from the stations ash dam. The stormwater diversion program should generally be in accordance with that outlined in Table 1 of the report *"ERARING POWER STATION SELENIUM REDUCTION PROGRAM"* dated 29 March 2001, and.

The licensee must provide, as an addendum to each Annual Return, a report that describes progress in the implementation of the stormwater diversion program during the previous year and outlines action to be implemented during the next reporting period.

U1.2 Before 31 December 2003, the licensee must complete an audit of emission / discharge monitoring conducted at discharge points 1,2,3,10,11,12,13,14 and 17 for the purpose of identifying any non compliances with the requirements of ***"Approved Methods For The Sampling And Analysis Of Air Pollutants In NSW"*** *(July 2001) and* ***"Approved Methods Of The Sampling And Analysis Of Water Pollutants In New South Wales"*** *(December 1998),* or such other methods that may be approved by the EPA.

The audit report must be submitted to the EPA by **31 January 2004.**

U1.3 Any new continuous emission monitoring instruments installed on the premises for the purpose of monitoring emissions to atmosphere must comply with ***"Approved methods of the sampling and analysis of air pollutants in New South Wales"***, or such other methods that may be approved by the EPA.

Special conditions

E1.1 Not applicable.

Dictionary

General Dictionary

In this licence, unless the contrary is indicated, the terms below have the following meanings:

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the

	commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998
BOD	Means biochemical oxygen demand
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 1998.
flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
industrial waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
inert waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period

concentration limit of a sample]	of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
reprocessing of waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
treatment of waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TSP	Means total suspended particles
TSS	Means total suspended solids
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste code	Means the waste codes listed in Appendix 5 of the EPA document A Guide to Licensing Part B.
waste type	Means Group A, Group B, Group C, inert, solid, industrial or hazardous waste

Mr Grahame Clarke

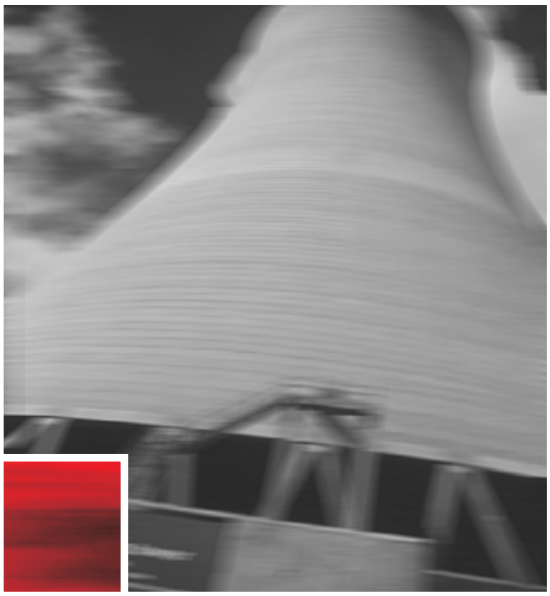
Environment Protection Authority

(By Delegation)

Date of this edition - 13-Mar-2005

End Notes

1	Licence varied by notice V/M upgrade, issued on 07-Jul-2000, which came into effect on 07-Jul-2000.
2	Licence transferred through application 140098, approved on 30-Nov-2000, which came into effect on 02-Aug-2000.
3	Licence varied by notice 1003063, issued on 07-Dec-2000, which came into effect on 19-Dec-2000.
4	Licence varied by notice 1007825, issued on 18-Jul-2001, which came into effect on 12-Aug-2001.
5	Licence varied by notice 1016571, issued on 27-Oct-2003, which came into effect on 21-Nov-2003.
6	Licence varied by notice 1042247, issued on 16-Feb-2005, which came into effect on 13-Mar-2005.



appendix e

flora and fauna report

Flora and Fauna Impact Assessment
Upgrade to Existing Ash Dam
Eraring Power Station

20 February 2006

Prepared for:
Eraring Energy
PO Box 5044
Dora Creek NSW 2264

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HLA Ref: S6036301_RptFinal_Feb06.doc

DISTRIBUTION

Flora and Fauna Impact Assessment
Ash Dam Expansion
Eraring Energy
20 February 2006

Copies	Recipient	Copies	Recipient
1	**Garry Craig** **Ash Disposal Project Manager** Eraring Energy PO Box 5044 Dora Creek NSW 2264	1 Copy	**HLA File**

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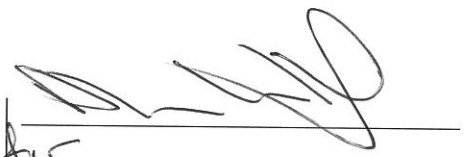

Evelyn Craigie
Environmental Scientist

Peer Review: **Date:**

20 Feb 06

for **Michael England**
Senior Principal, National Practice Leader
Environmental Planning

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EXECUTIVE SUMMARY

HLA-Envirosciences Pty Limited (HLA) has been commissioned by Eraring Energy to conduct an environmental assessment on approximately 56 ha of land located north of the existing Eraring Power Station (EPS) ash dam. The project involved a review of existing information, followed by general flora and fauna survey and targeted surveys. It is proposed that part of the study area will be used for the future disposal of ash from the EPS.

124 vascular plant species have been recorded within the study area, 114 of which were recorded during the present study, with the remainder recorded in previous studies within the study area. The species were primarily within two vegetation communities, Coastal Plains Smooth-barked Apple Forest and Coastal Plains Scribbly Gum Woodland, with a few species recorded in the limited aquatic habitat that is present within the study area. The general condition of the study area is considered to be very good, based on the diversity and dominance of native species. *Tetratheca juncea*, a threatened species protected by the provisions of the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999*, was identified in the study area.

94 species of vertebrate fauna, excluding fish, were recorded. The majority of the species were birds, with four mammal species recorded, including the Sugar Glider. Aquatic habitats were limited, however there are many hollows in standing trees and fallen timber that provide habitat for a variety of hollow dependant species.

The proposed project will result in the removal of approximately 52 ha of habitat for *Tetratheca juncea*, however 30 per cent of the mapped occurrences occur outside of the project footprint and similar habitat types are likely to occur to the north of the study area. Several hundred specimens of *Tetratheca juncea* is known to occur elsewhere within the EPS lands, while the locations of other threatened species known to occur within the EPS lands will not be impacted by the proposed ash dam extension.

1 INTRODUCTION

HLA-Envirosciences Pty Limited (HLA) has been commissioned by Eraring Energy (EE) to conduct an environmental assessment (EA) for proposed upgrade works to Eraring Power Station (EPS). This study is one of a number of technical studies supporting the EA. This study relates to the proposed expansion of the existing EPS ash dam. The study area, shown in **Figure 1**, covers approximately 56 ha of land located directly to the north of the ash dam which is under consideration for the future disposal of ash from EPS. This assessment involved:

- a review of existing information;
- a general survey for vascular plant species;
- a general survey for terrestrial vertebrate fauna species;
- targeted surveys for threatened species;
- vegetation mapping that is consistent with remnant vegetation community descriptions; and
- assessment of impact of the proposed project.

1.1 Proposed Project

The proposed project involves an upgrade to EPS's existing ash disposal facility, using dense phase disposal to provide greater efficiency in ash disposal on the site. The use of dense phase disposal as proposed will incorporate an expansion of the existing ash dam to cover certain adjoining land directly north of the existing dam.

Under the current lean phase disposal method, the existing ash dam is expected to be full by 2011/2012. The proposed dense phase disposal method requires a smaller footprint for disposal and will ensure that Eraring has sufficient disposal capacity to accommodate the full life of the plant beyond 2030.

The proposed upgrade will require the acquisition of some 35 ha of land adjacent to the existing ash dam, as well as a range of new infrastructure including storage vessels and pumping facilities. The expansion of the ash disposal area would be located to the north of the existing ash dam and would require the progressive clearing of approximately 52 ha of native vegetation over the life of the project (estimated to be some twenty years). Disposal of the ash would be undertaken in four stages, from the lowest elevation, in approximately 5 m altitudinal increments. The clearing of vegetation will take place in approximately 5 m vertical increments ahead of the ash disposal. The footprint of the expanded ash disposal facility within the study area is shown in **Figure 2**.

2 EXISTING INFORMATION REVIEW

2.1 Existing Information Review

Existing information that was reviewed for this report included a review of the Department of Environment and Conservation (DEC) online Wildlife Atlas (WA) and previous studies within the EPS Lands. The studies include biodiversity surveys completed by Biosis (1999), HLA (2004a) and HLA (2004b). Additional data obtained during an on-going biodiversity study of the EPS lands undertaken by HLA-Envirosciences (in prep.) was reviewed to identify the potential for significant flora and fauna species to occur within the present study area.

The DEC WA was searched for records of significant plant species that are known to occur within a 20 km x 20 km area centred on the study area. Significant plants are those that are protected by the *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or are considered to be a Rare Or Threatened Australian Plant (ROTAP) Species (Briggs and Leigh 1995). The on-line databases maintained by the National Herbarium of New South Wales were also searched for records of significant species within one kilometre of the study area.

Mapping of remnant vegetation communities completed by NPWS (2003) for the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS) was also reviewed.

2.2 Existing Information Review - Flora

2.2.1 Previous Studies

There are four species of vascular plant that are protected by the provisions of the TSC Act, and three non-threatened species that are considered to be regionally significant, that have been recorded within the EPS lands. These seven species are listed in **Table 1**. An explanation of the ROTAP codes is given in **Appendix A**.

Table 1: Significant Flora species recorded within EPS lands.

Scientific Name	**Common Name**	NSW Status	EPBC Status	ROTAP code
Genoplesium despectans? [c]	Sharp Midge Orchid	Unprotected		2K
Acacia bynoeana [b]	Tiny Wattle	Endangered	Vulnerable	3VC-
Callistemon linearifolius [b]		Vulnerable		2RCi
Hakea bakeriana [a,b,c]		Unprotected		
Bossiaea stephensonii		Unprotected		
Pultenaea tuberculata		Unprotected		
Tetratheca juncea [a,b,c]	Black-eyed Susan	Vulnerable	Vulnerable	3VCa

[a] HLA (2004a) [b] HLA (2004b) [c] Biosis (1999)

Tetratheca juncea has been recorded in most eucalypt dominated remnant woodland habitat north of the Lake Road (Biosis 1999, HLA 2004a and HLA 2004b), including within the study area (HLA 2004a) where the species was recorded within a drainage depression in the west of the current study area. The previous study areas were bounded by the present EPS lands. The entire EPS lands comprise approximately 250 ha of remnant woodland, of which 150 ha is

potential *Tetratheca juncea* habitat. Approximately 50 ha of the remnant woodland is dominated by Black Oak and is known not to support large populations of *Tetratheca juncea*.

Hakea bakeriana was also identified within the present area during the (Biosis 1999, HLA 2004a and HLA 2004b) studies, and is relatively common in forests to the west and east of the existing ash dam. Both *Bossiaea stephensonii* and *Pultenaea tuberculata* are also at their distribution limits and have been found within the study area or in similar habitats within the EPS lands (Biosis 1999, HLA 2004a and HLA 2004b).

Both *Acacia bynoeana* and *Callistemon linearifolius* were recorded during the HLA (2004b) study. *Callistemon linearifolius* was recorded in poorly drained habitat dominated by *Melaleuca linearis* to the west of the power station. *Acacia bynoeana* was recorded on ridge tops in open woodland dominated by *Corymbia gummifera*, *Eucalyptus haemastoma* and *E. capitellata*. The shrub understorey is patchy, dominated by *Lambertia formosa* and *Leptospermum trinervium*. The ground cover is low, dominated by tussocks of *Entolasia stricta* with patches of leaf litter.

The Biosis (1999) survey recorded an orchid species, to the east of the existing ash dam, tentatively as *Genoplesium despectans*. This species is known to occur south from Wollongong, and as such the Eraring locality is very significant. The Biosis (1999) report does not indicate when the species was observed as the quadrat was surveyed in spring, summer, autumn and winter. There is the possibility that the species is the endangered *Genoplesium insignis*, restricted to the Wyong district.

The vegetation of the study area has been broadly described as 'Dry Open Woodland', dominated by Scribbly Gum (*E. haemastoma*), Bloodwood (*Corymbia gummifera*), Smooth-barked Apple (*Angophora costata*) and Brown Stringybark (*E. capitellata*) (Biosis 1999). The canopy was described as between 15 m and 20 m high with an understorey to 2 m. The lower shrub layer is described as dominated by *Banksia sp*., *Persoonia levis*, *Dillwynia retorta* and *Lambertia formosa*. The ground cover species that were considered diagnostic included *Themeda australis*, *Entolasia stricta*, *Ptilothrix deusta*, *Lomandra* sp., *Phyllanthus hirtellus* and *Pratia purpurascens*.

The NPWS (2003) completed broad scale vegetation survey and mapping of remnant vegetation for the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS). The study area is mapped as the Coastal Plains Smooth-barked Apple Woodland vegetation community, with Coastal Plains Scribbly Gum Woodland occurring to the north of the ridgeline that forms the northern boundary of the study area.

The Coastal Plains Smooth-barked Apple Woodland is described as dry shrubby forest, the canopy species dominated by *Angophora costata* and *Corymbia gummifera*, with *Eucalyptus capitellata* co-dominating in places. The mid-shrub understorey is characterised by *Allocasuarina littoralis*, *Banksia spinulosa* and *Acacia mrytifolia*, while *Lambertia formosa* and *Dillwynia retorta* less commonly occur. The ground cover is described as dominated by *Entolasia stricta* and *Themeda australis*. Significant species known to occur within this community include the threatened species *Tetratheca juncea*, *Angophora inopina* and *Macrozamia flexuosa* (ROTAP species).

The community is said to be floristically similar to Coastal Plains Scribbly Gum Woodland, however the canopy is lower, more open and differences in the shrub understorey include *Banksia spinulosa* being replaced by *Banksia oblongifolia*. The ground cover is similar to the Coastal Plains Scribbly Gum Woodland, however *Ptilothrix deusta* is common. Significant species known to occur within this community include the threatened species *Tetratheca juncea*, *Angophora inopina*, *Acacia bynoeana*, and *Cryptostylis hunteriana*.

The community described by Biosis (1999) includes both the Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland communities as described by NPWS (2003), making no distinction between relative abundance in canopy species or ground cover species.

2.2.2 On-line databases

A review of the DEC on-line WA identified a further three vulnerable species that occur within 10 km of the study area. These are *Angophora inopina*, *Syzygium paniculatum* and *Grevillea parviflora* subsp. *parviflora*. A search of the National Herbarium of New South Wales on-line databases did not identify any additional ROTAP or threatened species that may occur in the study area.

2.3 Existing Information Review - Fauna

2.3.1 Previous Studies

Limited fauna studies have been undertaken for parts of the study area due to the narrow strip of vegetation that occurs between the northern boundary of EPS land and the existing ash dam. Biosis (1999) placed hair tubes, completed limited spotlighting, call playback and bat detection along the southern parts of the present study area, with most activities taking place near the intersection of the track to the north of the existing ash dam and the track that connects to the ridge line track near the former gravel quarry.

No significant species were recorded within the present study area during the Biosis (1999) survey, however the vulnerable Powerful Owl (*Ninox strenua*) was detected in woodland south of the existing ash dam and there is no reason why the species would not occur in other large areas of woodland that support a significant population of arboreal mammals. Other threatened species recorded during the Biosis (1999) survey included the Eastern Free-tailed Bat (*Mormopterus norfolkensis*), Common Bent-wing Bat (*Miniopterus schreibersii*) and Large-footed Mouse-eared Bat (*Myotis macropus*). All of these species have the potential to forage or fly over the present study area. Insectivorous bat species are reliant, on the presence of freshwater, particularly for drinking and also as insect prey are often concentrated at these locations. While the use of the existing ash dam for these purposes is uncertain, other sources of freshwater are limited within the study area.

Recent biodiversity studies (HLA 2004b) recorded five threatened species, with the potential for another to occur within the EPS lands. The species are listed in **Table 2**. The Squirrel Glider (*Petaurus norfolcensis*) was tentatively identified, based on general appearance and weight of three specimens that were captured in woodland and forest to the west of the power station. The tentative identification was based on the similarity in appearance between the non-threatened Sugar Glider and Squirrel Glider. While the Squirrel Glider is heavier than the Sugar Glider (Suckling 1998), the weight of the specimens caught was between the two species. The Sugar Glider is considered to be regionally significant (Biosis 1999). The species listed in **Table 2** are likely to utilise habitats within the present study area based on the presence of a large area of woodland with good connectivity to habitats where the species were recorded and high connectivity with extensive woodland and forest to the north.

Table 2: Threatened vertebrate species recorded within study area.

Scientific Name	Common Name	Status TSC
Mormopterus norfolkensis	Eastern Little Mastiff-bat	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Miniopterus australis	Little Bent-wing Bat	Vulnerable

Scientific Name	Common Name	Status TSC
Miniopterus schreibersii	Common Bent-wing Bat	Vulnerable
Myotis macropus	Large-footed Mouse-eared Bat	Vulnerable
Petaurus norfolcensis	Squirrel Glider	Vulnerable

The majority of species observed in the EPS lands are birds, accounting for 45 out of 80 species observed (HLA 2004b). Small areas of habitat occur for the endangered Regent Honeyeater, particularly to the west of the power station where the winter flowering Swamp Mahogany (*E. robusta*) occurs.

The Spotted-tailed Quoll (*Dasyurus maculatus* subsp. *maculatus*) has been recorded to the south of the power station along Lake Road (Chris Wood, pers. comm.). Again there is no reason why the species would not occur in large areas of woodland in the area, including the study area.

2.4 On-line databases

2.4.1 DEC WA

A review of the Department of Environment and Conservation on-line WA (DEC WA) identified 41 threatened species that have been recorded within a 20 km x 20 km grid centred on the study area. Many of these species are marine and do not have habitat within the study area, including the Dugong (*Dugong dugong*), Loggerhead Turtle (*Caretta caretta*) and Green Turtle (*Chelonia mydas*). Other species utilise sand flats habitat, such as the Greater Sand Plover (*Charadrius leschenaultii*), Sooty Oystercatcher (*Haematopus fuliginosus*), Pied Oystercatcher (*Haematopus longirostris*), Little Tern (*Sterna albifrons*) and Great Knot (*Calidris tenuirostris*). These species have been excluded from the remaining species, listed in **Table 3**, that utilise terrestrial and freshwater habitats.

Table 3: Threatened vertebrate species found within a 20 km x 20 km grid centred on study area (DEC WA).

Species	TSC Act Status
Barking Owl (*Ninox connivens*)	Vulnerable
Black Bittern (*Ixobrychus flavicollis*)	Vulnerable
Black-necked Stork (*Ephippiorhynchus asiaticus*)	Endangered
Brown Treecreeper (*Climacteris picumnus*)	Vulnerable
Comb-crested Jacana (*Irediparra gallinacea*)	Vulnerable
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	Vulnerable
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	Vulnerable
Masked Owl (*Tyto novaehollandiae*)	Vulnerable
Osprey (*Pandion haliaetus*)	Vulnerable
Powerful Owl (*Ninox strenua*)	Vulnerable
Regent Honeyeater (*Xanthomyza phrygia*)	Endangered
Rose-crowned Fruit-Dove (*Ptilinopus regina*)	Vulnerable
Sooty Owl (*Tyto tenebricosa*)	Vulnerable
Swift Parrot (*Lathamus discolor*)	Endangered
Turquoise Parrot (*Neophema pulchella*)	Vulnerable
Giant Barred Frog (*Mixophyes iteratus*)	Endangered
Green-thighed Frog (*Litoria brevipalmata*)	Vulnerable
Red-crowned Toadlet (*Pseudophryne australis*)	Vulnerable
Stuttering Frog (*Mixophyes balbus*)	Endangered

Species	TSC Act Status
Wallum Froglet (*Crinia tinnula*)	Vulnerable
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	Endangered
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	Vulnerable
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	Vulnerable
Eastern Freetail-bat (*Mormopterus norfolkensis*)	Vulnerable
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	Vulnerable
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Vulnerable
Koala (*Phascolarctos cinereus*)	Vulnerable
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Vulnerable
Large-footed Myotis (*Myotis adversus*)	Vulnerable
Little Bentwing-bat (*Miniopterus australis*)	Vulnerable
Spotted-tailed Quoll (*Dasyurus maculatus*)	Vulnerable
Squirrel Glider (*Petaurus norfolcensis*)	Vulnerable
Yellow-bellied Glider (*Petaurus australis*)	Vulnerable

2.4.2 DEH EPBC Act Protected Matters Search Tool

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects matters of national environmental significance. The on-line databases maintained by the Commonwealth Department of Environment and Heritage (DEH) were searched to identify potential matters of national environmental significance that may occur within a 10 km radius of the study area. A summary of the findings of the on-line databases is given in **Table 4**.

Table 4: Potential for matters of national environmental significance.

Matter	Occurrences with 10 km
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Significance (Ramsar Sites)	1
Commonwealth Marine Areas	None
Threatened Ecological Communities	None
Threatened Species	21
Migratory Species	10
Critical Habitats	None
Commonwealth Reserves	None

The 21 threatened species of flora or fauna potentially occurring within 10 km of the study area are shown in **Table 5**.

Table 5: Threatened species potentially occurring within 10 km of study area.

Species	EPBC Act Status
Birds	
Australian Painted (*Rostratula australis*)	Vulnerable
Regent Honeyeater (*Xanthomyza phrygia*)	Endangered
Swift Parrot (*Lathamus discolor*)	Endangered
Frogs	
Giant Barred Frog (*Mixophyes iteratus*)	Endangered
Giant Burrowing Frog (*Heleioporus australiacus*)	Vulnerable
Green and Golden Bell Frog (*Litoria aurea*)	Vulnerable

Species	EPBC Act Status
Littlejohn's Tree Frog (*Litoria littlejohni*)	Vulnerable
Stuttering Frog (*Mixophyes balbus*)	Vulnerable
Mammals	
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	Endangered
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Vulnerable
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Vulnerable
Long-nosed Potoroo - SE mainland (*Potorous tridactylus tridactylus*)	Vulnerable
Spotted-tailed Quoll (*Dasyurus maculatus*)	Endangered
Reptiles	
Broad-headed Snake (*Hoplocephalus bungaroides*)	Vulnerable
Plants	
Bynoe's Wattle (*Acacia bynoeana*)	Vulnerable
Angophora inopina	Vulnerable
Leafless Tongue-orchid (*Cryptostylis hunteriana*)	Vulnerable
Newcastle Doubletail (*Diuris praecox*)	Vulnerable
Grevillea parviflora subsp. parviflora	Vulnerable
Syzygium paniculatum	Vulnerable
Tetratheca juncea	Vulnerable

The ten migratory species that either have been recorded or potentially occur within the search area based on habitat modelling are listed in **Table 6**.

Table 6: Migratory bird species potentially occurring within 10 km of study area

Species	Type of Presence
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	Species or species habitat likely to occur within area
White-throated Needletail (*Hirundapus caudacutus*)	Species or species habitat may occur within area
Black-faced Monarch (*Monarcha melanopsis*)	Breeding may occur within area
Satin Flycatcher (*Myiagra cyanoleuca*)	Breeding likely to occur within area
Rufous Fantail (*Rhipidura rufifrons*)	Breeding may occur within area
Regent Honeyeater (*Xanthomyza phrygia*)	Species or species habitat likely to occur within area
Latham's Snipe (*Gallinago hardwickii*)	Species or species habitat may occur within area
Eastern Curlew (*Numenius madagascariensis*)	Species or species habitat likely to occur within area
Pacific Golden Plover (*Pluvialis fulva*)	Species or species habitat likely to occur within area
Painted Snipe (*Rostratula benghalensis* s. lat.)	Species or species habitat may occur within area

3 SITE INVESTIGATION METHODS

3.1 Flora Survey

The vascular plant species present within the study area were investigated through a combination of walked survey transects and nine 400 m^2 survey plots. The plots were located after review of aerial photography in order to sample variation in canopy cover and elevation. Field investigations took place from 19-22 July and 26 July 2005. Preliminary investigation of aerial photography identified the presence of two broad vegetation communities, based on canopy cover. These were defined as eucalypt dominated open woodland and forest.

3.1.1 Survey Plots

The survey plot shape was a 20 m x 20 m square. Physical and biological information was recorded at each survey plot. Physical information included aspect, slope, area of bare earth, area of litter, presence of fallen timber and rock outcropping. Biological information included canopy cover, canopy height, dominating species in each stratum, species present and their cover. Cover was determined using a modified Braun-Blanquet classification, as described in **Table 7.** Additional and significant species were noted along more than 3000 m of walked traverses across the study area, undertaken for the targeted surveys. A sample of species that could not be readily identified in the field was collected and identified with the aid of Harden (1992), Harden 1993), Harden (2000) and Harden (2002). The location of flora survey effort is shown in **Figure 3.**

Table 7: Modified Braun-Blanquet classification rank explanation.

Rank	Cover
1	< 5 % and few individuals
2	< 5 % and many individuals
3	5 % ≥ 25 %
4	25 % ≥ 50 %
5	50 % ≥ 75 %
6	>75 %

Species nomenclature is consistent with National Herbarium of New South Wales naming. The species that have had a change in nomenclature since being recorded by Biosis (1999) are listed in **Table 8**.

Table 8: Updated nomenclature for species recorded by Biosis (1999).

Biosis (1999)	Present Study
Chionochloa pallida	*Joycea pallida*
Drosera peltata ssp *auriculata*	*Drosera auriculata*
Pultenaea elliptica	*Pultenaea tuberculata*
Stipa pubescens	*Austrostipa pubescens*

The results of the flora study were used to define vegetation communities according to descriptions of communities defined by the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS) where possible.

3.1.2 Targeted Survey

In addition to the general vegetation survey, targeted surveys were carried out for species listed in **Table 1**, and for *Angophora inopina*, *Syzygium paniculatum* and *Grevillea parviflora* subsp. *parviflora*, significant species identified during the review of on-line databases maintained by DEC. The survey method comprised parallel walking transects, 10 m apart over the entire study area. The GPS location coordinates of the target species identified within 5 m either side of each transect were recorded with a GPS. Given the clonal nature of *Tetratheca juncea*, observation of the species within 5 m of other specimens is arbitrarily considered a single record. Multiple observations are recorded where the species occur in an area greater than 25 m^2. For example, a 10 m x 10 m patch of *Tetratheca juncea* is considered to have four plants present.

3.2 Fauna

The fauna survey focused on terrestrial vertebrate species utilising the study area. The survey techniques and time involved are given in **Table 9**. The locations of the surveys are shown in **Figure 4**. Field investigations took place on 19-22 July, 26 July 2005 and 31 October – 3 November, generally between 7 a.m. and 9 p.m. All vertebrate species, or characteristic evidence of species, was noted. Characteristic evidence of species included scats, feathers, bone material, scratches, tree scarring, nests, burrows and other digging activity. Triggs (1998) was used as an interpretive guide to aid identification of characteristic evidence of animal presence, including bone, tree scarring and digging activity.

Table 9: Fauna survey methods for study area.

Targeted Fauna	Method	Timing	Duration
Terrestrial mammals	Size A Elliott Traps	19-22 July	3 x 250 m transects of 25 traps for 3 nights
	Cage Traps	19-22 July 31 October-3 November	9 traps for 3 nights
Arboreal mammals	Size B Elliott Traps	19-22 July	15 traps on trees with feeding scars for 3 nights
	Spotlighting	19-22 July 31 October-3 November	3 x 1 hour (3 hours total) 3 x 2 hours (6 hours total)
Insectivorous Bats	Echolocation detection	31 October-3 November	Min. 1 hour per night (5 hours total)
Birds (diurnal)	Observation	19-22 July 31 October-3 November	3 hours total + incidental observations 3 hours total + incidental observations
Birds (nocturnal)	Call playback Spotlighting	19-22 July 31 October-3 November	1 hour (Concurrent with survey for nocturnal mammals) 1 hour (Concurrent with survey for nocturnal mammals)
Amphibians	Observation Hand search Listening	31 October-3 November	1 hour at aquatic habitats
Reptiles	Observation Hand search	31 October-3 November	2 hours

Trapping
Traps were baited according to targeted species. General terrestrial fauna baits used a 1:1 mix of rolled oats and peanut butter, with some additional natural vanilla essence added. No honey was used to reduce the potential for ant infestation. Arboreal traps were baited with a 1:1:1 mix of rolled oats, peanut butter and honey. An additional lure of 1:1 honey to water mix was sprayed onto tree trunks up to a height of approximately 4 m between traps and feeding scars, hollows or potential landing spots. Cage traps were baited with fresh chicken wings to attract terrestrial predators such as quolls or cats. Tuna oil was dripped around the traps and along 10 m long trails to act as an additional lure. Mammals caught were identified with the aid of Strahan (1998), if necessary.

Nocturnal Survey
The territorial calls of nocturnal species were passively listened for in addition to the playback of territorial calls to elicit responses from the Squirrel Glider, Masked Owl, Powerful Owl and Koala. A compact disk (CD) with the calls was played on a portable CD player and broadcast through a 15 W Toa megaphone. The calls were broadcast for approximately 10 seconds, with a minute of passive listening for returned calls before the call was repeated over a ten-minute period. A five-minute period of passive listening took place between each species, followed by a brief inspection of surrounding trees with a halogen headlamp for animals that may have come closer to investigate the call.

Insectivorous bats were not surveyed in July as many bats migrate northward during the winter period, or their activity is significantly reduced as a result of metabolic function or activity of dietary items. Bats were surveyed starting at the first call detected or from 6.30 p.m., whichever came first, and lasted for a minimum of 60 minutes, however approximately two hours of detection time was completed on 4 November 2005. The hour period was chosen so that bats detected are likely to be those that roost nearby. Bat calls were detected using an ANABAT II detector and recorded onto a datacard via the ANABAT CF interface module. The files were then downloaded and compared to reference calls for bats in the Sydney Basin (Pennay *et al*. 2004).

Other nocturnal work involved spotlighting, using a 100 W Powabeam spotlight. Transects were walked along formed tracks. Larger trees were targeted, as were trees that were potentially utilised for foraging. One person undertook the survey for approximately one hour each night, with an additional person using a 500,000 candlepower spotlight during the spring survey.

Herpetofauna Survey
Herpetofauna was surveyed opportunistically during the vegetation survey and also by searching potential refuge sites such as fallen timber, shallowly embedded rock and under exfoliating bark. Aquatic habitat was also checked for snakes, turtles, lizards and frogs. Frogs were also detected using passive listening at freshwater aquatic habitat and elsewhere during the field survey for territorial calls. Herpetofauna was identified using the keys of Cogger (2000) if necessary.

Bird Survey
Diurnal birds were recorded when observed directly or when territorial calls were heard. Targeted bird surveys took place for a 30 minute period over six days in the early morning and during the middle of the day. Birds were also noted when observed opportunistically during other aspects of the field investigations.

4 RESULTS AND DISCUSSION

4.1 Field Investigations - Flora

124 species of vascular plant have been recorded within the study area, 114 of which were recorded during the present study. Ten of the species were recorded during previous studies (HLA 2004b and Biosis 1999) and include species that are readily identifiable in spring or summer.

With the exception of the disturbed habitats between the existing ash dam shore and access track immediately to the north of the existing ash dam, no exotic species were observed away from tracks and other disturbances. This is a good indication of the limited disturbance the study area has experienced in the past few decades.

Using the vegetation community descriptions of NPWS (2003), the vegetation of the study area can be assigned to two communities, the extent of which is shown in **Figure 5.** These communities are:

- Coastal Plains Smooth-barked Apple Forest; and
- Coastal Plains Scribbly Gum Woodland.

The Coastal Plains Smooth-barked Apple Forest community is similar to the Coastal Plains Smooth-barked Apple Woodland (NPWS 2003), with the key difference being the denser canopy. The community has been mapped where the slopes are steeper and in gullies. As a result of the moister conditions resulting from the aspect and slope, the shrub understorey is denser than the Coastal Plains Scribbly Gum Woodland, with the exception of where the taller shrub stratum is dominated by *Allocasuarina littoralis*. The ground cover tends to have a denser cover than Coastal Plains Scribbly Gum Woodland, although species composition is similar. Scattered throughout the understorey is *Hakea bakeriana*, while *Tetratheca juncea* was observed where there was higher light penetration. Within the study area there is approximately 23.5 ha of Coastal Plains Smooth-barked Apple Forest.

The Coastal Plains Scribbly Gum Woodland has been defined within the study area based on the more open canopy structure and the higher frequency of Scribbly Gum (*E. haemastoma*). The community tends to also occupy drier and lower elevations that have gentler slopes. The drainage lines within the Coastal Plains Scribbly Gum Woodland tend to have a higher density of shrubs, particularly *Leptospermum trinervium*, *L polygalifolium* subsp*. polygalifolium* and *Hakea bakeriana*. Within the study area there is approximately 32 ha of Coastal Plains Scribbly Gum Woodland.

There were 684 clumps of the threatened species *Tetratheca juncea* observed within the study area, particularly in areas where the canopy cover was less dense in sheltered aspects, for example amongst open woodland with an understorey of *Leptospermum trinervium*. The locations where the species was observed are shown in **Figure 6**.

No other threatened species were observed, however habitat for *Acacia bynoeana*, and *Cryptostylis hunteriana* occurs in the lower slopes within the Coastal Plains Scribbly Gum Woodland, particularly where the understorey is open and the groundcover is sparse or low. No habitat for *Callistemon linearifolius* was observed within the study area. There is no habitat for *Syzygium paniculatum* or *Grevillea parviflora* subsp. *parviflora* within the study area.

Within the study area there are three species that are considered regionally significant. *Bossiaea stephensonii* is at the northern limit of the species southern populations distributional

limit. *Pultenaea tuberculata* is likely to be close to the species northern distributional limit. Also found during the targeted survey was *Hakea bakeriana,* which is restricted in distribution to the region between Newcastle and the Hawkesbury River. *Hakea bakeriana* occurs throughout the study area, particularly in moister habitats.

Three species, *Blandfordia grandiflora*, *Cymbidium suave* and *Doryanthes excelsa*, are protected by under Schedule 13 of the *National Parks and Wildlife Act 1974* were recorded during the survey. The locations of *Cymbidium suave*, *Doryanthes excelsa* and *Hakea bakeriana* are shown in **Figure 7**.

The study area has apparently been subjected to a low level of disturbance. This observation is based on the dominance and diversity of native species. Weeds are restricted to localised areas of earth moving, such as tracks, gravel extraction pits and water diversion channels. Most occurrences of weeds were along or within 10 m of the existing ash dam shoreline. Only two significant species of weed were recorded, both near the margins of the existing ash dam. These were Bitou Bush (*Chrysanthemoides monilifera* subsp. *rotundata*) and Pampas Grass (*Cortaderia selloana*). Pampas Grass is common on the nearby drier ash surface and within areas that have been partially rehabilitated.

4.2 Field Investigations - Fauna

94 species were recorded, including six insectivorous bat species, three arboreal mammal species and two small ground-dwelling mammals that were trapped. Species observed during the present and past biodiversity surveys within land managed by Eraring energy are listed in **Appendix B**.

Bird species were the most common fauna type observed, with small canopy and dense shrub understorey dwelling species dominating. The existing ash dam shoreline is habitat for a small number of Black-winged Stilts, Masked Plovers and Grey Teals. Species observed utilising deeper water, or more isolated mudflats included Pelicans, Black Swans and Silver Gulls.

In contrast to the low diversity of terrestrial mammals, there is a high abundance of small mammals. Bush Rats and Brown Antechinuses (*Antechinus stuartii*) were trapped frequently, with the highest densities recorded in places with high canopy cover and dense ground cover. Two arboreal mammal species were trapped, and one other was observed during spotlighting. A Ring-tailed Possum was caught in a cage trap baited with chicken, and a Sugar Glider was captured to the east of the proposed ash dam expansion area. Ring-tailed Possums were frequently observed, while Brush-tailed Possums were occasionally observed. There were many trees with scarring from feeding glider species, most likely to be Sugar Gliders, although it is suspected that the threatened Squirrel Glider is present in forest habitat to the west of the present study area.

A cage trap was consistently triggered without successfully capturing the animal. Although faecal matter similar to a Bush Rat (*Rattus fuscipes*) was present within the trap, it is likely that a larger predator, for example a Lace Monitor, fox or dog triggered the trap but was able to retreat out of the trap. Bush Rats and Lace Monitors were both caught in cage traps.

Four threatened insectivorous bat species were recorded during the survey. These were the Eastern Freetail-bat (*Mormopterus norfolkensis*), Common Bent-wing Bat (*Miniopterus schreibersii*), Little Bent-wing Bat (*Miniopterus australis*) and Great Pipistrelle (*Falsistrellus tasmaniensis*). The four bats are dependant on hollows within trees for roosting. Insectivorous bat species are reliant, on the presence of freshwater, particularly for drinking and also as insect prey are often concentrated at these locations. While the use of the existing ash dam for these purposes is uncertain, other sources of freshwater is limited within the study area.

The aquatic habitats are limited to small pools in drainage lines, areas of dam sedges and one large pool created by earth moving near the existing ash dam. As a consequence, observed frog fauna within the study area was typical of such habitats, including *Litoria fallax*, *Crinia signifera* and *Pseudophryne coriacea*. The Striped-marsh Frog (*Limnodynastes peronii*) and Freycinet's Frog (*Litoria freycineti*) was observed at pools near the existing ash dam.

5 IMPACT ASSESSMENT

5.1 Existing Impacts

The southern boundary of the study area is adjacent to the existing ash dam, characterised by open water associated with the existing ash dam. Water within the dam is recovered and reused in the ash disposal process. The south eastern portion of the study area is adjacent to an area of ash deposition that is presently undergoing rehabilitation (see **Figure 1**). Part of the study area is currently used as a buffer area for Eraring Power Station, and has graded tracks. The boundary is partly delineated by a barbed wire toped fence that is poorly maintained in sections. The property north of the present boundary has few disturbances and is typified by native vegetation in a mature state as evidenced by the presence of a diverse shrub understorey, absence of weeds and many trees with hollows. Part of the northern boundary of the study area is defined by an existing four-wheel drive track, while there are some minor tracks associated with trail bike riding activity within the study area. There is a disturbed area associated with gravel extraction in the north eastern part of the study area, with evidence of minor littering. Despite the presence of these potential disturbances, the study area appears to have largely avoided the typical impacts associated with edge effects, such as weed and feral animal encroachment. There is an open earthen drain designed to divert surface water flowing from part of the study area to the existing ash dam to a freshwater pond south of the eastern part of the study area.

5.2 Potential Impacts

The bushland is in good condition and supports a variety of native species, including mature eucalypts containing hollows. The greatest impact is the loss of approximately 52 ha of an area of high native and low exotic species biodiversity that is also structurally diverse. The proposed ash dam expansion will affect approximately 22 ha of Coastal Plains Scribbly Gum Woodland and 11 ha of Coastal Plains Smooth-barked Apple Forest. This equates to less than 11 per cent of the approximately 300 ha of woodland within the EPS lands, including the lands acquired for the proposed ash dam expansion. There are approximately 200 ha of similar habitat, including the proposed acquisition. These woodlands are located to the east of the existing ash dam, south of the existing ash dam, west of the coal stockpile and south of the coal conveyor from Myuna underground coal mine. The removal of this vegetation will result in the removal of fauna habitat, such as mature hollow bearing eucalypts, dense shrub understorey, dense ground cover, fallen logs and leaf litter that supports native fauna. It is likely that it would take over 100 years for a community of a similar structure to develop from a rehabilitated area, providing native biodiversity can be maintained.

Fauna species most likely to be affected by the proposed project are species that utilise hollows in trees and fallen timber, as well as species dependant on the dense understorey and groundcover. This will include the small mammal population, arboreal mammals and insectivorous bats that roost in tree hollows. It is likely that it would take over 100 years for hollows to have developed to the stage that will accommodate species that potentially could utilise the present woodland. The rate of hollow development is related to the trees growth, where slow growth of trees would result in a longer period before species such as possums and insectivorous bats could colonise rehabilitated areas.

It is likely that bird species diversity is dependant on flowering of shrubs and trees. Flowers, in addition to providing nectar and pollen, also attract insects the species of birds that feed upon them. The scarring of trees by gliders and the ease of capturing them in winter is indicative of the reduced availability of nectar within the study area during the winter season. Few trees were

observed in flower and the majority of flowering shrubs were the regionally significant *Hakea bakeriana*. No territorial calls of glider species were heard during the field investigations.

The disturbed landscape resulting from ash dam expansion would be susceptible to the establishment and spread of weeds and feral animals and also aggressive native species that are adapted to disturbed landscapes. The remaining bushland surrounding the cleared area would suffer from edge effects without management strategies to effectively rehabilitate the ash cover to a state that is sympathetic to the surrounding vegetation communities.

The footprint of the proposed ash dam expansion is outside of the freshwater pond, presently used to store surface run off from part of the study area. The water input from the areas proposed for ash dam expansion may cease or be reduced and there may be some impact upon water quality into the dam as the ash dam expansion progresses. The pond is presently shallow and is used by various aquatic species, including Black-winged Stilts, Black Swans and Grey Teals (N. Mcelhinney, pers.obs.). These species presently utilise the existing ash dam (HLA 2004), although the aquatic habitat will progressively be reduced under existing activities as the ash dam fills.

5.2.1 Threatened Species Conservation Act 1995 considerations

The *Threatened Species Conservation Act 1995* aims to protect endangered species, populations and ecological communities. Threatened plant species found within a 20 km x 20 km grid centred on the study area are listed in **Table 1** and threatened vertebrate species found within a 20 km x 20 km grid centred on the study area are listed in **Table 3**. Information on species ecology, behaviour and distribution was sourced from published research, general reviews within standard references such as Cogger (2000), Strahan (1998), Churchill 1998) and Harden (1992, 1993, 2000, 2002).

The threatened species detected within the site were:

- the Eastern Freetail-bat (*Mormopteris norfolkensis*);
- the Grey-headed Flying Fox (*Pteropus poliocephalus*);
- the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- the Little Bent-wing Bat (*Miniopteris australis*);
- the Common Bent-wing Bat (*Miniopteris shreibersii oceanensis*); and
- *Tetratheca juncea*.

Habitat is present within the study area for a further 18 species. Seven-part Tests of Significance have been undertaken for these species and are provided in **Appendix C**. A brief discussion of the species, their habitats and potential for impact to the species follows.

The proposed project will impact upon these species listed above as it involves clearing approximately 52 ha of native vegetation. Clearing of native vegetation is a Key Threatening Process under Schedule 3 of the TSC Act and has been addressed in the Seven-Part Test of Significance.

There are no endangered populations, ecological communities, critically endangered species or critically endangered ecological communities within the study area.

Tetratheca juncea is a listed threatened species that occurs within the study area. During the targeted survey, 684 occurrences of *Tetratheca juncea* were found. 472, or approximately 70 per cent of mapped occurrences are within the footprint of the proposed ash dam expansion, as

shown in **Figure 6**. *Tetratheca juncea* are generally associated with the Coastal Plains Smooth-barked Apple Forest and Coastal Plains Scribbly Gum Woodland at the site.

Two of the threatened bat species observed are dependant on tree hollows for roosting and breeding. Two others require subterranean habitats for roosting and breeding, however all bat species detected in the local area are likely to utilise the woodland for foraging activity, however the Large-footed Myotis is more likely to forage over the existing ash dam and freshwater pools. A large area of similar remnant vegetation occurs to the north of the study area (NPWS 2003) and it is unlikely insectivorous bat species are reliant on the woodland for foraging activity. The woodland is also likely to be used by the Grey-headed Flying-fox when flowering resources become seasonally abundant. However the large area of remnant vegetation to the north has been mapped as being dominated by similar canopy species (NPWS 2003), and it is unlikely the local population of Grey-headed Flying-fox is dependent on the woodland within the study area.

There is habitat for the Brown Treecreeper and the Turquoise Parrot. The Brown Treecreeper potentially occurs in open forest habitats where there are trees with hollows present. The Turquoise Parrot habitat is present in the grassy lower slopes of the study area where there are nearby trees with hollows.

Despite no territorial calls being heard from owl species, there is considered to be habitat for the Powerful Owl, Barking Owl and, to a lesser extent, the Sooty Owl. The vulnerable Powerful Owl (*Ninox strenua*) was detected in woodland south of the existing ash dam (Biosis 1999) and there is no reason why the species would not occur in other large areas of woodland that support a significant population of arboreal mammals, including the study area.

The limited flowering resources reduces the potential for threatened specialised nectar feeding avian species, such as the Swift Parrot and Regent Honeyeater, to utilise the habitats significantly. The Swift Parrot is present in the local area during winter (Higgins 1999), while the Regent Honeyeater is likely to be preparing to breed in habitats west of the Great Dividing Range. The Gang-gang Cockatoo is likely to utilise the habitats within the study area as the species is present in the local area over a longer period and would be able to utilise flowering resources as they become available. The Glossy Black-cockatoo is a specialist feeder on the fruits of *Allocasuarina* sp. Black Oak (*Allocasuarina littoralis*) is common on the higher slopes of the study area, however no evidence of foraging was observed at the time of the field investigations.

Of the remaining threatened species that were listed in **Table 3**, it is unlikely that any of the amphibian species are present, due to the reduced water quality of the existing ash dam, and few other aquatic habitats. The aquatic habitats were limited to small pools in drainage lines, areas of dam sedges and one large pool created by earthmoving near the existing ash dam.

Many of the threatened bird species that occur within the local area have specialised habitats, for example the Rose-crowned Fruit-Dove, a species that is reliant on rainforests or habitats with trees and shrubs that have small fruits including berries. No trees that have small succulent fruits were observed within the study area and it is unlikely the species would be reliant on habitats within the study area.

Many significant bird species in the local area utilise freshwater habitats that are marshy or have emergent or floating vegetation, a habitat type that is absent from the study area and adjacent to the existing ash dam. As such there is no habitat within the study area for the Black Bittern, Comb-crested Jacana and Black-necked Stork. Vegetation associated with the existing ash dam includes limited fringing habitat of low marsh, dominated by Samphire (*Sarcocornia quinqueflora* subsp. *quinqueflora*).

There is potential habitat for Koalas and the Spotted-tailed Quoll. Schedule 2 of SEPP No.44 lists Scribbly Gums (*E. haemastoma*), a species that is scattered throughout the study area, as a Koala food source. Although not observed, there is habitat for the Spotted-tailed Quoll, based on the presence of many ground dwelling mammals, potential refuge sites and the connectivity of the study area to larger areas of habitat to the north. There is evidence of dogs and foxes within the study area, species that will compete for food resources and potentially prey upon quolls.

The Brush-tailed Rock-wallaby was not detected during the study and there is little potential for the species to occur within the study area, based on the vulnerability of the species to be eaten by large feral predators, for example wild dogs and foxes, that occur in nearby areas. Present day habitat for the species is typically rocky escarpments and cliffs (Eldridge and Close 1998), features that are absent within the study area. The steeper gullies and dense vegetation may afford some protection, however as the habitat is small and isolated, it is unlikely a viable population could persist.

5.2.2 State Environmental Planning Policy No 44—Koala Habitat Protection

The aims of State Environmental Planning Policy No 44—Koala Habitat Protection (SEPP No.44) are 'to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline:

> *'(a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and*
>
> *(b) by encouraging the identification of areas of core koala habitat, and*
>
> *(c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.'*

The study area is located within the Lake Macquarie City Council Local Government Area (LGA). The LGA is listed in Schedule 1 of SEPP No.44, and contains trees listed in Schedule 2 of SEPP No.44 as species that are known food resources for Koalas. As the nominated trees constitute more than 15 per cent of the canopy cover, it is considered that potential koala habitat, as defined in SEPP No.44 is present.

Core Koala habitat is defined as an area with a resident Koala population, including recent sightings, especially where females and young are present. No Koalas were observed and the nearest recorded location is approximately 3 km to the north at Awaba and 3 km to the south at Morisset. While it is possible that Koalas will pass through the site occasionally, it is unlikely there is a resident population. The study area is therefore not considered to be core Koala habitat. The provisions for the protection of core Koala habitat under SEPP No.44 do not therefore require further consideration.

5.2.3 Environment Protection and Biodiversity Conservation Act 1999 considerations

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects matters of national environmental significance. A summary of the findings of the on-line databases is given in **Table 4**.

The catchment of the Hunter Estuary Wetlands, a Wetlands of International Significance, is within 10 km of the study area, however run off from the proposed project will be contained with

the existing ash dam bund. Any discharge will flow into Lake Macquarie. The Hunter Estuary Wetlands will not be impacted by the proposed project.

With the exception of the Grey-headed Flying-fox, no species of fauna listed in **Table 5** were observed within the study area. The proposed project will result in the removal of approximately 52 ha of woodland habitat. The Spotted-tailed Quoll, while not observed within the study area, may potentially occur. This is based on the presence of a dense understorey, potential den sites and abundant foraging resource that includes small mammals and birds. The Regent Honey-eater also potentially has habitat within the study area, in the form of flowering Eucalypts and in particular the presence of many Banksias and other flowering shrubs in the understorey. The impact to both species is not expected to be significant on the basis of a large area of similar habitat found to the north of the study area. The Swift Parrot is unlikely to be affected by the proposed project, as the species is unlikely to be present in the local area during the peak flowering period of the present vegetation community.

A relatively thick ground cover is a major habitat requirement for the Long-nosed Potoroo. The species is more common in areas with light sandy soil where it digs for and eats arthropods and their larvae, roots, tubers and fungi (Johnston 1998). Evidence of foraging, similar to this species was noted within the study area, however it is attributed to the Northern Bandicoot which has been observed in similar habitats located nearby. The impact to this species is not expected to be significant on the basis of a large area of similar habitat found to the north of the study area.

It is unlikely there will be a significant impact to species listed in **Table 5** that are reliant on aquatic habitats, as there are no creeks or relatively permanent pools within the study area. The exceptions are the existing ash dam, a pond created to intercept water from part of the ridge before it enters the existing ash dam and a minor pond created during earthmoving. The last pool dries out in summer and has not contained water throughout the year since 2003 (Neil McElhinney, pers. obs.). There is no reed bed habitat that would support a population of Painted Snipe.

Habitat for species requiring rocky areas, for example the Broad-headed Snake, Brush-tailed Rock-wallaby and Large-eared Pied Bat, is absent. The Broad-headed Snake is closely associated with sandstone platforms with exfoliated rock (Cogger 2000), the Brush-tailed Rock-wallaby is closely associated with cliffs where it shelters from predators (Eldridge and Close 1998), while the Large-eared Pied Bat roosts in subterranean habitats, such as caves (Hoye and Dwyer 1998).

Six-hundred and eighty-four clumps of *Tetratheca juncea* was recorded within the study area. The species is known to occur in scattered populations elsewhere within the EPS lands, with the most comparable area of habitat located to the east of the existing ash dam. The species is assumed to occur in similar habitats to the north of the study area. The viability of the local population is not expected to be significantly affected as the adjacent areas are unlikely to be impacted, if a buffer is established along the ridgeline and weeds are controlled on the ash deposit.

There is potential for ten migratory species, listed in **Table 6**, to occur within the study area. One species, the White-bellied Sea-eagle, was observed roosting within the woodland it is proposed to clear. No evidence of nesting was observed and it is likely the majority of the species foraging taking place over Lake Macquarie. It is unlikely the species will be significantly impacted by the proposed project.

The White throated Needletail is only likely to use the habitat within the study area for foraging for insects, primarily over the canopy of the woodland. Similar habitat in the local area is available for this species to continue this activity.

The Black-faced Monarch, Satin Flycatcher and Rufous Fantail potential will breed in the sheltered drainage areas in the east of the study area. The drainage areas are located outside of the proposed project footprint and therefore the species will not be impacted by the proposed project.

There is no littoral habitat for the Pacific Golden Plover within the woodland associated with the study area and no impact to this species is expected. The Eastern Curlew is unlikely to utilise the open grassy habitats within the study area as these are limited in extent, typically less than a hectare, and are relatively isolated.

There are no reed bed habitats that provide habitat for either the Latham's Snipe or Painted Snipe.

The clearing of the woodland is highly unlikely to interfere with the migratory patterns of the Regent Honeyeater, as there is similar woodland habitat to the north of the study area.

5.2.4 Impact Mitigation

The staged and gradual nature of the clearing will in itself reduce the overall impact of the proposed clearing, being undertaken in an incremental fashion of a period of twenty years.

The main impact will be the loss of native biodiversity within the area of ash dam expansion. This can be mitigated by ensuring rehabilitation efforts on surrounding EPS lands and on the expanded ash dam in the long term to establish vegetation communities that will be similar in the post rehabilitation landscape to those presently within the study area. A rehabilitation plan should be prepared prior to the commencement of the proposed ash dam expansion. The plan should include, but not be limited to the control of weeds in adjacent areas of existing disturbance and use of soil material sourced from the proposed ash dam expansion.

The control of weeds in adjacent areas and in areas where soil is recovered is important as the ash surface and surrounds provide opportunities for weeds to establish and allow weeds to spread into presently high quality woodland. Weeds and exotic species that are present in the surrounding areas will readily establish in rehabilitated areas. It is preferred that soil and regolith stripped from the woodland be used in an area that will not be disturbed by proposed ash dam expansion. For example, it would be preferable to use the material to augment capping of areas that are presently being rehabilitated rather than use the soil in an area that will be buried under further ash deposition. Using soil and regolith sourced from areas within the project footprint in areas presently undergoing rehabilitation will increase the depth that plants can establish roots.

Additionally, seed stored in the soil will increase the native biodiversity, as many species that are not readily available commercially will be present in the seed store. This will result in a community that is closer in diversity to the original vegetation that will be lost. Importantly the genetic integrity of the local vegetation will be maintained.

Another impact will be the loss of roosting, nesting and denning opportunities by birds, bats and arboreal mammals. It will take many decades for hollow development to begin, provided growth of trees is rapid and a reasonable size is obtained. Tree roots do not penetrate ash deposits, resulting in an initial growth phase followed by tree death or stunted growth for many species. The shallow root system also makes trees susceptible to being blown over, particularly on the outer edge of woodlands. Increasing the depth of material above the ash deposit should mitigate this impact.

As hollow development is likely to take several decades, it is necessary to provide supplementary artificial hollows. This will require the establishment of boxes in suitable habitat

with a variety of entrance sizes to accommodate the different species. Boxes must be maintained until hollows in rehabilitated areas have developed sufficiently for targeted species to occupy. Maintenance includes repair of damaged boxes and removal of pest species, such as the Common Myna and European bees.

The placement of hollow logs and timber on the ground provides shelter for terrestrial species, however it is important that the sites do not become den sites for feral predators, for example the Red Fox. Additionally grass species that tend to form dense swards, such as Kikuyu, Pampas Grass and Rhodes Grass must not be allowed to establish in rehabilitated areas as these increase feral animal use, thereby discouraging the establishment of native animal populations.

In order to reduce the potential impact of adjacent woodland being impacted by weed encroachment and wind throw, it is recommended that a minimum 20 m horizontal buffer be retained below the northern ridgeline. Wind throw is the effect of trees that were previously sheltered being uprooted as they are exposed to high winds. It is likely the wind strength experienced by trees along the ridgeline will be greater. The buffer will also retain some trees with hollows while providing an area to place nest boxes to replace hollows lost further down slope. The retained buffer will also ensure connectivity between the eastern and western populations of *Tetratheca juncea*.

It is important that species that tend to dominate vegetation communities without providing foraging or denning opportunities for native fauna, for example Swamp Oak, be excluded from the rehabilitation program. Species that are local to the area that flower regularly should be encouraged, particularly species that flower in winter. This will provide a foraging resource for nectivorous species, such as the Grey-headed Flying-fox and Regent Honeyeater. Flowering trees and shrubs provide habitat for insects, which are important for pollination and also provide a foraging resource for many bird and insectivorous bat species.

6 RECOMMENDATIONS

To minimise the impacts of the proposal upon native flora and fauna, the following actions are recommended:

- Retain a buffer zone of a minimum 20 metres along the ridge top;
- Stage the clearing of vegetation and undertake further assessments prior to each stage to ascertain the level of success of mitigation measures;
- Timing the clearing so as not to coincide with critical periods in significant species life-cycles;
- Prior to the first stage of clearing, install artificial nest boxes within nearby woodland within the EPS lands and particularly within the proposed ridge buffer area;
- Artificial nest and roost boxes to replace tree hollows at a ratio of 2:1;
- Monitoring the condition of artificial nest boxes is to be incorporated into the Biodiversity Management Plan being prepared for the Eraring Energy lands;
- Prepare a rehabilitation plan that utilises soil and regolith stripped during clearing in rehabilitation of existing, and if practicable, the ash deposited as part of the proposed project; and
- Rehabilitate the ash deposit to a similar community, particularly with regard to nectar producing species, to that which shall be removed as part of the proposed project.

7 CONCLUSIONS

The study area has two vegetation communities present that provide varied habitats for bird and mammal species that utilise dry sclerophyll forests, particularly the Coastal Plains Smooth-barked Apple Forest of the upper slopes. The study area has apparently had a low level of disturbance, as evidenced by the absence of exotic plant species away from tracks, gravel extraction pits and water diversion channels. This has resulted in relatively complex communities in terms of structure and species composition. Six threatened species were recorded within the study area. These were four species of insectivorous bat, the Grey-headed Flying-fox and a threatened plant species. The plant, *Tetratheca juncea*, occurs throughout the study area. The threatened bat species are likely to utilise the hollow bearing trees within the study area. There is potential habitat for other threatened vertebrate fauna within the study area. It is likely the loss of the hollow bearing trees will have the potential to reduce the native vertebrate diversity of the local area if mitigation measures are not put in place.

8 PERSONAL COMMUNICATIONS

Deborah Saunders (DEC Threatened Species Officer/ Swift Parrot Recovery Team) 28 November 2003

Chris Wood (Former Environmental Officer, Eraring Energy), 17 November 2004.

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Figures

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

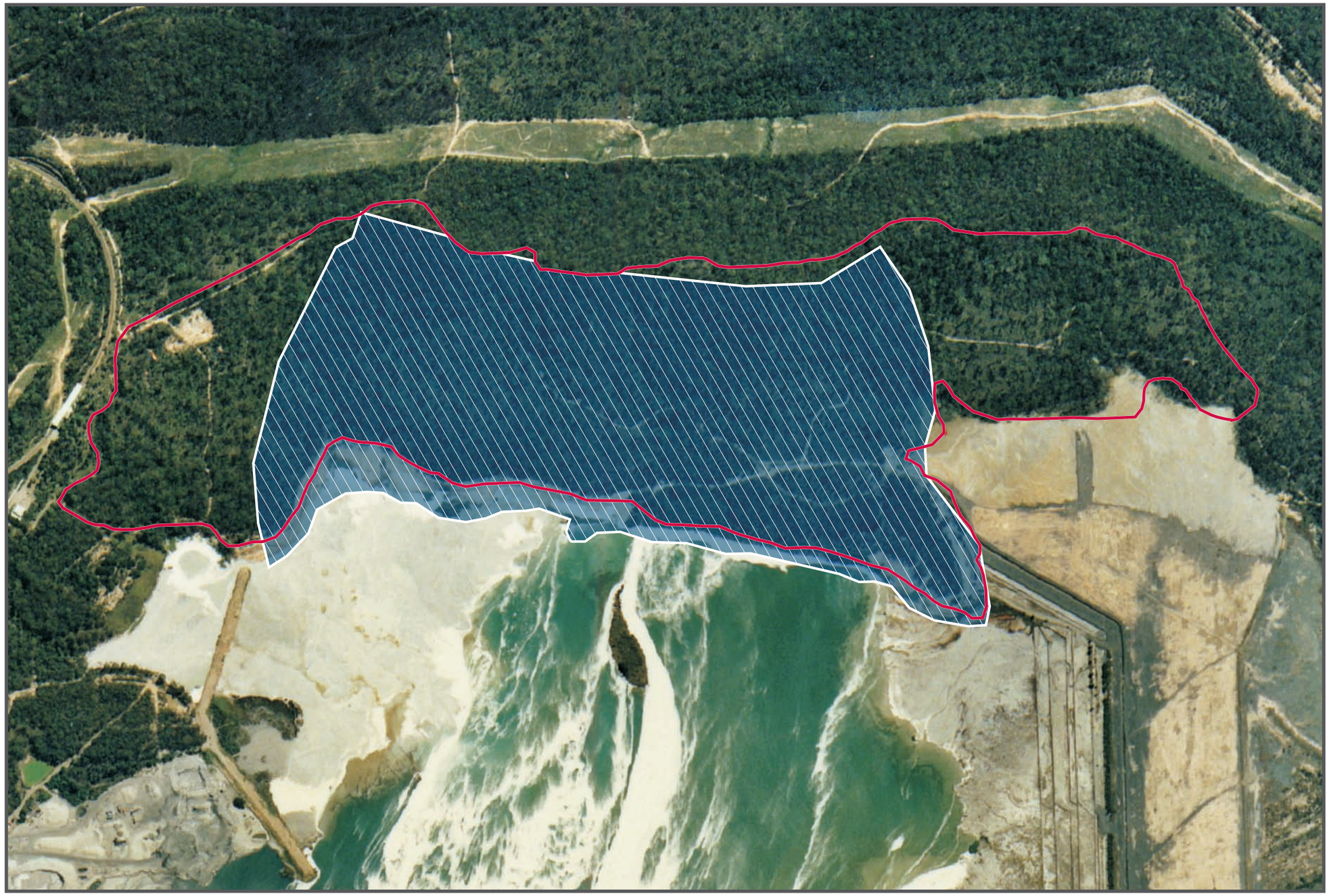
Study area

Study Area
Eraring Energy
Flora and Fauna Impact Assessment
Upgrade to Existing Ash Dam
Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 1



PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

Site boundary

Proposed ash disposal area

Approximate Area of Proposed Ash Disposal Within Study Area
Eraring Energy
Flora and Fauna Impact Assessment
Proposed Upgrade to Existing Ash Dam
Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 2

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

- Site boundary
- Surveyed transects
- HLA 2005 Survey
- HLA 2004 Survey
- Biosis 1999 Survey

Location of Flora Surveys
Eraring Energy
Flora and Fauna Impact Assessment
Proposed Upgrade to Existing Ash Dam
Eraring Power Station
Rocky Point Road, Dora Creek

HLA

N

0 150m

FIGURE 3

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

- Site boundary
- Spotlight transect
- Terrestrial A sized Elliot traps (20 per transect)
- B sized Elliot traps - 5 clustered
- 30 minute Bird observation location
- Terrestrial cage traps - 2 per location
- B sized Elliot trap
- Owl callback playback broadcast location
- Echolocation recording
- Echolocation recording (HLA 2004)

Location of Fauna Surveys
Eraring Energy
Flora and Fauna Impact Assessment
Upgrade to Existing Ash Dam
Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 4

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

Site boundary
Coastal Plains Smooth-barked Apple Woodland
Coastal Plains Scribbly Gum Woodland

Vegetation Community Extents
Eraring Energy
Flora and Fauna Impact Assessment
Upgrade to Existing Ash Dam
Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 5

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

Site boundary
Tetratheca juncea

Location of *Tetratheca juncea*
Eraring Energy
Flora and Fauna Impact Assessment
Upgrade to Existing Ash Dam
Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 6

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

- Site boundary
- *Blandfordia grandiflora*
- *Bossiaea stephensonii*
- *Cymbidium suave*
- *Doryanthes excelsa*
- *Hakea bakeriana*
- *Pultenaea tuberculata*

Location of Additional Significant Flora Species
Eraring Energy
Flora and Fauna Impact Assessment
Proposed Upgrade to Existing Ash Dam
Eraring Power Station
Rocky Point Road, Dora Creek

HLA

0 150m

FIGURE 7

Appendix A
Flora Recorded in Study Area

Appendix A: Flora recorded in study area.

Species nomenclature consistent with National Herbarium of New South Wales, 30 June 2005

N/I
- N - Native to Australia
- I - Exotic species

NSW Status:
- V - Vulnerable (Threatened Species Conservation Act, 1995)
- P13 - Protected Plants (National Parks and Wildlife Act, 1974)
- U - Unprotected

EPBC Status
- V - Vulnerable (Environment Protection and Biodiversity Conservation Act 1999)

ROTAP
Rare Or Threatened Australian Plant (ROTAP) Species (Briggs and Leigh 1995)
Code explanation:
- 2 Geographic range in Australia less than 100 km.
- 3 Geographic range in Australia greater than 100 km
- E Species at risk of disappearing in the wild 10 –20 years if land use at current locations change
- V Species at risk of disappearing in the wild 20 –50 years if land use at current locations change
- K Conservation status poorly known, suspected of being E, V or R
- C Species is reserved in proclaimed conservation reserve. Adequacy of conservation is given by proceeding E, V or R.
- - Reserved population size unknown
- a At least 1000 plants present in conservation reserves

Observed
Location of plot (refer to Figure 3).
Misc, recorded incidentally. Number refers to nearest plot
- H16 - HLA unpublished. Plot surveyed spring 2004
- B10 - Biosis (1999), Plot 10.
- B20 - Biosis (1999), Plot 20.

Class: *Cycadopsida*

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Zamiaceae*						
Macrozamia communis		N	U			2,3

Class: *Filicopsida*

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Dennstaedtiaceae*						
Pteridium esculentum	Bracken	N	U			3,6
Family: *Gleicheniaceae*						
Gleichenia dicarpa	Coral Fern	N	U			Eraring – Crown land misc.
Family: *Lindsaeaceae*						
Lindsaea linearis	Screw Fern	N	U			1,2,6,8,9,H16,B20
Lindsaea microphylla	Lacy Wedge Fern	N	U			2,3,6,8

Class: *Magnoliopsida* (*Liliidae*)

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Antheriaceae*						
Tricoryne elatior	Yellow Rush-lily	N	U			B20
Family: *Blandfordiaceae*						
Blandfordia grandiflora	Christmas Bells	N	P13			B10
Family: *Colchicaceae*						
Burchardia umbellata	Milkmaids	N	U			H16,B20

Class: *Magnoliopsida* (*Liliidae*) continued

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Cyperaceae*						
Baumea articulata		N	U			Misc.
Carex inversa	Knob Sedge	N	U			Misc.
Cyperus difformis	Dirty Dora	N	U			Misc.
Eleocharis acuta		N	U			Misc.
Gahnia sieberiana		N	U			8,9,B20
Isolepis nodosus		N	U			Misc.
Lepidosperma laterale		N	U			1,2,4,7,B10,B20
Ptilothrix deusta		N	U			4,5,7,H16,B10
Schoenus apogon		N	U			Misc.
Schoenus brevifolius		N	U			Misc.
Schoenus melanostachys		N	U			Misc.
Family: *Dioscoreaceae*						
Dioscorea transversa	Native Yam	N	U			2,H16
Family: *Doryanthaceae*						
Doryanthes excelsa	Gymea Lily, Giant Lily	N	P13			6
Family: *Iridaceae*						
Patersonia glabrata		N	U			B10
Patersonia longifolia		N	U			H16
Patersonia sericea		N	U			1,2,4,6,H16,B10
Family: *Juncaceae*						
Juncus planifolius		N	U			Misc.
Family: *Lobeliaceae*						
Lobelia dentata		N	U			Misc.

Class: *Magnoliopsida* (*Liliidae*) continued

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Lomandraceae*						
Lomandra glauca	Pale Mat-rush	N	U			B10
Lomandra longifolia	Spiny-headed Mat-rush	N	U			8
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush	N	U			2,B20
Lomandra obliqua		N	U			1,2,3,4,5,6,7,8,H16,B20
Family: *Orchidaceae*						
Acianthus fornicatus	Pixie Caps	N	U			2,6
Cryptostylis sp.	Tongue Orchid	N	U			B20
Cryptostylis subulata	Large Tongue Orchid	N	U			9,H16
Cymbidium suave	Snake Orchid	N	P13			Misc.
Dipodium sp.		N	P13			Misc.
Thelymitra sp.		N	U			Misc.
Family: *Philydraceae*						
Philydrum lanuginosum	Frogsmouth	N	U			Misc.
Family: *Phormiaceae*						
Dianella longifolia var. *longifolia*		N	U			5,6,9
Family: *Poaceae*						
Aristida warburgii		N	U			H16
Austrostipa pubescens		N	U			B20
Cortaderia selloana	Pampas Grass	N	U			Misc
Entolasia stricta	Wiry Panic	N	U			1,2,3,4,5,6,7,8,9,H16,B10,B20
Eragrostis brownii	Brown's Lovegrass	N	U			H16
Joycea pallida		N	U			H16,B10
Microlaena stipoides var. *stipoides*		N	U			H16
Panicum simile	Two Colour Panic	N	U			8
Themeda australis	Kangaroo Grass	N	U			2,3,7,8,B20

Class: *Magnoliopsida* (*Liliidae*) continued

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Restionaceae*						
Lepyrodia scariosa		N	U			B20
Family: *Xanthorrhoeaceae*						
Xanthorrhoea latifolia subsp. *latifolia*		N	U			1,2,3,4,5,6,7,8,9,H16,B10,B20
Family: *Xyridaceae*						
Xyris sp.		N	U			H16

Class: *Magnoliopsida* (*Magnoliidae*)

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Apiaceae*						
Actinotus minor	Lesser Flannel Flower	N	U			1,3,4,5,6,B10
Platysace linearifolia		N	U			5,6,7,B10
Xanthosia tridentata		N	U			H16
Family: *Araliaceae*						
Polyscias sambucifolia	Elderberry Panax	N	U			2
Family: *Asteraceae*						
Chrysanthemoides monilifera subsp. *rotundata*	Bitou Bush	I	U			Misc..
Family: *Bignoniaceae*						
Pandorea pandorana subsp. *pandorana*	Wonga Wonga Vine	N	U			2,3,6,7
Family: *Casuarinaceae*						
Allocasuarina littoralis	Black Oak	N	U			2,5,6,8,9,H16,B20
Family: *Crasulaceae*						
Crassula sieberiana subsp. *sieberiana*	Australian Stonecrop	N				

Class: *Magnoliopsida* (*Magnoliidae*) continued

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Cunoniaceae*						
Ceratopetalum gummiferum	Christmas Bush	N	P13			Misc.
Family: *Dilleniaceae*						
Hibbertia aspera subsp*. aspera*		N	U			3,5,7,9,H16
Hibbertia empetrifolia subsp. empetrifolia		N	U			Misc..
Family: *Droseraceae*						
Drosera auriculata	Golden Sundew	N	U			1,2,3,5,7,8,9,B10
Drosera spatulata		N	U			2
Family: *Epacridaceae*						
Astroloma humifusum	Native Cranberry	N	U			6,9
Epacris pulchella		N	U			1,3,4,6,8,9,H16,B10,B20
Leucopogon appressus		N	U			H16
Leucopogon virgatus		N	U			4,6,7,B20
Melichrus procumbens	Jam Tarts	N	U			H16,B10
Family: *Euphorbiaceae*						
Phyllanthus hirtellus		N	U			B20
Family: *Fabaceae* (*Faboideae*)						
Bossiaea obcordata		N	U			1,6,7,8,9,B20
Bossiaea stephensonii		N	U			H16,B10,B20
Dillwynia retorta (J.C.Wendl.) Druce species complex		N	U			1,3,4,5,6,7,8,9,H16,B10,B20
Glycine clandestina		N	U			8
Gompholobium latifolium	Golden Glory Pea	N	U			2,6,8,9
Gompholobium pinnatum	Pinnate Wedge Pea	N	U			9 Misc,H16
Hardenbergia violacea	False Sarsaprilla	N	U			3,5,7,8
Hovea linearis		N	U			1,3,5,6,8
Mirbelia rubiifolia		N	U			4,7,H16,B10,B20

Class: *Magnoliopsida* (*Magnoliidae*) continued

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Fabaceae* (*Faboideae*) continued						
Podolobium ilicifolium	Prickly Shaggy Pea	N	U			1,7,8
Podolobium scandens	Netted Shaggy Pea	N	U			2,3
Pultenaea dentata		N	U			H16
Pultenaea paleacea		N	U			8,B20
Pultenaea tuberculata		N	U			1,3,4,7,8,B10
Pultenaea villosa		N	U			B10
Family: *Fabaceae* (*Mimosoideae*)						
Acacia brownii	Heath Wattle	N	U			3,4
Acacia falcata		N	U			B10
Acacia longifolia subsp. *longifolia*	Sydney Golden Wattle	N	U			H16
Acacia myrtifolia	Red-stemmed Wattle	N	U			5,8,9,H16,B20
Acacia suaveolens	Sweet Wattle	N	U			1,3
Acacia ulicifolia	Prickly Moses	N	U			1,7,B10
Family: *Goodeniaceae*						
Dampiera purpurea		N	U			B10,B20
Dampiera stricta		N	U			1,4,7,9,B10
Goodenia heterophylla subsp. *eglandulosa*		N	U			2,6,B10
Family: *Haloragaceae*						
Gonocarpus tetragynus		N	U			3,5,6,7,9
Family: *Lauraceae*						
Cassytha glabella f. glabella		N	U			1,2,3,4,6,7,9,H16,B10
Cassytha pubescens		N	U			B20
Family: *Loranthaceae*						
Amyema sp.		N	U			B20

Class: *Magnoliopsida* (*Magnoliidae*) continued

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Myrtaceae*						
Angophora costata	Rusty Gum	N	U			2,6,8,9,H16,B10,B20
Corymbia gummifera	Red Bloodwood	N	U			1,5,B10
Eucalyptus capitellata	Brown Stringybark	N	U			2,3,4,5,6,7,8,9,B20
Eucalyptus haemastoma	Broad-leaved Scribbly Gum	N	U			1,4,7,9,H16,B10,B20
Kunzea ambigua	White Tick Bush	N	U			H16
Leptospermum laevigatum	Coast Teatree	N	U			B10,B20
Leptospermum polygalifolium subsp. *polygalifolium*		N	U			5,6,8
Leptospermum trinervium		N	U			1,2,3,4,5,6,7,8,H16,B20
Melaleuca sieberi		N	U			H16
Melaleuca thymifolia		N	U			H16
Family: *Polygalaceae*						
Comesperma ericinum form A		N	U			3,4,7,H16,B10
Family: *Proteaceae*						
Banksia oblongifolia		N	U			H16,B10,B20
Banksia serrata	Saw Banksia	N	U			1,2,4,5,6
Banksia spinulosa var. *collina*		N	U			1,2,3,4,5,6,7,8,9,B10,B20
Grevillea sericea subsp. sericea		N	U			1,3,4,6,8,9,H16
Hakea bakeriana		N	U			1,2,4,5,6,7,8,9,H16,B20
Hakea dactyloides		N	U			1,5,B10,B20
Isopogon anemonifolius		N	U			1,3,5,6,7,8,9,H16,B10
Lambertia formosa		N	U			1,2,3,4,5,6,7,8,9,B10
Persoonia laurina subsp. laurina		N	U			2
Persoonia levis	Broad-leaved Geebung	N	U			14,5,6,9,B10,B20
Persoonia linearis	Narrow-leaved Geebung	N	U			7,B10
Xylomelum pyriforme	Woody Pear	N	P13			9

Class: *Magnoliopsida* (*Magnoliidae*) continued

Scientific Name	Common	N/I	NSW Status	EPBC Status	ROTAP	Observed
Family: *Rutaceae*						
Boronia polygalifolia		N	P13			H16
Family: *Sapindaceae*						
Dodonaea triquetra		N	U			2
Family: *Schizaeaceae*						
Schizaea bifida	Forked Comb Fern	N	U			Misc.
Family: *Stackhouseiaceae*						
Stackhousia viminea	Slender Stackhousia	N	U			1,H16
Family: *Thymelaeaceae*						
Pimelea linifolia subsp*. linifolia*		N	U			3,5,H16,B20
Family: *Tremandraceae*						
Tetratheca ericifolia		N	U			9
Tetratheca juncea		N	V	V	3VCa	1,3,5,6,7

Appendix B
Fauna observations

Taxonomic nomenclature as per Barker *et al*. (1995), Cogger, H.G. (2000), Higgins (1999), Higgins and Davies (1996), Higgins and Peter (2002), Higgins *et al*. (2001), Marchant and Higgins (1990a), Marchant and Higgins (1990b), Marchant and Higgins (1993) and Strahan (1998).

NSW Status - As per Threatened Species Conservation Act 1995 (TSC Act) or National Parks and Wildlife Act 1975 (NPW Act)
- U - Unprotected (NPW Act)
- P - Protected (NPW Act)
- V - Vulnerable (Schedule 2 TSC Act)

Record Origin - 1 Study undertaken July 2005
- 2 Eraring biodiversity study (2003-2004)
- 3 Study undertaken November 2005

How Observed
- F - Tracks/scratchings
- O - Observed
- R - Remains (bone, feather, fur etc)
- T - Trapped
- W - Heard (includes echolocation detection)

Class: *Amphibia*

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Anura* Family: *Hilidae*				
Litoria fallax	Dwarf Green Treefrog	P	3,2	W
Litoria freycineti	Freycinet's Frog	P	3	W,O
Litoria tyleri	Tyler's Tree Frog	P	3	W

Class: *Amphibia* - continued

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Anura* Family: *Myobatrachidae*				
Crinia signifera	Common Eastern Froglet	P	1,2,3	W,O
Limnodynastes peronii	Brown-striped Frog	P	2,3	W
Limnodynastes tasmaniensis	Spotted Grass Frog	P	2,3	W
Pseudophryne coriacea	Red-backed Toadlet	P	1,2,3	W

Class: *Aves*

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Anseriformes* Family: *Anatidae*				
Anas castanea	Chestnut Teal	P	3	O
Anas gracilis	Grey Teal	P	2	
Cygnus atratus	Black Swan	P	1,2,3	O
Order: *Caprimulgiformes* Family: *Podargidae*				
Podargus strigoides	Tawny Frogmouth	P	1,2	R
Order: *Charadriiformes* Family: *Charadriidae*				
Elseyornis melanops	Black-fronted Dotterel	P	3	O
Vanellus miles	Masked Lapwing	P	1,2,3	O
Order: *Charadriiformes* Family: *Lardidae*				
Larus novaehollandiae	Silver Gull	P	1,2,3	O

Class: *Aves* - continued

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Charadriiformes* Family: *Recurvirostridae*				
Himantopus himantopus	Black-winged Stilt	P	1,2,3	O
Order: *Ciconiiformes* Family: *Ardeidae*				
Egretta novaehollandiae	White-faced Heron	P	1,2	O
Nycticorax caledonicus	Nankeen Night-Heron	P	3	O
Order: *Columbiformes* Family: *Columbidae*				
Macropygia amboinensis	Brown Cuckoo-Dove	P	2	
Order: *Coraciiformes* Family: *Alcedinidae*				
Dacelo novaeguineae	Laughing Kookaburra	P	1,2	O
Order: *Cuculiformes* Family: *Cuculidae*				
Cacomantis flabelliformis	Fan-tailed Cuckoo	P	2	
Chrysococcyx lucidus	Shining Bronze-Cuckoo	P	2	
Order: *Falconiformes* Family: *Accipitridae*				
Haliaeetus leucogaster	White-bellied Sea-Eagle	P	3	O
Haliastur sphenurus	Whistling Kite	P	3	O
Order: *Passeriformes* Family: *Acanthizidae*				
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P	1,2	O
Acanthiza nana	Yellow Thornbill	P	2	
Acanthiza pusilla	Brown Thornbill	P	2,3	

Class: *Aves* - continued

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Passeriformes* Family: *Acanthizidae*				
Gerygone mouki	Brown Gerygone	P	2	
Smicrornis brevirostris	Weebill	P	1,2	O
Order: *Passeriformes* Family: *Artamidae*				
Gymnorhina tibicen	Australian Magpie	P	1,2,3	O
Strepera graculina	Pied Currawong	P	1,2	O
Order: *Passeriformes* Family: *Campaphagidae*				
Coracina novaehollandiae	Black-faced Cuckoo-shrike	P	1,2	O
Order: *Passeriformes* Family: *Corvidae*				
Corvus coronoides	Australian Raven	P	1,2,3	O
Order: *Passeriformes* Family: *Dicruridae*				
Grallina cyanoleuca	Magpie-lark	P	1,2,3	O
Rhipidura fuliginosa	Grey Fantail	P	1,2,3	O
Rhipidura leucophrys	Willie Wagtail	P	1,2	O
Order: *Passeriformes* Family: *Estrildidae*				
Neochmia temporalis	Red-browed Finch	P	1,2,3	O
Order: *Passeriformes* Family: *Eupetidae*				
Psophodes olivaceus	Eastern Whipbird	P	1,2,3	W

Class: *Aves* - continued

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Passeriformes* Family: *Maluridae*				
Malurus cyaneus	Superb Fairy-wren	P	1,2,3	O
Malurus lamberti	Variegated Fairy-wren	P	2	
Stipiturus malachurus malachurus	Southern Emu-wren	P	3	O
Order: *Passeriformes* Family: *Meliphagidae*				
Acanthorhynchus tenuirostris	Eastern Spinebill	P	1,2,3	O
Anthochaera carunculata	Red Wattlebird	P	1,2	O
Lichenostomus chrysops	Yellow-faced Honeyeater	P	2	
Lichenostomus leucotis	White-eared Honeyeater	P	2	
Lichenostomus penicillatus	White-plumed Honeyeater	P	1,3	O
Lichmera indistincta	Brown Honeyeater	P	1,2	O
Manorina melanocephala	Noisy Miner	P	1,2,3	O
Meliphaga lewinii	Lewin's Honeyeater	P	1,2	O
Philemon citreogularis	Little Friarbird	P	3	O
Phylidonyris nigra	White-cheeked Honeyeater	P	2,3	O
Phylidonyris novaehollandiae	New Holland Honeyeater	P	2,3	O
Order: *Passeriformes* Family: *Pachychephalidae*				
Pachycephala pectoralis	Golden Whistler	P	1,2	O
Pachycephala rufiventris	Rufous Whistler	P	2	
Order: *Passeriformes* Family: *Pardalotidae*				
Pardalotus striatus	Striated Pardalote	P	2	

Class: *Aves* - continued

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Passeriformes* Family: *Petrocidae*				
Eopsaltria australis	Eastern Yellow Robin	P	2	
Order: *Passeriformes* Family:				
Zosterops lateralis	Silvereye	P	1,2	O
Order: *Pelecaniformes* Family: *Pelecanidae*				
Pelecanus conspicillatus	Australian Pelican	P	1,2	O
Order: *Psittaciformes* Family: *Cacatuidae*				
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	P	2	
Order: *Psittaciformes* Family: *Psittacidae*				
Trichoglossus haematodus	Rainbow Lorikeet	P	1,2	O

Class: *Mammalia* (*Eutheria*)

Scientific Name	Common Name	Status TSC	Record origin	How Observed (present study)
Order: *Chiroptera* Family: *Molossidae*				
Mormopterus norfolkensis	Eastern Little Mastiff-bat	V	2,3	W
Mormopterus sp.2		P	2	
Nyctinomus australis	White-striped Mastiff-bat	P	2	

Class: *Mammalia* (*Eutheria*)- continued

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Chiroptera* Family: *Pteropodidae*				
Pteropus poliocephalus	Grey-headed Flying-fox	V	2	
Order: *Chiroptera* Family: *Vespertilionidae*				
Chalinolobus gouldii	Gould's Wattled Bat	P	2	
Chalinolobus morio	Chocolate Wattled Bat	P	3	W
Falsistrellus tasmaniensis	Great Pipistrelle	V	3	W
Miniopterus australis	Little Bent-wing Bat	V	2,3	W
Miniopterus schreibersii	Common Bent-wing Bat	V	2,3	W
Myotis macropus	Large-footed Mouse-eared Bat	V	2	
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	2	
Nyctophilus gouldi	Gould's Long-eared Bat	P	2	
Nyctophilus sp.		P	3	W
Vespadelus pumilus	Eastern Forest Bat	P	2,3	
Vespadelus vulturnus	Little Forest Eptesicus	P	2	
Order: *Fissipedia* Family: *Canidae*				
Canis familiaris	Dog	U	2	
Order: *Lagomorpha* Family: *Leporidae*				
Lepus capensis	Brown Hare	U	2,3	O
Oryctolagus cuniculus	Rabbit	U	2	
Order: *Rodentia* Family: *Muridae*				
Rattus fuscipes	Bush Rat	P	1,2,3	T
Rattus rattus	Black Rat	U	2	

Class: *Mammalia* (*Marsupialia*)

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Dasyuromorphia* Family: *Dasyuridae*				
Antechinus flavipes	Yellow-footed Antechinus	P	2	
Antechinus stuartii	Brown Antechinus	P	1,2	T
Order: *Diprodonta* Family: *Macropodidae*				
Wallabia bicolor	Swamp Wallaby	P	1,2	O
Order: *Diprodonta* Family: *Petauridae*				
Petaurus norfolcensis	Sugar Glider	P	1	T
Petaurus norfolcensis	Squirrel Glider	V	2	
Pseudocheirus peregrinus	Common Ringtail Possum	P	1,2	O,T
Order: *Peramelina* Family: *Peramelidae*				
Isoodon macrourus	Common Brushtail Possum	P	1,2	O
Order: *Diprodonta* Family: *Phalangeridae*				
Trichosurus vulpecula	Northern Brown Bandicoot	P	1,2	F

Class: *Reptilia*

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Serpentes* Family: *Colubridae*				
Dendrelaphis punctata	Green Tree Snake	P	2	

Class: *Reptilia* - continued

Scientific Name	Common Name	Status TSC	Record Origin	How Observed (present study)
Order: *Serpentes* Family: *Elapidae*				
Pseudechis porphyriacus	Red-bellied Black-snake	P	2,3	O
Order: *Squamata* Family: *Agamidae*				
Amphibolurus muricatus	Jacky Lizard	P	3	
Order: *Squamata* Family: *Scincidae*				
Eulamprus quoyii	Eastern Water Skink	P	2	
Lampropholis delicata	Grass Skink	P	1,2,3	O
Saiphos equalis	Three-toed Skink	P	3	O
Order: *Squamata* Family: *Varanidae*				
Varanus varius	Lace Monitor	P	2,3	T,0

Appendix C
Part 5A Assessment

Environmental Planning and Assessment Act (1979) – Section 5A Considerations.

Significant effect on threatened species, populations or ecological communities, or their habitats.

Section 5A of the *EP&A Act* consists of seven factors that must be taken into account in deciding whether a proposed development or activity is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. This is known as the Seven-Part Test. In the case where suitable habitat for a threatened species occurs, it will be assumed the species will potentially utilise the habitat unless it can be demonstrated otherwise, in accordance with the uncertainty principle of ecological sustainable development. Populations will be considered viable or part of a viable population, in accordance with NSW Department of Environment and Conservation guidelines.

Species that have been sighted within the study area and species that have potential habitat present within the study area have been assessed using the Seven Part Test. The species below have not been assessed as they are unlikely to use the site.

Black Bittern
The Black Bittern inhabits terrestrial and estuarine wetlands, mangroves and streamside vegetation. It is generally found in areas with permanent water and dense vegetation. While the study area and adjacent existing ash dam contain some permanent water, they do not contain the habitat attributes that would support the Black Bittern. Furthermore, the species has not been identified during field surveys of the study area and its surrounds. Therefore, a Seven-Part Test of Significance has not been undertaken for this species.

Black-necked Stork
The Black-necked Stork inhabits river pools, swamps and intertidal flats where it feeds on fish, frogs, eels, crabs, turtles and snakes. The study area and adjacent existing ash dam do not contain suitable habitat attributes to support the species and lack the species' preferred prey items. Furthermore, the species has not been identified during field surveys of the study area and its surrounds. Therefore, a Seven-Part Test of Significance has not been undertaken for this species.

Comb-crested Jacana
The Comb-crested Jacana is found in permanent wetlands with a surface covering of floating vegetation, such as water-lilies, across which it forages. The study area and adjacent existing ash dam do not contain this type of habitat and the species has not been identified during field surveys. A Seven-Part Test of Significance has not been undertaken for this species.

Rose-crowned Fruit Dove
The Rose-crowned Fruit Dove occurs mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest where fruit is plentiful. No trees with small succulent fruits were observed within the study area and the species has not been detected during field surveys conducted at the site. A Seven-Part Test of Significance has not been undertaken for this species.

Sooty Owl
The Sooty Owl occurs in various types of rainforest including dry rainforest, subtropical and warm temperate rainforest and moist eucalypt forest. This habitat does not occur at the site and the species has not been observed during field surveys of the area. A Seven-Part Test of Significance has not been undertaken for this species.

Giant Barred Frog
The Giant Barred Frog is found in deep, damp leaf litter in rainforests and moist eucalypt forests and nearby dry eucalypt forest. It requires shallow, flowing rocky streams for breeding. The study area does not support this habitat type. The water within the existing ash dam is of poor quality and other aquatic habitats are limited to small pools in drainage lines, areas of dam sedges and a large man made pool near the existing ash dam. The species was not detected during field surveys of the site. A Seven-Part Test of Significance has not been undertaken for this species.

Green-thighed Frog
The Green-thighed Frog breeds after heavy rainfall in late spring and summer around grassy semi-permanent ponds and flood prone grassy areas. The water within the existing ash dam is of poor quality and other aquatic habitats are limited to small pools in drainage lines, areas of dam sedges and a large man made pool near the existing ash dam. The species was not detected during field surveys of the site. A Seven-Part Test of Significance has not been undertaken for this species.

Red-crowned Toadlet
The Red-crowned Toadlet inhabits wet sandstone outcrops and periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. The study area comprises dry areas and does not contain this habitat type. The species has not been detected during field surveys conducted at the site. A Seven-Part Test of Significance has not been undertaken for this species.

Stuttering Frog
The Stuttering Frog inhabits rainforest and wet, tall open forests where it breeds in streams. The water within the existing ash dam is of poor quality and other aquatic habitats are limited to small pools in drainage lines, areas of dam sedges and a large man made pool near the existing ash dam. A Seven-Part Test of Significance has not been undertaken for this species.

Wallum Froglet
Wallum Froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country. The study area does not support suitable habitat for the species. A Seven-Part Test of Significance has not been undertaken for this species.

Brush-tailed Rock Wallaby
The Brush-tailed Rock Wallaby occurs in a variety of habitats, such as rainforest gullies, wet and dry sclerophyll forests, open woodlands that have suitable rocky areas and sites with numerous ledges, caves and crevices. The study area does not contain this habitat type. There is also evidence of the presence of dogs and foxes at the site, which further reduces the likelihood of the Brush-tailed Rock Wallaby occurring there. A Seven-Part Test of Significance has not been undertaken for this species.

Large-eared Pied Bat
The Large-eared Pied Bat roosts in caves, mine tunnels and the abandoned, bottle shaped mud nests of Fairy Martins (Strahan 1995). It occurs in well timbered areas containing gullies. Roosting habitat does not occur at the site and as such, a Seven-Part Test of Significance has not been undertaken for this species.

Yellow-bellied Glider
The Yellow-bellied Glider is found in tall mature eucalypt forest, generally in areas with high rainfall and nutrient rich soils. The study area is dry and does not contain nutrient rich soils. Within the study area, there are trees with scarring from feeding glider species, most likely Sugar Gliders as this species has been caught during previous trapping events. No territorial

calls of gliders species were heard during the field investigations. A Seven-Part Test of Significance has not been undertaken for this species.

SECTION 5A ASSESSMENT (SEVEN PART TEST)

1. In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Barking Owl *Ninox connivens*
The Barking Owl nests in tree hollows of large old eucalypts. Breeding occurs during late winter and early spring. The study area contains many hollow bearing mature eucalypts that have the potential to provide nesting sites for the Barking Owl. Targeted surveys for the species using call playback, failed to detect the presence of the species in the study area. It has also not been detected in previous surveys conducted at the EPS lands. It is unlikely the species utilises the site and its life cycle is unlikely to be disrupted such that a viable local population is likely to be placed at risk of extinction.

Brown Treecreeper *Climacteris picumnus*
The Brown Treecreeper requires hollows in dead or live standing trees for nesting. The species is sedentary and present year round at many sites. The study area contains mature hollow bearing trees that would be cleared as part of the proposed works. The present survey and past surveys have failed to detect the species within EPS lands. It is unlikely the species utilises the site to a significant extent and it is unlikely a viable local population is likely to be placed at risk of extinction.

Gang-gang Cockatoo *Callocephalon fimbriatum*
The Gang-gang Cockatoo inhabits mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. *Eucalyptus* sp. fruit form part of the species' diet. The species was not observed within the study area or in the EPS lands during the present or past studies. It is unlikely that a viable population of the species will be adversely impacted such that it will be placed at the risk of extinction.

Glossy Black-Cockatoo *Calyptorhynchus lathami*
The Glossy Black-Cockatoo is a specialist feeder on the fruits of *Allocauarina* sp.. Nesting occurs in a hollow of a tall tree that can be living or a stag (Higgins 1999). The species has not been detected during surveys of the area, or in the surrounding woodland within EPS lands, and no evidence of foraging was observed during the field investigations. It is unlikely that a viable population of the species will be adversely impacted by the proposed project such that it will be placed at the risk of extinction.

Osprey *Pandion haliaetus*
The Osprey breeds from July to September and nests high in dead trees or in dead crowns of live trees. While the proposed works would remove potential nesting habitat, the species is unlikely to use the site as it was not detected during field surveys undertaken for the study area and has not been detected during previous surveys of the EPS lands. The life cycle of the species is unlikely to be disrupted such that a viable local population is likely to be placed at risk of extinction.

Masked Owl *Tyto novaehollandiae*
While there is potential foraging and breeding habitat within the study area, the present and previous studies within the EPS lands have not detected the presence of the Masked Owl. The life cycle of the species is unlikely to be disrupted such that a viable local population is likely to be placed at risk of extinction.

Powerful Owl *Ninox strenua*
The proposed works would remove approximately 52 ha of potential nesting habitat and foraging habitat for the species. The species has been detected to the south of the existing ash dam in 1998 (Biosis 1999), however the species has not been detected during biodiversity surveys within the EPS lands since that time, including targeted surveys undertaken within the study area during in July and November 2005. As the species was recorded outside of the study area, and has not been recorded recently, it is unlikely a local population of the species is dependant on the study area.

Regent Honeyeater *Xanthomyza phrygia*
The Regent Honeyeater breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. The species nests in horizontal branches or forks in tall mature eucalypts and Sheoaks. This habitat does not occur in the study area. Furthermore, the species was not observed during field surveys of the study area, or during previous surveys of the land managed by Eraring Energy. The proposed project will not disrupt the life cycle of a viable local population, placing it at the risk of extinction.

Swift Parrot *Lathamus discolor*
The Swift Parrot breeds between September and January in Tasmania and migrates north to the mainland in winter. During this time it feeds upon high nectar-yielding eucalypts. This habitat does not occur in the study area. Furthermore, the species was not observed during field surveys of the study area, or during previous surveys of the land managed by Eraring Energy. The species of Eucalyptus within the study area do not flower when the species is present in the local area. The proposed project will not disrupt the life cycle of a viable local population, placing it at the risk of extinction.

Turquoise Parrot *Neophema pulchella*
The Turquoise Parrot nests in tree hollows, logs or posts from August to December. This habitat is present within the study area and would be removed as part of the proposed works. However, it is unlikely that the species uses the site as it was not detected during field surveys of the study area and has not been detected during previous surveys. It is unlikely that the proposed works would disrupt the life cycle of a viable local population, placing it at the risk of extinction.

Eastern False Pipistrelle *Falsistrellus tasmaniensis*
The Eastern False Pipistrelle roosts in eucalypt hollows and also under bark and in buildings. Habitat for the species exists at the site and surveys have detected the presence of the species within the study area. Therefore, the proposed works would remove probable roosting habitat for the species. Mitigation measures have been proposed to reduce the impacts of the proposed works and to avoid disrupting the life cycle of a viable local population. These measures are outlined in **Section 5.2.4 and Section 6** of the report and include setting up artificial roosting sites for the species.

Eastern Freetail Bat *Mormopteris norfolkensis*
The Eastern Freetail Bat roosts in tree hollows and spouts. Surveys have detected the species within the study area and the mature eucalypts at the site provide probable habitat for the Eastern Freetail Bat. The proposed works involve the removal of these eucalypts, removing potential roosting sites for the species. Mitigation measures have been proposed to reduce the impacts of the proposed works, and to avoid disrupting the life cycle of a viable local population. These measures are outlined in **Section 5.2.4 and Section 6** of the report and include setting up artificial roosting sites for the species.

Greater Broad-nosed Bat *Scoteanax rueppellii*
The Greater Broad-nosed Bat is an arboreal species that occurs in woodlands and open forests and closed forests. It roosts in tree hollows and occasionally in the roofs of buildings (Strahan, 1995). Females congregate in suitable trees prior to giving birth in summer. The mature hollow

bearing eucalypts at the site provide potential habitat for the Greater Broad-nosed Bat. The proposed works involve the removal of these eucalypts, removing potential roosting sites for the species. Mitigation measures have been proposed to reduce the impacts of the proposed works, and to avoid disrupting the life cycle of a viable local population. These measures are outlined in **Section 5.2.4 and Section 6** of the report and include setting up artificial roosting sites for the species.

Grey-headed Flying-fox *Pteropus poliocephalus*
The Grey Headed Flying Fox congregates in roost sites that are commonly in gullies, close to water and in vegetation with a dense canopy. It is in these roost sites that mating, birth and the rearing of young occurs (Tidemann 1998). The species has been detected during surveys of the study area and as such, it is likely the species uses the site for foraging. No potential roost sites were detected within the study area. It is unlikely that the life-cycle of the species will be disrupted such that a viable local population will be placed at the risk of extinction.

Large-footed Myotis *Myotis adversus*
The Large-footed Myotis roosts in caves, mines or tunnels and under bridges or buildings (Richards 1998). The species is known to roost within the cooling water outlet tunnel that services the Eraring Power Station. No subterranean habitat is present within the study area, and therefore is unlikely that the life-cycle of the species will be disrupted such that a viable local population will be placed at the risk of extinction.

Little Bentwing Bat *Miniopteris australis*
The Little Bentwing Bat depends upon specific nursery sites to rear its young. It roosts in caves and tunnels during the day (Dwyer 1998a). The species has been detected during surveys of the study area and as such, it is likely the species uses the site for foraging. The proposed project would not impact upon the species' roost sites as no subterranean habitat is present within the study area. It is unlikely that the life-cycle of the species will be disrupted such that a viable local population will be placed at the risk of extinction.

Eastern Bentwing Bat *Miniopterus schreibersii oceanensis*
The Eastern Bent-wing Bat roosts in caves, old mines, underground storm water channels and structures that provide sufficient shelter (Dwyer 1998b). The site does not contain such structures, and as such is unlikely that a viable population of the species occurs at the site. Field surveys failed to detect the presence of the species within the study area.

Spotted-tailed Quoll *Dasyurus maculatus*
The Spotted-tailed Quoll breeds from April to July and uses hollow-bearing trees, fallen logs, small caves, rock crevices or boulder fields as den sites. Suitable habitat for the species is present within the study area and would be removed as part of the proposed works. However, it is unlikely that the species uses the site as targeted surveys using cage traps failed to capture any quolls. It is unlikely that the proposed works would disrupt the life cycle of a viable local population, placing it at the risk of extinction.

Squirrel Glider *Petaurus norfolcensis*
The Squirrel Glider is found in dry sclerophyll forest and woodland where it nests in bowl shaped tree hollows lined with leaves. The mature hollow bearing eucalypts at the site provide potential habitat for the Squirrel Glider. The proposed works involve the removal of these eucalypts, removing potential nesting sites for the species. Mitigation measures have been proposed to reduce the impacts of the proposed works, and to avoid disrupting the life cycle of a viable local population. These measures are outlined in **Section 5.2.4 and Section 6** of the report and include setting up artificial nest boxes for the species.

Koala
Koala habitat is closely associated with certain eucalypt species, such as *Eucalyptus haemastoma*, *Eucalyptus punctata* and *Eucalyptus tereticornis.* Surveys of the study area did not detect evidence of koala activity. It is unlikely a viable population will be adversely affected by the proposed project.

Black-eyed Susan *Tetratheca juncea*
Black-eyed Susan is mainly found in coastal districts in low open forest and woodland with a mixed shrub understorey and a grassy groundcover. Flowering generally occurs between July and December. The species usually spreads via underground stems and also reproduces sexually. Large populations have been identified as being particularly important. There is a viable local population of the species within the study area, of which approximately 70 per cent will be removed as part of the proposed project. It is likely the species will be able to persist within the study area if connectivity is maintained between the eastern and western population. Viable populations of the species also occur in the woodland to the south east of the study area and may also occur to the north. Should connectivity be maintained between the eastern and western population within the study area, it is unlikely the proposed works would result in sufficient disruption of the life cycle of the viable population within the study area, placing it at the risk of extinction.

2. In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

There are no endangered populations protected in accordance with the provisions of *Part 2* of *Schedule 1* of the TSC Act that will be impacted by the proposed project.

3. In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- ***a) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
- ***b) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***

There are no endangered ecological communities or critically endangered ecological communities protected in accordance with the provisions of *Part 3* of *Schedule 1 or Part 2 of Schedule 1A* of the TSC Act that will be impacted by the proposed project.

4. In relation to the habitat of a threatened species, population or ecological community:

- ***a) the extent to which habitat is likely to be removed or modified as a result of the action proposed,***
- ***b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and***
- ***c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.***

Barking Owl *Ninox connivens*
The Barking Owl is an arboreal species inhabiting eucalypt woodland and open forest. The species roosts along creek lines during the day, usually in tall understorey trees with dense foliage or the dense clumps of canopy leaves in large eucalypts. Prey includes invertebrates, birds and mammals.

a) The proposed project involves the removal of approximately 52 ha of bushland that includes dense tall understorey vegetation and is therefore removing potential habitat for the species. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of apparently similar habitat to the north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. As such, the long term survival of the species is unlikely to be impacted upon by the proposed project.

Brown Treecreeper *Climacteris picumnus*

The species is known to utilise woodlands and forests dominated by *Eucalyptus* spp., especially rough barked species, usually in communities with a sparse but grassy understorey, but not with a dense woody understorey (Higgins *et al*. 2001). Fallen timber and leaf litter may be of importance as habitat for insect prey (pers. obs. N. McElhinney).

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. As such, the long term survival of the species is unlikely to be impacted upon by the proposed project.

Masked Owl *Tyto novaehollandiae*

The Masked Owl inhabits dry eucalypt forests and woodlands and generally uses large tree hollows or caves for roosting. The species hunts within and along the edges of forests, preying upon tree-dwelling and ground mammals.

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. As such, the long term survival of the species is unlikely to be impacted upon by the proposed project.

Osprey *Pandion haliaetus*

The Osprey is associated with coastal, littoral and terrestrial wetland (including inland rivers) habitats, preferring areas with coastal cliffs, but the species will utilise low sandy and rocky shores. It breeds mainly in coastal regions, utilising a prominent open position near water and it is said to be tolerant of human activity. Nests have been recorded on artificial structures and may maintain populations in developed areas. Threats include clearing of trees utilised for nesting and roosting and also increased turbidity reducing the visibility of potential prey (Marchant and Higgins 1993). There are mullet within the existing ash dam (Chris Wood, pers. comm.)

a) The study area does contain suitable habitat for the species. The species was not detected during field surveys conducted at the site. It has not been detected in previous surveys conducted in the surrounding areas managed by Eraring Energy. The long term survival of the species is unlikely to be impacted upon by the proposed project.
b) Adjacent habitats are wooded, and it is unlikely the species would utilise them significantly.
c) The habitat to be removed is unlikely to be important to the species.

Powerful Owl *Ninox strenua*
The Powerful Owl is an arboreal species inhabiting woodland, open sclerophyll forest and tall open wet forest and rainforest. It requires large tracts of forest or woodland habitat where it can hunt for medium sized arboreal marsupials and roost during the day.

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of apparently similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. As such, the long term survival of the species is unlikely to be impacted upon by the proposed project.

Regent Honeyeater *Xanthomyza phrygia*
The main coastal habitat for *Xanthomyza phrygia* is dry sclerophyll forest dominated by Spotted Gum (*Corymbia maculata*) and Swamp Mahogany (*Eucalyptus robusta*), or woodland with an understorey dominated by Teatree (*Leptospermum* sp) and *Banksia* sp. (Higgins *et al*. 2001).

a) The study area has no dominant canopy types present. However, approximately 52 ha of potential habitat for the species will be removed as part of the proposed project as the study area has an understorey dominated by Teatree and *Banksia* sp.. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of apparently similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. As such, the long term survival of the species is unlikely to be impacted upon by the proposed project.

Swift Parrot *Lathamus discolor*
In NSW the Swift Parrot inhabits dry open eucalypt woodlands, especially Ironbark and Box associations. The species feeds mostly on nectar, also consuming sugar-exuding insects and sometimes seed (Higgins 1999).

a) The species has tendencies to site fidelity (pers comm. Deborah Saunders) and the study area does not constitute a significant foraging resource. There is a small area of better quality winter foraging habitat located to south west of the Eraring Power Station that is more significant in terms of seasonal foraging availability.
b) The species was not detected during field surveys conducted at the site. It has not been detected in previous surveys conducted in the surrounding areas managed by Eraring Energy.

c) The long term survival of the species is unlikely to be impacted upon by the proposed project.

Turquoise Parrot *Neophema pulchella*

This species is usually associated with the foothills of the Great Dividing Range, inhabiting grassy woodland and open forest communities with dominant Eucalyptus tree species. It nests in trees hollows of both living and dead trees, often low to the ground (Higgins 1999). The Turquoise Parrot feeds usually beneath trees on seeding grasses and weeds (Slater *et al*. 1989).

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. The lower slopes dominated by a canopy of open woodland and a groundcover of native grasses are limited within the study area and occur elsewhere within the EPS lands, particularly to the south of the study area.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. As such, the long term survival of the species is unlikely to be impacted upon by the proposed project.

Eastern False Pipistrelle *Falsistrellus tasmaniensis*

The Eastern False Pipistrelle inhabits open and closed forests. It roosts in the stem holes of living eucalypts. The mature eucalypts at the site provide potential habitat for the Eastern False Pipistrelle.

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has probable habitat value for the species, which has been detected during surveys conducted at the site. Mitigation measures have been proposed (see **Section 5.2.4 and Section 6**) to reduce the impacts of the proposed works, and to avoid affecting the long term survival of the species in the locality.

Eastern Freetail Bat *Mormopteris norfolkensis*

The Eastern Freetail Bat typically inhabits woodlands and open and closed forests, roosting in tree hollows and spouts. The mature eucalypts at the site provide potential habitat for the Eastern Freetail Bat.

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has probable habitat value for the species, which has been detected during surveys conducted at the site. Mitigation measures have been proposed (see **Section 5.2.4 and Section 6**) to reduce the impacts of the

proposed works, and to avoid affecting the long term survival of the species in the locality.

Greater Broad-nosed Bat *Scoteanax rueppellii*

The Greater Broad-nosed Bat is an arboreal species that occurs in woodlands and open forests and closed forests. It roosts in tree hollows and occasionally in the roofs of buildings (Strahan 1995).

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has probable habitat value for the species, which has been detected during surveys conducted at the site. Mitigation measures have been proposed (see **Section 5.2.4 and Section 6**) to reduce the impacts of the proposed works, and to avoid affecting the long term survival of the species in the locality.

Grey-headed Flying-fox *Pteropus poliocephalus*

The species forages on a wide variety of flowers and fruits, such as figs, palms (Tidemann 1998) and commercial crops as well as nectar and pollen from flowering Myrtaceous species, and are important pollinators (Eby 1991). The roost site is important, as it is where young are left when they are too large to be carried on the mother. The main threat to the species is the clearing of vegetation, especially the wintering camps in north-eastern NSW (NPWS 2001).

d) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area. There is a small area of better quality winter foraging habitat located to south west of the Eraring Power Station that is more significant in terms of seasonal foraging availability.
e) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
f) The vegetation within the study area has probable habitat value for the species, which has been detected during surveys conducted at the site. Mitigation measures have been proposed (see **Section 5.2.4 and Section 6**) to reduce the impacts of the proposed works, and to avoid affecting the long term survival of the species in the locality.

Large-footed Myotis *Myotis adversus*

Small colonies of 10-15 Large-footed Myotis's roost in subterranean locations close to water such as caves, but will also utilise man-made structures including abandoned underground mines, tunnels, under bridges and building cavities in the southern range of the species distribution, although the species has been known to utilise tree hollows (Churchill 1998). The species will utilise most riparian communities, foraging mainly for insects and also fish (Churchill 1998). Water bodies range from streams to large lakes or dams (Richards 1998).

a) The species is known to roost within the EPS lands, however the roost site will not be impacted by the proposed project. The woodland habitat within the study area may be used as a supplementary foraging habitat. Similar habitat in terms of spatial extent and

vegetation structure occurs within the EPS lands to the west and south east of the study area.

b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The majority of the standing water within the study area is of poor quality and is unlikely to support the Large-footed Myotis. The species has not been detected during field surveys of the area. It is unlikely the long term survival of the species would be affected by the proposed project.

Little Bentwing Bat *Miniopteris australis*

The Little Bentwing Bat forages for small insects beneath the canopy of a variety of well timbered habitats such as rainforest, *Melaleuca* swamps and dry sclerophyll forests.

a) The study area contains potential foraging habitat for the species which would be removed as part of the proposed project, however no subterranean habitat will be impacted.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has value as foraging habitat for the species, which has been detected during surveys conducted at the site.

Spotted-tailed Quoll *Dasyurus maculates*

The Spotted-tailed Quoll is a partly arboreal and mostly nocturnal species inhabiting a wide variety of habitats. These include rainforest, woodland, coastal heathland and riparian forests from the coast to the snowline. Den sites include caves, crevices and also hollow logs. It feeds upon a variety of prey items, from small wallabies, carrion to insects (Edgar and Belcher 1998).

a) The study area contains potential habitat for the species which would be removed as part of the proposed project.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat.
c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. As such, the long term survival of the species is unlikely to be impacted upon by the proposed project.

Squirrel Glider *Petaurus norfolcensis*

The Squirrel Glider utilises dry sclerophyll habitats and woodlands where it dens in tree hollows. It feeds on insects, nectar, pollen, sugary insect exudates and sap. Trees utilised include Grey Gums (*E. punctata*) and Forest Red Gums (*E. tereticornis*), while many Smooth-barked Apples (Angophora costata) have evidence of glider feeding activity. Acacia species that exude sap are also favoured. Squirrel Gliders will out compete the closely related and smaller Sugar Glider, once hollows are large enough to enter (Suckling 1998).

a) The study area contains potential habitat for the species that would be removed as part of the proposed project. Similar habitat in terms of spatial extent and vegetation structure occurs within the EPS lands to the west and south east of the study area.
b) The bushland that would be removed is adjacent to a large tract of apparently similar habitat to the north, where the species can potentially move between the western and eastern remnants in the post project landscape. Adjacent to the southern boundary of

the study area is an existing ash dam. The removal of the bushland within the study area would not result in fragmentation or isolation of habitat, particularly if mitigation measures suggested in **Section 5.2.4** and **Section 6** are implemented.

c) The vegetation within the study area has potential habitat value for the species, however, surveys have failed to detect the species at the site. The species has been tentatively identified at another site within the woodland managed by Eraring Energy. Mitigation measures have been proposed (see **Section 5.2.4** and **Section 6**) to reduce the impacts of the proposed works, and to avoid affecting the long term survival of the species in the locality.

Black-eyed Susan *Tetratheca juncea*

Habitat is described as being restricted to open forest on skeletal sandy loam pH neutral and low fertility soils over sandstone that support woodlands dominated by *Angophora costata*, *Eucalyptus haemastoma*, *Corymbia gummifera*, *Eucalyptus capitellata* and *Eucalyptus globoidea* (Benson and McDougall 2001). As seen in **Figure 6**, Black-eyed Susan was found throughout the study area, including to the east and west of the proposed ash dam expansion.

a) The proposed project would involve the removal of approximately 52 ha of potential habitat within the study area.
b) The bushland that would be removed is adjacent to a large tract of similar habitat to its north, however this has a drier northerly aspect and may not support a significant population of Black-eyed Susan. Adjacent to the southern boundary of the study area is an existing ash dam. The removal of the bushland within the study area may result in fragmentation or isolation of habitat of the western population that will remain in the post project landscape.
c) Due to the occurrence of the species in the woodland areas surrounding the study area and the implementation of the proposed mitigation measures outlined in **Section 5.2.4** and **Section 6**, it is unlikely that the proposed project will impact the long term survival of the species within the study area.

5. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly.

No critical habitat has been declared for the site or habitats that occur in or around the site.

6. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There are two recovery plans applicable to species that have the potential to occur within the study area:

- Recovery Plan for the Barking Owl *Ninox Connivens* (Draft February 2003); and
- Recovery Plan for the Large Forest Owls: Powerful Owl *Ninox strenua,* Sooty Owl *Tyto tenebricosa* and Masked Owl *Tyto novahollandiae* (Draft May 2005).

The objectives and actions listed in the recovery plans emphasise the importance of protecting habitat for the species, both on and off reserves, and reducing the impact of competition from feral animals. Particular emphasis is placed upon protecting known habitats for the species. Surveys have failed to detect the presence of the owl species listed above within the study area.

While the proposed project involves clearing of potential habitat for a variety of species, the mitigation measures outlined in **Section 5.2.4** and **Section 6** would be implemented to reduce the impact to habitats and control feral animals and weeds.

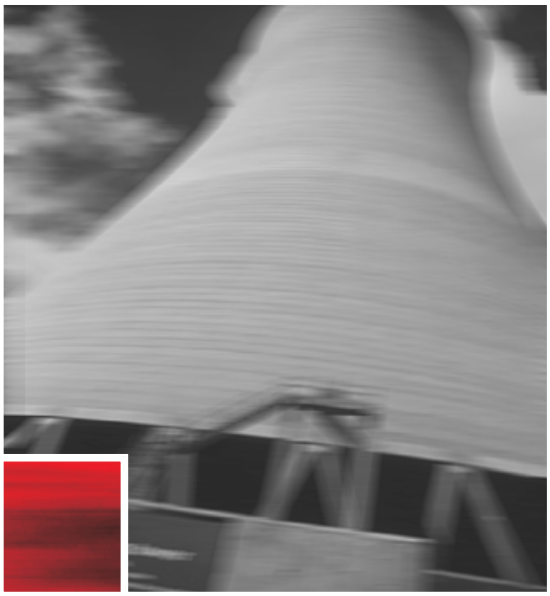
7. Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The 'Clearing of native vegetation' is a Key Threatening Process under Schedule 3 of the TSC Act. The following species are listed as being adversely affected by this process:

- Barking Owl;
- Masked Owl;
- Osprey;
- Powerful Owl;
- Regent Honeyeater;
- Swift Parrot;
- Turquoise Parrot;
- Greater Broad-nosed Bat;
- Grey-headed Flying-fox; and
- Spotted-tailed Quoll.

Tree clearing impacts these species by many mechanisms, including the reduction in nest sites, particularly tree hollows, reduction in food resources, for example loss of nectar producing trees and mistletoes, loss of woody debris that provide habitat for invertebrates and small terrestrial vertebrates and loss of grass seed. Fragmentation also allows aggressive species, both native and exotic to compete for food and nest sites.

The proposed project will involve clearing of approximately 52 ha of native vegetation, therefore is resulting in the increase in operation of a threatening process under the provisions of the TSC Act. The removal of these trees will be offset by the proposed mitigation measures, in particular, the retention of a 20 m buffer zone at the top of the ridge and set up of artificial nest boxes within the Eraring Energy remnant woodland buffer area. Therefore, the proposed project, whilst clearing native vegetation, will not result in threatened species being further threatened.



appendix f

epbc protected matters

Australian Government
Department of the Environment and Heritage

Protected Matters Search Tool

You are here: DEH Home > EPBC Act > Search

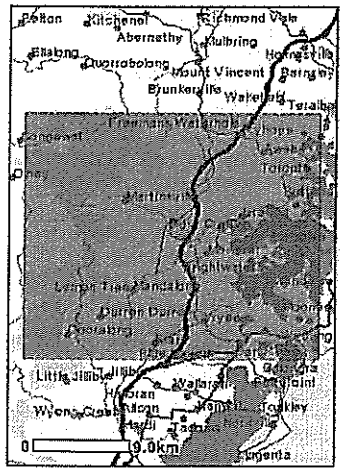
9 December 2005 12:49

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.deh.gov.au/epbc/assessmentsapprovals/index.html



Search Type: Area

Buffer: 0 km

Coordinates: -32.9691,151.3065, -33.2138,151.3065, -33.2138,151.6001, -32.969,151.6001

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.deh.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	1
Commonwealth Marine Areas:	Relevant
Threatened Ecological Communities:	None
Threatened Species:	40
Migratory Species:	31

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.deh.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species,

whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.deh.gov.au/epbc/permits/index.html.

Commonwealth Lands:	3
Commonwealth Heritage Places:	None
Places on the RNE:	2
Listed Marine Species:	51
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Other Commonwealth Reserves:	None
Regional Forest Agreements:	1

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information]
(Ramsar Sites)

HUNTER ESTUARY WETLANDS	Within same catchment as Ramsar site

Commonwealth Marine Areas [Dataset Information]

Approval may be required for a proposed activity that is likely to have a significant impact on the environment in a Commonwealth Marine Area, when the action is outside the Commonwealth Marine Area, or the environment anywhere when the action is taken within the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Within 3 Nautical Mile Limit

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Diomedea antipodensis * Antipodean Albatross	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni * Gibson's Albatross	Vulnerable	Species or species habitat may occur within area
Lathamus discolor * Swift Parrot	Endangered	Species or species habitat may occur within area
Macronectes giganteus * Southern Giant-Petrel	Endangered	Species or species habitat may occur within area

Macronectes halli * Northern Giant-Petrel	Vulnerable	Species or species habitat may occur within area
*Pterodroma neglecta neglecta** Kermadec Petrel (western)	Vulnerable	Species or species habitat may occur within area
Rostratula australis * Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri * Buller's Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta * Shy Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida * Campbell Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini * Salvin's Albatross	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi * White-capped Albatross	Vulnerable	Species or species habitat may occur within area
Xanthomyza phrygia * Regent Honeyeater	Endangered	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus * Giant Burrowing Frog	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea * Green and Golden Bell Frog	Vulnerable	Species or species habitat may occur within area
Litoria littlejohni * Littlejohn's Tree Frog, Heath Frog	Vulnerable	Species or species habitat may occur within area
Mixophyes balbus * Stuttering Frog, Southern Barred Frog (in Victoria)	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus * Southern Barred Frog, Giant Barred Frog	Endangered	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri * Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
*Dasyurus maculatus maculatus (SE mainland population)** Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Species or species habitat likely to occur within area
Eubalaena australis * Southern Right Whale	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae * Humpback Whale	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata * Brush-tailed Rock-wallaby	Vulnerable	Species or species habitat may occur within area
*Potorous tridactylus tridactylus** Long-nosed Potoroo (SE mainland)	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus * Grey-headed Flying-fox	Vulnerable	Roosting known to occur within area

Reptiles		
Chelonia mydas * Green Turtle	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Vulnerable	Species or species habitat may occur within area
Hoplocephalus bungaroides * Broad-headed Snake	Vulnerable	Species or species habitat likely to occur within area
Sharks		
*Carcharias taurus (east coast population)** Grey Nurse Shark (east coast population)	Critically Endangered	Species or species habitat may occur within area
Carcharodon carcharias * Great White Shark	Vulnerable	Species or species habitat may occur within area
Rhincodon typus * Whale Shark	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia bynoeana * Bynoe's Wattle, Tiny Wattle	Vulnerable	Species or species habitat likely to occur within area
Angophora inopina *	Vulnerable	Species or species habitat likely to occur within area
Caladenia tessellata * Thick-lipped Spider-orchid, Daddy Long-legs	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana * Leafless Tongue-orchid	Vulnerable	Species or species habitat may occur within area
Diuris praecox * Newcastle Doubletail	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus camfieldii * Camfield's Stringybark	Vulnerable	Species or species habitat likely to occur within area
*Grevillea parviflora subsp. parviflora**	Vulnerable	Species or species habitat likely to occur within area
Syzygium paniculatum * Magenta Lilly Pilly, Magenta Cherry, Pocket-less Brush Cherry, Scrub Cherry, Creek Lilly Pilly, Brush Cherry	Vulnerable	Species or species habitat likely to occur within area
Tetratheca juncea *	Vulnerable	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Migratory	Breeding may occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Breeding likely to occur within area

Rhipidura rufifrons Rufous Fantail	Migratory	Breeding may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
Calidris acuminata Sharp-tailed Sandpiper	Migratory	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Migratory	Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew	Migratory	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover	Migratory	Species or species habitat likely to occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Diomedea antipodensis Antipodean Albatross	Migratory	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross	Migratory	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel	Migratory	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel	Migratory	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross	Migratory	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross	Migratory	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross	Migratory	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross	Migratory	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross	Migratory	Species or species habitat may occur within area
Migratory Marine Species		
Mammals		
Balaenoptera edeni Bryde's Whale	Migratory	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale	Migratory	Species or species habitat may occur within area
Eubalaena australis * Southern Right Whale	Migratory	Species or species habitat likely to occur within area
Lagenorhynchus obscurus	Migratory	Species or species habitat may

Dusky Dolphin		occur within area
Megaptera novaeangliae * Humpback Whale	Migratory	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca	Migratory	Species or species habitat may occur within area
Reptiles		
Chelonia mydas * Green Turtle	Migratory	Species or species habitat may occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Migratory	Species or species habitat may occur within area
Sharks		
Carcharodon carcharias Great White Shark	Migratory	Species or species habitat may occur within area
Rhincodon typus Whale Shark	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Breeding likely to occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Breeding likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper	Listed	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Listed	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross	Listed	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross	Listed	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area

Lathamus discolor Swift Parrot	Listed - overfly marine area	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel	Listed	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel	Listed	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Listed - overfly marine area	Breeding may occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Breeding likely to occur within area
Numenius madagascariensis Eastern Curlew	Listed	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover	Listed	Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross	Listed	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross	Listed	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross	Listed	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross	Listed	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross	Listed	Species or species habitat may occur within area
Fishes		
Acentronura tentaculata Hairy Pygmy Pipehorse	Listed	Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish	Listed	Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish	Listed	Species or species habitat may occur within area

Heraldia nocturna Upside-down Pipefish	Listed	Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish	Listed	Species or species habitat may occur within area
Hippocampus abdominalis Eastern Potbelly Seahorse, New Zealand Potbelly, Seahorse, Bigbelly Seahorse	Listed	Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse	Listed	Species or species habitat may occur within area
Histiogamphelus briggsii Briggs' Crested Pipefish, Briggs' Pipefish	Listed	Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish	Listed	Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish	Listed	Species or species habitat may occur within area
Notiocampus ruber Red Pipefish	Listed	Species or species habitat may occur within area
Phyllopteryx taeniolatus Weedy Seadragon, Common Seadragon	Listed	Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse	Listed	Species or species habitat may occur within area
Solenostomus cyanopterus Blue-finned Ghost Pipefish, Robust Ghost Pipefish	Listed	Species or species habitat may occur within area
Solenostomus paradoxus Harlequin Ghost Pipefish, Ornate Ghost Pipefish	Listed	Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish	Listed	Species or species habitat may occur within area
Stigmatopora nigra Wide-bodied Pipefish, Black Pipefish	Listed	Species or species habitat may occur within area
Syngnathoides biaculeatus Double-ended Pipehorse, Alligator Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bend Stick Pipefish, Short-tailed Pipefish	Listed	Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish	Listed	Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish	Listed	Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri New Zealand Fur-seal	Listed	Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal	Listed	Species or species habitat may occur within area
Reptiles		
Chelonia mydas * Green Turtle	Listed	Species or species habitat may occur within area

Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Listed	Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake	Listed	Species or species habitat may occur within area
Whales and Other Cetaceans [Dataset Information]	Status	Type of Presence
Balaenoptera acutorostrata Minke Whale	Cetacean	Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale	Cetacean	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale	Cetacean	Species or species habitat may occur within area
Delphinus delphis Common Dolphin	Cetacean	Species or species habitat may occur within area
Eubalaena australis * Southern Right Whale	Cetacean	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus	Cetacean	Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin	Cetacean	Species or species habitat may occur within area
Megaptera novaeangliae * Humpback Whale	Cetacean	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca	Cetacean	Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin	Cetacean	Species or species habitat may occur within area
Tursiops aduncus Spotted Bottlenose Dolphin	Cetacean	Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin	Cetacean	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Communications, Information Technology and the Arts - Australian Postal Corporation

Communications, Information Technology and the Arts - Telstra Corporation Limited

Defence

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Historic

Cooranbong Post Office (former) NSW

Natural

Pulbah Island Nature Reserve NSW

Extra Information

State and Territory Reserves [Dataset Information]

Pulbah Island Nature Reserve, NSW

Watagans National Park, NSW

Regional Forest Agreements [Dataset Information]
Note that all RFA areas including those still under consideration have been included.

Lower North East NSW RFA, New South Wales

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

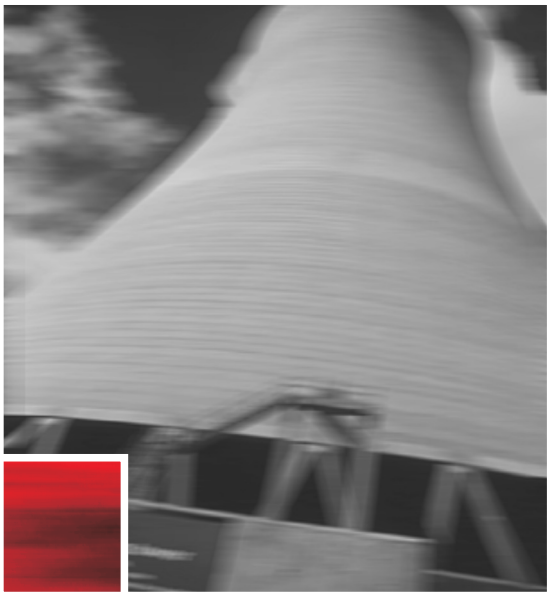
This database has been compiled from a range of data sources. Environment Australia acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra
- University of New England
- Other groups and individuals

ANUCLIM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Last updated:

Department of the Environment and Heritage
GPO Box 787 Canberra ACT 2601 Australia
Telephone: +61 (0)2 6274 1111



appendix g

government agency responses

Certified Environmental Management

Quality Endorsed Company

Occupational Health and Safety

CITY OF Lake Macquarie

18 January 2006

23 JAN 20

Mr Michael England
HLA Envirosciences Pty Limited
PO Box 726
PYMBLE NSW 2073

Our Ref: F2004/11747
Your Ref: Eraring Power Station Ash Dam Expansion
ABN 81 065 027 868

Dear Mr England

SUBJECT: ERARING POWER STATION PROPOSED UPGRADE WORKS

Thankyou for your letter concerning the proposed Emergency Gas Turbine Generator and Expansion of the Ash Dam Facility at Eraring Power Station. Council requests the following issues be considered when preparing the Environmental Assessment (EA) for the proposal.

Whilst the *Environmental Assessment Scoping Report 2005* provides an overview of the proposal, it is difficult to provide any detailed comments due to the lack of specific information. The details relating to the proposed 35ha Ash Dam extension are limited, in particular the exact location of these proposed works.

We understand that the proposed ash dam extension will occur in a northwards direction from the existing ash dam footprint. The northward extent of these works appears to encompass areas zoned 9 – Natural Resources in the Lake Macquarie Local Environment Plan 2004. The details contained within the *Environmental Assessment Scoping Report 2005* do not appear to consider this zoning or the objectives of the 9 Natural Resources Zone, being:

> **Zone 9 Natural Resources Zone**
> **1 Objectives of zone**
> The objectives of this zone are to:
> (a) provide land that has dual values as an economic natural resource and for environmental protection, and
> (b) recognise the dual values of the land and integrate economic use of the land with ecological sustainability, and
> (c) acknowledge the economic value of its natural resources, particularly for extraction of coal, gravel and timber, and
> (d) acknowledge the long term value of the land for the management and maintenance of biodiversity, threatened species habitat, and corridors by minimising the adverse impacts of resource development, and
> (e) rehabilitate disturbed land to a natural state, reflective of its long term value, and
> (f) minimise earthworks while enabling productive use of the land, and
> (g) permit habitat disturbance to facilitate forestry, surface activities for underground mining and other extraction of mineral and gravel resources and energy generation works, and
> (h) acknowledge the multiple use of State forests for tourism, conservation and sustainable harvesting of timber, and
> (i) provide for sustainable water cycle management.
>
> (ref: Lake Macquarie Local Environment Plan 2004)

www.lakemac.com.au
Phone: 02 4921 0333
126-138 Main Road Speers Point NSW 2284
Box 1906, Hunter Region Mail Centre NSW 2310
Fax: 02 4958 7257 council@lakemac.nsw.gov.au

Additionally, the Lot, DP and ownership of the land encompassed by the northward extent of the ash dam extension do not appear to be addressed in the *Environmental Assessment Scoping Report 2005.*

Biodiversity Impacts

- No mention has been made of the presence of listed endangered ecological communities or regionally significant vegetation communities. The presence of these should be reviewed having regard to the regional vegetation communities mapped by REMS 2003.
- Consideration should be given to the provision of compensatory habitat in relation to any clearing associated with the proposal. This would require quantification of the extent of habitat lost and areas of land that can be protected or rehabilitated to compensate for this within a reasonable time frame.
- With the recent commencement of the Native Vegetation Act 2003, there may be implications for this development that should be reviewed as part of the environmental assessment.
- A number of EPBC Act listed matters of national environmental significance may be affected by the proposal (for example plants listed in Table 5.1 of the scoping report), and further details of EPBC issues should be included in the assessment.
- Flora and fauna surveys should be undertaken having regard to the *Lake Macquarie Flora and Fauna Survey Guidelines* (July 2001) *and the Lake Macquarie Tetratheca juncea Management Plan* (as amended 2001). The environmental assessment should note this, and identify whether there is any inconsistency between the surveys undertaken and these guidelines.
- The regional biodiversity context and habitat connectivity (corridor) implications of the proposed development should be adequately evaluated and documented in the environmental assessment.
- It would be desirable for the land management plan applying to the site to be updated to take into account the proposed development, and for a draft of the updated document to be included with the environmental assessment, together with a report on the evaluation of the implementation of the current plan.

Water Quality Impacts

Council understands that off-site discharges from the ash dam occur during periods of high rainfall. We request that the EA being prepared for the proposal consider the impacts of the proposed ash dam extension on the frequency and nature of these occurrences, and impacts of such off-site discharges on receiving waters. In particular, the ecological impacts on the Whiteheads Lagoon and Lake Macquarie associated with altered water quality or quantity.

As you would be aware, the issue of Selenium levels in Lake Macquarie, associated with Power Station operations and other sources, has attracted considerable public attention over recent years. We request that this issue be addressed in the EA for the ash dam extension,

paying particular attention to the ecological impacts of increased Selenium loads (including affects fish laval abnormalities and productivity) as well as any public health issues related to seafood consumption.

Additional Issues

In addition to the biodiversity and water quality issues identified above, Council requests the EA for the proposal also consider the following issues:

- The impacts of the proposed Emergency Gas Turbine Generator on greenhouse gas emissions and climate change should be considered (particularly in the context of the emissions goal described in the *Lake Macquarie Greenhouse Action Plan 2004*).
- Any loss of visual amenity associated with the proposed ash dam expansion should be addressed.
- The potential impacts related to the increased capacity of the ash dam should be considered with respect to the stability of the dam wall, especially in relation to extreme rainfall event.

Council also requests that the long-term rehabilitation and land-use of the ash dam facilities be considered within the scope of the EA for the proposed works. This is of particular significance in reference to the zone objectives (especially objective e) of the areas within the 9 Natural Resources Zone.

Council wishes to be kept informed as to the progress of this important project, and look we look forward to reviewing the EA for the proposal. Should you require further information, please contact me on 4921 0393.

Yours faithfully

SYMON WALPOLE
CATCHMENT MANAGEMENT OFFICER
ENVIRONMENTAL PLANNING DEPARTMENT

Department of Lands

Land Administration & Management
Property & Spatial Information

13 JAN 2006

HLA-Envirosciences P/L
PO Box 726
PYMBLE NSW 2073

ATTENTION: Ms Erin Cox

Cnr New England Highway & Banks Street
(PO Box 6) East Maitland NSW 2323

Contact Officer: Kevin Thompson
Phone:(02) 49 379 307
Fax: 49 342 252
E-mail: kevin.thompson@lands.nsw.gov.au

Our Ref: **MD05H27**
Your Ref: S60363

Dear Ms Cox

Re: Eraring Power Station - Environmental Assessment Scoping

I refer to your letter of 22nd December 2005 regarding the preparation of an environmental assessment for proposed upgrade works at the Eraring Power Station at Dora Creek.

The letter and scoping report both refer to the proposed works as comprising the expansion of the existing ash disposal dam and the installation of an emergency generator. Neither provide details to locate the proposed works; this despite section 2.3 of the scoping report.

From additional information it has now been possible to identify the land proposed to be added to the ash disposal dam. Eraring Energy has already commenced acquisition of the site. With respect to the emergency generator, no specific comments can be provided due to a lack of information concerning the site for the installation.

In general, concerning any use or occupation of Crown lands for any purpose associated with the proposed works, the Department of Lands requires that such use of the Crown land is authorised by grant of appropriate tenure prior to any use commencing.

While Crown land remains affected, there are issues that would be required to be addressed. These issues include Native Title interests, Aboriginal Land Claims, Land Assessment and owner's consent to the lodgement of a development application

In addition to the advice from department of Planning, the following observations are provided, and as may be applicable should be included in the environmental assessment documentation.

Department of Natural Resources

Your Ref: S60363_DFLTR01_dec05
Our Ref: ER6821

10 February 2006

HLA-Envirosciences Pty Limited
PO Box 726
PYMBLE NSW 2073

Attention: Erin Cox

Dear Ms Cox

Proposed upgrade works at Eraring Power Station, Rocky Point Road, Dora Creek

I refer to your letter of 22 December 2005 seeking the Department of Natural Resources' requirements for preparation of an environmental assessment for the above proposed major project.

From the information provided in the Environmental Assessment Scoping Report, no legislation administered by the Department of Natural Resources applies to the proposed project. Therefore, we do not intend to submit any requirements for the environmental assessment.

Should there be any further enquiry in this matter, please contact me on (02) 4929 9850.

Yours sincerely

Vicki McBride

Vicki McBride
Acting Resource Access Manager
Hunter Region

Hunter Region 464 King Street Newcastle West NSW 2302 PO Box 2213 Dangar NSW 2309
Telephone (02) 4929 4346 Facsimile (02) 4929 6364 Website dnr.nsw.gov.au

- A definitive list of affected land (site identification) including Crown land based on a formal status search obtained from the Department's Maitland office following the provision of a detailed location of the proposed works.
- Items as specified in Schedule 2 of the EP&A Regulation 2000.
- Requirements for acquisition of Crown land outside existing infrastructure corridors. Authorisation under the Crown Lands Act 1989 for the use and occupation of Crown land is required where acquisition is not effected.
- Native Title, Aboriginal Land Claims, Land Assessment and owner's consent to the lodgement of development application.
- Potential impacts of the construction, existence and operation of the works including maintenance of any pipelines on Crown land generally and specifically fire trails or the maintenance thereof. Mitigation of adverse impacts and access management particularly during construction but also for future maintenance of the works.
- Stakeholder and Public consultation.

Should you require any further assistance, please contact me on 49 379 307.

Yours sincerely

Kevin Thompson
for Manager, Community Services
Hunter Central Coast
Crown Lands NSW

Department of
Environment and Conservation (NSW)

Your reference : Attn Mr Chris Ritchie
Our reference : 270758A13 NEF17773
Contact : Trevor Henderson, 49 086 824

Department of Planning
GPO Box 39
SYDNEY NSW 2001

10 OCT 2005

Dear Sir,

PROPOSED EMERGENCY GAS TURBINE AND ALTERATIONS AND ADDITIONS TO ERARING POWER STATION ASH DAM

I refer to your letter 4 October 2005 requesting the Department of Environment and Conservation (DEC) to recommend requirements for the preparation of an Environmental Assessment for the subject proposal.

The DEC assumes the Department of Planning (DoP) will provide the applicant with details of any general requirements for the Environmental Assessment.

The DEC has considered the details of the proposal as provided by DoP and Eraring Energy in the scoping paper and subsequent planning focus meeting held on 30 September 2005. The DEC considers the following key issues need to be addressed in the Environmental Assessment for this project.

GAS TURBINE

1. A comprehensive assessment of air emissions including the contribution of emissions to photochemical smog formation. Please indicate the type(s) of fuel on which the assessment is based and approval is sought.
2. An assessment of local, regional, interregional and cumulative air quality impacts from the plant.
3. A noise impact assessment in accordance with the NSW Industrial Noise Policy.

ASH DAM

4. A review of options for developing and expanding the beneficial reuse of power station ash as an alternative to land disposal.
5. Justification for the proposed ash disposal site to include a review of alternative sites within the existing ash dam catchment area that do not require removal of natural vegetation. For example, by constructing the disposal cells on ash already deposited at the eastern end of the ash dam.

PO Box 488G Newcastle NSW 2300
117 Bull Street Newcastle West NSW 2302
Telephone (02) 4908 6800
Facsimile (02) 4908 6810
ABN 30 841 387 271
www.environment.nsw.gov.au

6. An assessment of water quality issues associated with the proposed disposal option including any change in the volume of the discharge and the concentration of selenium and other pollutants to Lake Macquarie.
7. Identify the potential for dust generation and provide details of the proposed control measures. Include an assessment of the impact of ash disposal on local air quality, PM_{10} and total suspended particles (TSP).
8. A flora and fauna impact assessment of the site.
9. An Aboriginal cultural heritage assessment of the site.

The DEC requests that three (3) copies of the Environmental Assessment Report and the statement of commitments are submitted to 'The Manager' Department of Environment and Conservation PO Box 488G NEWCASTLE WEST NSW 2302.

If you have any questions concerning the above recommendations please contact Trevor Henderson on (02) 49086824.

Yours Sincerely

GRAHAME CLARKE
A/Manager Hunter Region
North East Branch
Environment Protection and Regulation Division

PO Box 488G Newcastle NSW 2300
117 Bull Street Newcastle West NSW 2302
Telephone (02) 4908 6800
Facsimile (02) 4908 6810
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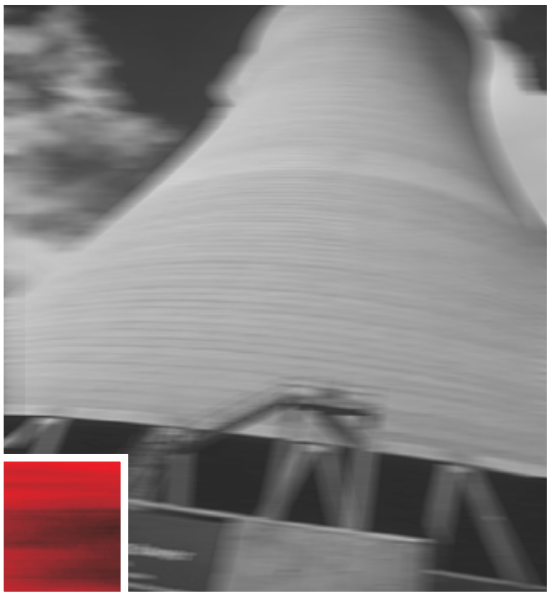

appendix h

land owners consent

Department of Lands

Land Administration & Management
Property & Spatial Information

Your reference: Garry Craig
Our reference: MD05H27
Contact: Gary Wood
Telephone: 4937 9323
Email: gary.wood@lands.nsw.gov.au

Cnr Newcastle Road & Banks Street East Maitland
P O Box 6 East Maitland NSW 2323
DX 21620 Maitland
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Facsimile (02) 4934 22524
ABN 21 804 973 362
www.lands.nsw.gov.au

Mr Garry Craig
A/Asset Manager
Eraring Power Station
Eraring Energy
PO Box 5044
DORA CREEK NSW 2264

PROPOSAL AFFECTING CROWN LAND
APPLICATION FOR PROJECT APPROVAL/CONCEPT APPROVAL
FOR UPGRADE WORKS TO ERARING POWER STATION

PROPERTY DETAILS: Crown land held as Licence 38706 and proposed to be acquired by Eraring Energy. Consent to acquire has been provided.

DESCRIPTION OF PROPOSED DEVELOPMENT: Electricity purposes being an extension of the existing ash dam at Eraring Power Station.

CONSENT AUTHORITY: NSW Department of Planning.

CONSENT STATEMENT

So far as the interests of the Department of Lands are concerned, consent is hereby given to the lodgement of the Development Application subject to the Crown and the Minister for Lands being indemnified and remaining indemnified against all claims arising out of the use and occupation of the land in relation to any development or activity undertaken in terms of Development Consent which may be subsequently granted.

TIME LIMIT: This consent remains current for a period of twelve (12) months from the date of issue.

CONSENT STIPULATIONS: This consent is subject to the following stipulations:

1. This consent is given, without prejudice, so that full investigation of the development proposal may proceed under environmental law.

   The giving of consent to lodgement of the development application does not imply or allow presumption of the concurrence of the Minister for Lands for the development proposal and does not prevent the Department of Lands, or the Minister, from lodging an objection at a later date when the full implications of the proposal are evident.

2. The proposal may also require separate application, investigation and determination by the Department of Lands and/or other authorities. It is the responsibility of the development proponent to ascertain the requirements of all public authorities involved.

3. Irrespective of any development consent granted or any approval given by other public authorities, the development proponent shall not commence development on the Crown land described in this letter without the prior approval of the Department of Lands.

4. The right is reserved to revoke or modify the consent at any time prior to determination of the development application.

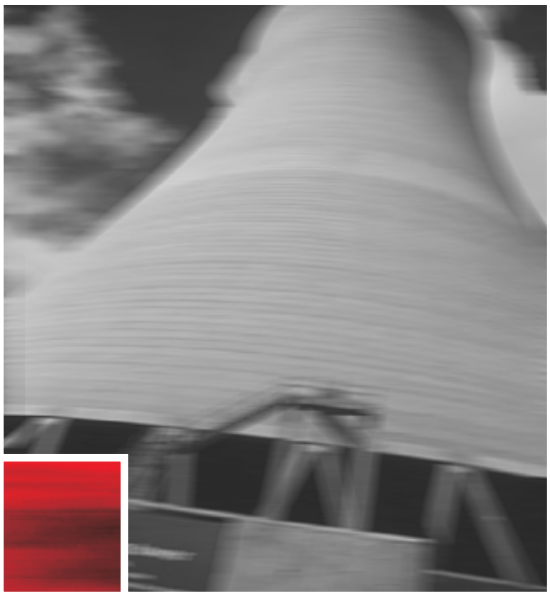
5. Department of Lands shall not be held responsible for any costs associated with the proposal and does not assume any construction or maintenance responsibilities.

6. Compliance with requirements for environmental assessment and all obligations under the Environmental Planning and Assessment Act 1979 will be the responsibility of Eraring Energy.

7. Eraring Energy shall ensure compliance as regards Certificates of Insurance and Occupational Health and Safety legislations prior to undertaking any work on the Crown land.

8. Upon determination of the development application a full copy of the approved consent or otherwise is to be provided to the Department of Lands (Maitland District Office).

Gary Wood
Principal Lands Officer
Crown Lands NSW
Sydney/Hunter
For and on behalf of the Minister for Lands
Date of Issue: 8 MARCH 2006



appendix i

air quality assessment

Air Quality Impact Assessment
Operation of Eraring Power Station Black Start Generator
Rocky Point Road Eraring NSW

24 February 2006

Prepared for:
Eraring Energy
Rocky Point Road
Eraring NSW 2264

Report by:
HLA-Envirosciences Pty Limited
ABN: 34 060 204 702
18 Warabrook Boulevarde Warabrook NSW 2304
PO Box 73 Hunter Region MC NSW 2310 Australia
Ph: +61 2 4968 0044
Fax: +61 2 4968 0005

HLA Ref: S6036302_FNLRPT_24Feb05.doc

DISTRIBUTION

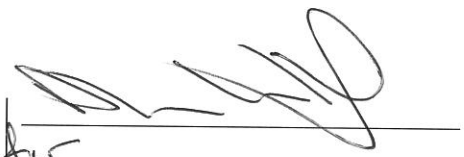
Flora and Fauna Impact Assessment
Ash Dam Expansion
Eraring Energy
20 February 2006

Copies	Recipient	Copies	Recipient
1	**Garry Craig** **Ash Disposal Project Manager** Eraring Energy PO Box 5044 Dora Creek NSW 2264	1 Copy	**HLA File**

By

HLA-Envirosciences Pty Limited
ABN: 34 060 204 702
18 Warabrook Boulevarde Warabrook NSW 2304
PO Box 73 Hunter Region MC NSW 2310 Australia

Neil McElhinney
Ecologist



Evelyn Craigie
Environmental Scientist

Peer Review: **Date:**

20 Feb 06

for **Michael England**
Senior Principal, National Practice Leader
Environmental Planning

CONTENTS

TABLES

FIGURES

APPENDICES

This document was prepared for the sole use of Eraring Energy and the regulatory agencies that are directly involved in this project, the only intended beneficiaries of our work. Any advice, opinions or recommendations contained in this document should be read and relied upon only in the context of the document as a whole and are considered current to the date of this document. Any other party should satisfy themselves that the scope of work conducted and reported herein meets their specific needs before relying on this document. HLA-Envirosciences Pty Limited cannot be held liable for third part reliance on this document, as HLA-Envirosciences Pty Limited is not aware of the specific needs of the third party.

HLA's professional opinions contained in this report are subject to modification if additional information is obtained, through further investigation, observations, or validation testing and analysis during process modification activities.

From a technical perspective, the ambient air quality environment presents substantial uncertainty. It is a heterogeneous, complex environment, in which small surface features or changes in process or meteorological conditions can have significant impacts on pollutant movement. Major uncertainties also present difficulties in source characterisation assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and mitigation actions.

Alteration of any of the modelled parameters can impact significantly on the reported findings and changes in plant conditions may result in impacts not predicted by this investigation.

EXECUTIVE SUMMARY

HLA-Envirosciences was commissioned by Eraring Energy to perform dispersion modelling for the proposed upgrade to Eraring Power Station located off Rocky Point Road, Eraring NSW (refer **Figure 1**). This investigation was undertaken to examine the potential impacts the addition of an emergency gas turbine generator (EGTG) may have on the ambient environment surrounding the existing power station. The air quality impact assessment report has been prepared for inclusion in the Environmental Assessment (EA) report being prepared as part of the regulatory approval process for the addition of the EGTG.

This report details the methodology used to make predictions of the potential ground level pollutant concentrations and presents the findings of the air quality impact assessment.

Dispersion modelling results show that under worst case pollutant emission rates and meteorological conditions, concentrations of all pollutants assessed are predicted to fall below the Department of Environment and Conservation (DEC) assessment criteria for all sensitive receptors surrounding the Eraring Power Station (EPS).

1 INTRODUCTION

HLA-Envirosciences was commissioned by Eraring Energy to perform dispersion modelling for the proposed upgrade to Eraring Power Station (EPS) located off Rocky Point Road, Eraring NSW (refer **Figure 1**). This investigation was undertaken to examine the potential impacts the addition of an emergency gas turbine generator (EGTG) may have on the ambient environment surrounding the existing power station. The air quality impact assessment report has been prepared for inclusion in the Environmental Assessment (EA) report being prepared as part of the regulatory approval process for the addition of the EGTG.

This report details the methodology used to make predictions of the potential ground level pollutant concentrations and presents the findings of the air quality impact assessment.

1.1 Applicable Guidelines

Works were conducted in accordance with the Department of Environment and Conservation (DEC) 2005 publication *Approved Methods and Guidance: For the Modelling and Assessment of Air Pollutants in New South Wales*. These guidelines were considered when developing dispersion modelling methodology, determining existing environmental pollutant concentrations, analysing meteorological data and when considering potential impacts as a result of this project.

2 SCOPE OF WORK

The scope of work undertaken by HLA included:

- Review of the proposed EGTG and identification of the likely emission sources;
- Generation of an air pollutant emissions inventory for the EGTG. The emissions inventory was compiled using data from the generator manufacturer and from emission factors sourced from National Pollutant Inventory (NPi) publications;
- Modelling the proposed EGTG using Ausplume v6.0 Gaussian plume dispersion model (refer **Section 5.1** for model justification);
- Assessment of the impact that the current power station emissions are having on the surrounding environment and the cumulative impacts likely as a result of the addition of a EGTG. Assessment has been made in terms of DEC ambient air quality limits; and
- Preparation of a report detailing all of the above along with presentation of conclusions.

3 SITE IDENTIFICATION

EPS is situated off Rocky Point Road, Eraring (refer **Figure 1**). The site is located to the north of the mouth of Dora Creek on the south-western corner of Lake Macquarie between the F3 Freeway and Myuna Bay. The power station is surrounded by predominantly undeveloped bushland, which serves as a buffer zone between the power station and surrounding residential developments. A number of coalmines are located close to the power station to the north (Awaba Colliery), east (Myuna Colliery) and west (Cooranbong Colliery).

The closest residential centres are Dora Creek (approximately 2 km to the southwest), Wangi Wangi and Arcadia Vale (approximately 5 km to the east) and Awaba and Toronto (approximately 5km and 6 km to the north and northeast respectively). Additional discussion of receptor locations is provided in **Section 6**.

4 PROCESS DESCRIPTION

The following process description has been sourced from information provided by Eraring Energy for inclusion in an EA document currently being prepared by HLA-Envirosciences. A site layout plan is shown in **Figure 2**.

4.1 Existing Power Station Operations

EPS is a coal-fired power station comprising four individual 660MW units with a total capacity of 2,640MW. The first of these generating units came into service in 1982, followed by the second and third units in 1983 and the fourth in 1984.

The four units contain steam driven, tandem compound reheat turbines with single flow high pressure, double flow intermediate pressure and two double flow low pressure exhaust cylinders. The four associated boilers are single-furnace, twin-drum and use natural circulation with divided back pass and balanced draught. A turbine steam by-pass system stabilises boiler firing at low load and enables easy matching of steam to turbine metal temperature during start-up.

Each generator is connected to a pair of generator transformers which raise the generated voltage of 23 kV to the transmission voltage of 330 kV in Units 1 and 2 and to 500 kV in Units 3 and 4. Electricity is transmitted overhead to the 330 and 500 kV switchyards which form part of the interconnected transmission system.

Coal for EPS is sourced from five different mines in the local area. The plant burns 5.2 million tonnes of coal per year.

EPS uses saltwater from Lake Macquarie for cooling water. The cooling system is a once-through system where water drawn from Bonnells Bay is directed through the station by the inlet canal. Most of the water flows through the power station condensers, with the remainder used for reducing the cooling water temperature before flowing back into Lake Macquarie and Myuna Bay.

4.2 Proposed Addition of EGTG

4.2.1 Purpose of EGTG

In the event of a total blackout of the electricity grid and the tripping of all generation sources, electricity is needed to re-fire the power station. The proposed EGTG will provide the electricity needed to restart two of the main units within EPS simultaneously to minimise the time taken to restore power to the State grid.

The proposed EGTG will provide the necessary electrical supply for restarting the power station and for powering station ancillaries while the main generating plant is prepared for starting.

In 2002, the Northern Gas Turbine Station (NGTS), which provided EPS with black start capability, was decommissioned and removed. Installation of the proposed EGTG at EPS would restore the black start capability previously offered by the now decommissioned NGTS.

Furthermore, as the EGTG would be directly connected to EPS's main switchboards it would provide additional security for in-service unit power supplies.

In addition to providing black start capability for the coal fired units, the EGTG would be operated to secure the power supplies for essential auxiliaries of two coal fired units when there is a shortfall of electricity supply, as indicated by National Electricity Market Management Company (NEMMCO) messages or market pool price excursions.

The primary objectives of the installation of the EGTG are therefore:

- To improve the security and reliability of the NSW electricity supply;
- To improve the time taken for the restoration of the NSW electricity following a black-out event; and
- To supplement the peak-load electricity when there is a shortfall of system electricity supply.

4.2.2 Siting

The black-start unit should ideally be located close to and directly connected to the main unit switchboard network so as to minimize voltage drop, and to provide better voltage stability.

The proposed EGTG is to be centrally located within the main station area, close to fuel oil, demineralised water and main electrical systems. The site is also in close proximity to the station's 11 kV switchboard system so that no external switching is required.

The location of the EGTG, within the existing EPS core area was chosen for a number of reasons including:

- The site is close to terminal points for distillate fuel oil and demineralised water;
- The site is accessible to underground electrical conduit to the EPS 11kV switchboard system;
- Noise generated by the gas turbine would be contained by the earth bank to the east;
- Rainwater run-off from the EGTG can be directed to the EPS existing water treatment system;
- The site is already highly disturbed, comprising cleared and excavated areas within the existing power station construction works; and
- Temporary maintenance facilities presently occupy the site.

4.2.3 Main Processes

The EGTG proposed to be installed at EPS is the GE Frame 6B heavy industrial unit which is the latest evolution PG6581 rated for nominal 42 MW output (the minimum size required to restart EPS).

The EGTG is a simple (or open/Brayton) cycle generator fuelled by automotive distillate, which will be gravity fed from existing fuel storage tanks at the EPS.

The EGTG is equipped with a conventional lead acid battery bank which will be kept charged by regular AC supplies. When a black-start is required, the batteries are used to start the GT diesel engine, as well as powering all controls and auxiliaries for the unit. The diesel engine, once started, is used to spin the GT rotor to full speed whereupon diesel fuel (or gas, if gas fired) is introduced to the GT combustion chambers and spark ignited. Once ignition occurs, the diesel engine disengages and shuts down and the gas turbine is under governor speed control. Following a short warm-up period, the turbine is ready to accept some load from the generator. The generator will be able to be synchronised to the directly connected Unit 1/2 station switchboard, from where it will be possible to power any Unit or Station switchboard. The main

Unit black-start then requires 2 units essential auxiliaries to be direct on line started in specified order, the boilers fired, then the main turbine being accelerated to synchronous speed ready for loading from the power system network.

The proposed EGTG will have dual fuel capability, utilising both distillate and gas. EE is currently in negotiations with the Mandalong mine gas/coal bed for the use of 1,500 GJ/day of methane gas to run the black-start unit. Gas would be supplied to the site via a pipeline with all necessary approvals for such a pipeline being subject to a separate application/approval.

The EGTG would be air cooled, without the requirement for external water supplies for cooling. In the event that water injection is used for the reduction of NOx, demineralised water from the EPS storage tanks would be used as a fuel diluent.

4.2.4 Operations

The EGTG will effectively restart two main units at EPS simultaneously, thus assisting with bringing the entire State electricity grid back online in the event of a system collapse. The unit will also be used to increase EPS net export during tight system capacity events.

A typical black-start sequence would take place as follows:

- The EGTG is started by its own diesel engine start system.
- The power from the EGTG is used to start two main coal-fired units within EPS, bringing the station back into operation.
- Key transmission lines between EPS and other areas are energized.
- The power from EPS is used to restart other power plants in the system.
- Power is finally re-applied to the general electricity distribution network and sent to consumers.

The other circumstance in which the EGTG would be activated is during routine testing. Testing is undertaken to ensure that the unit is properly maintained and capable of performing the required task and to train personnel (this is especially important because of the rare need for the service and the resulting inability to get useful on-the-job experience). Routine testing on one of the EPS coal-fired units would take place on an annual basis. The EGTG would also be used to test run, both loaded and unloaded, 12 times per year to maintain its operational condition. Routine testing would total approximately 20 hours per year.

In total, when combined with anticipated running time during shortfalls in supply of electricity, the generator would be expected to be operated for up to approximately 200 hours per year if fired only on diesel fuel.

Negotiations are currently in progress with a local coal mine to procure supplies of coal bed methane gas, which would otherwise be lost to the atmosphere during mine operations. If gas is obtained from this source, the EGTG could be expected to operate up to between 1,000 and 2,000 hours per year.

5 METHODOLOGY

A computational dispersion model was used to determine the potential impacts of the expanded plant operations on the surrounding environment. The model used was the AUSPLUME (v6.0) dispersion model developed by Victorian EPA for regulatory assessment of projects that emit air pollutants. Details of the model inputs and model justification have been summarised in the following sections.

5.1 Dispersion Modelling

The AUSPLUME v6.0 dispersion model is an advanced Gaussian plume dispersion model, with algorithms based on the Industrial Source Complex – Short Term (ISCST3) model approved by the US EPA for use in regulatory assessments undertaken within the United States. ISC is one of the most widely used regulatory models in the world.

AUSPLUME v6.0 was developed by the Victorian EPA to enhance the ISC model and make it applicable to Australian conditions. AUSPLUME v6.0 is approved by the NSW EPA for use in regulatory assessments undertaken in NSW. A complete description of the model is provided in the AUSPLUME v6.0 user manual, which is available upon request.

The model uses the Gaussian dispersion model equation to simulate the dispersion of a plume from point, area, or volume sources. The model takes account of dry and wet deposition and includes algorithms to account for retention of dust within open pits and includes mechanisms for determining the effect of terrain on plume dispersion. The model works on an hourly time step. This means that it requires a meteorological data file that provides wind speed, wind direction and other dispersion parameters on an hourly basis. For each hour the plume dispersion is determined using the conventional Gaussian model assumptions.

5.2 Model Inputs

Various sets of information are required to allow the estimation of the dispersion of pollutants using AUSPLUME v6.0. This data can be split into six main areas:

1. Meteorology;
2. Terrain Effects;
3. Building Wake Effects;
4. Modelling Scenario(s);
5. Pollutants of Concern; and
6. Source Characteristics and Emissions Inventory.

Each of the above inputs has been addressed separately in the following sections. Modelling output files have been included as **Appendix A**.

5.2.1 Meteorology

The specific parameters defined in a dispersion meteorological data set include ambient temperature, wind speed, wind direction, atmospheric stability class and vertical mixing height. The ambient temperature allows the model to factor in effects such as thermal buoyancy effects on plume rise and dispersion. Wind direction and wind speed are major factors in pollutant dispersion from a point source. The wind speed influences the dilution and entrainment of the plume into the air continuum while the wind direction determines the direction pollutants will be

carried downstream of the point source. Atmospheric stability class is a function of wind speed, ambient temperature and cloud cover. However, stability classes are practically defined by wind speed and cloud cover (where data is available). Stability class is a convenient assignment to six generally grouped atmospheric conditions and dictate the mechanism by which the plume is dispersed. The vertical mixing height is defined as the height up to which the atmosphere is free to mix in the vertical direction, again, this parameter dictates the mechanism of plume dispersion.

A site specific meteorological (met) data set was sourced from a met station situated between the Ash Dam and the EPS buildings. The data sourced from this station could not be used for dispersion modelling due to the lack of both Sigma Theta data (required for calculation of atmospheric Stability Classes) and ambient temperature (used by the Ausplume model as a variable in dispersion calculations).

To allow dispersion modelling to occur, a 12 month meteorological data set was generated using the TAPM prognostic meteorological model. The data set was prepared in accordance with guidance set out by DEC in the publication "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*". The TAPM meteorological data set was generated using the following parameters:

- TAPM v3.0 was utilised when generating the meteorological data set.
- GEODATA 9-second (~250m) terrain height database was utilised.
- TAPM default databases for land use, synoptic analysis and sea surface temperatures were used.
- A wind field consisting of 25 by 25 horizontal grid points, 25 vertical levels and an outer grid of 30 km, with nested grids of 10km and 3km was used when generating the meteorological data set.
- TAPM defaults for advanced meteorological inputs used.

Wind roses for the 2004 TAPM generated meteorological data have been plotted and are shown in **Figure 3**. The seasonal and annual wind roses (wind speed and wind direction patterns) were compared with the data sourced from the Ash Dam met station (refer **Figure 4**). Differences and similarities noted between the meteorological data for the Ash Dam and the met file generated by TAPM are as follow:

- The TAPM model produced a met file with a lower proportion of calm periods (2.44%) than the measured data for the EPS Ash Dam met file (22.27%). This lower level of calms has the potential to impact on the dispersion pattern surrounding the EPS resulting in higher ground level pollutant concentration closer to the power station. This difference between the two met files has been discussed further as part of the impact assessment;
- The annual and seasonal wind patterns produced by the two met files were similar in wind direction with the largest proportion of winds noted during the year in an arc from the west to north-northwest and from the east. Wind patterns in summer were predominantly from the east with the pattern reversing during the winter. The autumn and spring wind patterns were similar to the annual wind rose with predominant winds from both the east and west.
- In addition to the different calm percentages noted between the two met files, the TAPM met file had a higher percentage of +4m/s winds than the EPS Ash Dam met file. Higher wind speeds would influence pollutant transport and it would be expected that the TAPM met file would result in higher concentrations at remote receptors than would be expected with the wind speeds noted at the Ash Dam. As with the low calm percentages, the differences and implications of different wind speeds has been discussed in the impact assessment section of this report.

5.2.2 Terrain Effects

Topographical data for the area surrounding the EPS was digitised and was entered into the Ausplume model. A graphical depiction of the topography has been prepared and is shown in **Figure 5**.

The receptor grid over which the modelling was performed was 10km by 7km using the Australian Map Grid coordinate system. A grid spacing of 250m was used in the north-south and east-west direction. The receptor grid was selected on the basis that it would allow the assessment of the closest sensitive receptors to the EPS.

5.2.3 Building Wake Effects

The effect building wakes have on the dispersion of pollutants is that they generally decrease the distance downwind that the plume comes into contact with the ground. This may result in higher ground level pollutant concentrations closer to the source of emission. Building wake effects have not been considered in this study due to the height of the stack and proximity of the EGTG to the main EPS plant buildings.

5.2.4 Modelling Scenario

The modelling for this investigation examined the operation of the EGTG under worst case operating conditions. The actual operation of the EGTG is predicted to be as follows:

- Operated for 30 hours per month for summer and winter months (peak loads); and
- Operated for up to 3 hours per month for autumn and spring months (off-peak loads).

For purposes of dispersion modelling, the generator is assumed to be operating continuously. The aim of this assumption is to determine the worst case short term average pollutant concentrations e.g for Sulfur Dioxide (SO_2) the worst case 10 minute, 1 hour and 24 hour average concentration will be determined for the receptors for the full 365 day meteorological data file. This worst-case concentration will be used for comparison with existing operations and DEC ambient limits as detailed in **Section 5.4**.

As the EGTG is only planned to be operating intermittently, the annual average concentration is not considered to be a valid measure of the performance of the EGTG and hence has not been considered for this investigation.

5.2.5 Pollutants of Concern

The pollutants of concern for this dispersion modelling investigation were based on pollutant emissions data sourced from the National Pollutant Inventory (NPi) publication Emission Estimation Technique Manual (EETM) for Combustion Engines (version 2.3, Oct 2003). Table 2 of the NPi EETM for combustion engines lists predicted pollutants from different engine types. The engine selected as representative of the EGTG was the diesel and natural gas – dual fired (>450kW) engine. The pollutants predicted for this type of engine are as follows:

- Carbon Monoxide (CO);
- Oxides of Nitrogen (NO_X);
- Particulate Matter less than 10 microns (PM_{10});
- Sulfur Dioxide (SO_2); and
- Volatile Organic Compounds (VOCs).

Emission data for the above pollutants has been sourced from two locations. Data for CO and NO_X has been sourced from manufacturer specifications (*'Uprate Options for the M6001 Heavy Duty Gas* Turbine', GE Power Systems, 2002-2003) and the remaining pollutant data has been sourced from published emission factors detailed in the above NPi publication. Emission calculations are shown in **Appendix B**.

5.2.6 Source Characteristics and Emissions Inventory

One emission source has been assumed for the EGTG operating in accordance with the assumptions detailed above in **Section 5.2.4**. **Tables 1** and **2** detail the Emissions Inventory used for the modelling scenario with emission factor calculation details shown in **Appendix B**.

Table 1: EGTG Source Characteristics

Characteristic	Stack ID	Units
Stack Height	15	m
Velocity*	37.9	m/s
Stack Diameter	3.4**	m
Volumetric Flow Rate*	341.1***	m^3/s
Stack Temp*	546	^oC

* Assumed to be Stack Conditions

** (equivalent diameter calculated from stack X-sectional area)

*** Rounding errors result in slight variance in calculated volumetric flow rate from velocity and diameter estimates

Table 2: Pollutant Emission Data

Compound	Main Emission Stack		
	mg/m^3	g/s	Emission Data Source
Oxides of Nitrogen	44	15.2	Manufacturer specification
Carbon Monoxide	8	2.8	Manufacturer specification
Sulfur Dioxide*	8.4	2.8**	National Pollutant Inventory
PM_{10} Particulates	16.5	5.6**	National Pollutant Inventory
Volatile Organic Compounds	13.3	4.5**	National Pollutant Inventory

Volumetric Flow Rates used to calculate emission concentrations and emission rates are shown in **Table 1**

* Sulfur dioxide concentration calculated assuming 500ppm sulfur content in Distillate fuel

** Fuel usage of 12335 L/hr used to calculate SO_2, PM_{10} and VOC emissions

5.3 Existing Environment

The existing environment refers to the potential for the existing air quality in the area surrounding an emission source to combine with the emissions from a facility (such as the existing EPS) resulting in cumulative impacts higher than those expected from the emission source when considered in isolation.

Eraring Energy monitors a variety of pollutants at two locations in accordance with their Environmental Protection Licence (EPL1429). These are situated to the south of the EPS in Dora Creek (monitors situated in the Bowling Club off Minnie Street, Dora Creek) and Marks Point (monitors situated in the grounds of the Marks Point Public School).

Pollutants monitored at these two locations are as follows:

- Oxides of Nitrogen;
- Sulfur Dioxide; and
- Meteorological Parameters (wind speed, wind direction and Sigma Theta at Dora Creek and wind speed, wind direction, sigma theta, ambient temperature and relative humidity at Marks Point).

A summary of data collected between January 2003 and December 2004 (two most recent full calendar years) is shown as **Table 3**.

Table 3: Monitoring Data Summary for Marks Point and Dora Creek

Location	Year	SO_2 ($\mu g/m^3$)*			NO_2 ($\mu g/m^3$)*
		10 Min**	1 Hour**	24 Hour**	1 Hour**
Dora Creek	2003	259.4	151.4	19.5	51.9
	2004	288.2	165.4	30.9	95.2
Marks Point	2003	199.1	164.5	19.1	97.1
	2004	230.3	173.7	37.9	87.7
Criteria***		712	570	228	246

* Concentrations calculated at 25°C from directly measured pphm concentration

** All data are maximum concentrations calculated from 10 minute average monitoring data

*** Refer to **Section 5.4**

No background data was available for PM_{10} or VOC.

Results for the monitoring program performed by Eraring Energy indicate the following:

- Maximum background SO_2 concentrations calculated for Dora Creek and Marks Point are 288$\mu g/m^3$, 174$\mu g/m^3$ and 38$\mu g/m^3$ (10 minute, 1 hour and 24 hour averages respectively). All maximum concentrations comply with DEC assessment criteria of 712$\mu g/m^3$, 570$\mu g/m^3$ and 228$\mu g/m^3$ for 10 minute, 1 hour and 24 hour averages respectively.
- Maximum background NO_2 concentration calculated for Dora Creek and Marks Point was 97$\mu g/m^3$ (1 hour average). The maximum NO_2 concentration complies with assessment criteria of 246$\mu g/m^3$.

The highest background concentrations detailed above have been utilised for this study to ensure the assessment considers the worst possible potential pollutant ground level concentration. Only short term averaging results have been utilised for this study for the reasons outlined in **Section 5.2.4**.

5.4 Air Pollutant Assessment Criteria

Assessment criteria defined by DEC are aimed at providing guidance as to whether or not emissions from an industrial facility will achieve the appropriate environmental outcome. Ground level pollutant concentrations exceeding the assessment criteria adopted by DEC are viewed as likely to impact on either the health or amenity of an area.

Air pollutants modelled in this investigation were as follows:

- Oxides of Nitrogen (assumed for modelling purposes to all be in the form of NO_2);
- Sulfur Dioxide;
- Carbon Monoxide;
- Particulate matter less than 10 microns: and
- Volatile Organic Compounds (VOC).

All assessment criteria have been obtained from the DEC publication *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*.

Assessment criteria for the gaseous pollutants are given in **Table 4** and have also been included in the results summaries (refer **Tables 6** and **7**).

Table 4: Gaseous pollutant assessment criteria

Pollutant	Averaging Period				
	10 Minute	15 Minute	1 Hour	8 Hour	24 Hour
Nitrogen Dioxide	nc	nc	246	nc	nc
Sulfur Dioxide	712	nc	570	nc	228
Carbon Monoxide	nc	100	30	10	nc
PM_{10}	nc	nc	nc	nc	50
VOC	nc	nc	nc	nc	nc

All criteria concentrations are $\mu g/m^3$ with exception of CO, which is expressed as mg/m^3

NC refers to no criteria available

Source: NSW EPA, 2005, Approved Methods and Guidance For the Modelling and Assessment of Air Pollutants in New South Wales

As described in **Section 5.2.4**, no long term (annual) averaging periods were modelled due to the intermittent operational nature of the EGTG.

VOC from diesel combustion typically comprise unburnt droplets of fuel (NPi, 2003). No assessment criteria exist for unburnt diesel emissions and as such, further assessment of VOCs has not been performed. Assessment of the performance of the EGTG is more appropriately performed by means of a stack test measurement of the VOC emissions.

6 SENSITIVE RECEPTORS

DEC define sensitive receptors as a location where people are likely to work or reside. This may include a dwelling, school, hospital, office or public recreational area. Any air quality impact assessment also needs to consider the location of known or likely future sensitive receptors.

The EPS is situated in an area surrounded by pockets of residential developments and large scale industrial developments (predominantly coal mines). To allow an assessment of the potential impact of the operation of the EGTG on the surrounding receptors, discrete receptors have been placed at various locations surrounding the location of the EGTG. The receptor locations are shown in **Figure 6** and a list of the receptor locations is shown below in **Table 5**.

Table 5: Sensitive Receptor Locations

Receptor Number	Receptor Location
1	Bowling Club, off Gardiner Street, Dora Creek
2	Corner of Gradwells Road and Greenway Street, Dora Creek
3	Corner Awaba Road and Border Street, Eraring
4	Gradwells Road Dora Creek
5	Border Street, Eraring
6	Cross Street, Eraring
7	Corner of Rocky Point Road and Wangi Road off ramp, Eraring
8	Myuna Bay Sport and Recreation Area, Myuna Bay
9	Corner of Summerhill Drive and Wangi Road, Myuna Bay
10	Corner of Buttaba Hills Road and Wangi Road, Buttaba

7 MODELLING RESULTS

Dispersion modelling results have been summarised in terms of both the maximum ground level pollutant concentrations predicted by the dispersion model at all points surrounding the facility within the receptor grid (10 km by 7 km grid with the plant located approximately in the centre of the grid) and the concentrations at the sensitive receptors defined in **Section 6**. Predicted increase in pollutant concentrations are detailed below in **Table 6** with cumulative concentrations shown in **Table 7**.

Table 6: Predicted increase in pollutant concentrations at sensitive receptor locations

Receptor No.	SO_2			NO_2	PM_{10}	CO		
	10 Min	1 Hour	24 Hour	1 Hour	1 Hour	15 Min	1 Hour	8 Hour
Units	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	mg/m^3	mg/m^3
Maximum*	3.0	2.1	0.6	11.6	1.1	0.0028	0.0021	0.0013
1	0.7	0.5	0.1	2.5	0.3	0.0006	0.0005	0.0002
2	0.8	0.6	0.2	3.1	0.4	0.0007	0.0006	0.0003
3	0.7	0.5	0.2	2.8	0.4	0.0007	0.0005	0.0003
4	0.7	0.5	0.2	2.9	0.4	0.0007	0.0005	0.0003
5	0.7	0.5	0.1	2.9	0.2	0.0007	0.0005	0.0002
6	1.4	1.1	0.2	5.7	0.4	0.0013	0.0011	0.0004
7	0.8	0.8	0.2	4.5	0.5	0.0011	0.0008	0.0004
8	0.7	0.5	0.3	2.6	0.5	0.0006	0.0005	0.0004
9	1.3	0.9	0.4	5.1	0.9	0.0012	0.0009	0.0007
10	1.1	0.8	0.3	4.4	0.6	0.0011	0.0008	0.0006
% Increase**	0.4	0.4	0.2	4.7	2.2	0.003	0.007	0.013
Criteria	**712**	**570**	**228**	**246**	**50**	**100**	**30**	**10**

All units are in $\mu g/m^3$ with the exception of Carbon Monoxide (CO) which is expressed as mg/m^3

* Maximum results are calculated regardless of location

** Percent pollutant increase expressed as a percentage of criteria

Table 7: Predicted cumulative pollutant concentrations at sensitive receptor locations

Receptor No.	SO_2			NO_2	PM_{10}	CO		
	10 Min	1 Hour	24 Hour	1 Hour	1 Hour	15 Min	1 Hour	8 Hour
Units	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	mg/m^3	mg/m^3
Maximum*	291.2	175.8	38.5	108.7	No cumulative concentrations possible due to lack of background data			
1	288.9	174.2	38.0	99.6				
2	289.0	174.3	38.1	100.2				
3	288.9	174.2	38.1	99.9				
4	288.9	174.2	38.1	100.0				
5	288.9	174.2	38.0	100.0				

Receptor No.	SO_2			NO_2	PM_{10}	CO		
	10 Min	1 Hour	24 Hour	1 Hour	1 Hour	15 Min	1 Hour	8 Hour
Units	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	mg/m^3	mg/m^3	mg/m^3
6	289.6	174.8	38.1	102.8	No cumulative concentrations possible due to lack of background data			
7	289.0	174.5	38.1	101.6				
8	288.9	174.2	38.2	99.7				
9	289.5	174.6	38.3	102.2				
10	289.3	174.5	38.2	101.5				
Criteria	***712***	***570***	***228***	***246***	***50***	***100***	***30***	***10***

All units are in $\mu g/m^3$ with the exception of Carbon Monoxide (CO) which is expressed as mg/m^3

* Maximum results are calculated regardless of location

All results have been plotted on regional topographical maps showing the locations of the surrounding receptors and land use patterns. The concentration isopleths are shown as **Figures 7 - 14**.

8 IMPACT ASSESSMENT

Results of the dispersion modelling for the operation of the EGTG indicate that all assessed air quality pollutants when considered in isolation from the background are below DEC assessment criteria. Assessed pollutants under worst case dispersion conditions with the EGTG operating continuously are expected to increase background pollutant concentrations by less than 0.5% of each pollutant criteria for assessed pollutants with the exception of NO_2 and PM_{10} which were both less than 4.7% (e.g. SO_2 maximum addition of 3.0 $\mu g/m^3$ (0.4%) of SO_2 criteria of 712$\mu g/m^3$).

Cumulative pollutant concentrations do not result in exceedence of any of the pollutants for which background data exists (SO_2 and NO_2). The pollutants for which background data does not exist are not expected to pose a problem cumulatively due to the low relative contribution of each of the pollutants (PM_{10} expected to contribute a maximum of 1.1$\mu g/m^3$ and Carbon Monoxide less than 0.0028$\mu g/m^3$ toward the ambient environment).

As discussed in **Section 5.2.1**, there is the potential for the met data used in the dispersion modelling to produce dispersion patterns slightly different to those that may be generated using measured data. Analysis of the met data suggests that the actual wind speeds in the vicinity of the EPS are lower than those predicted by TAPM. As this could result in higher ground level concentrations closer to the EPS, this needed to be considered as part of the impact assessment.

Dispersion patterns shown in **Figures 7** to **14** show the maximum predicted ground level concentrations occur relatively close to the plant to the east, north and southwest. The highest predicted pollutant concentrations all occur within the EPS boundary or adjacent to the Ash Dam to the north of the EPS and if lower wind speed resulted in worse dispersion conditions, it would be expected that the worst case impacts would occur closer to the EPS.

The higher proportion of +4m/s wind noted in the TAPM met file have produced concentrations shown in **Table 6** and **7**. Lower proportions of +4m/s winds as observed in the Ash Dam met file are likely to result in higher pollutant concentrations closer to the emission source, which is within the property boundary and hence not considered to be a significant issue.

The predicted pollutant concentrations are based on continuous operation of the generator for all meteorological conditions over a twelve month period. This modelling methodology is aimed at allowing the prediction of worst-case pollutant concentrations under all meteorological conditions. As the actual operation of the EGTG will be limited to a small number of events during the year, the modelling results are considered to be conservative and provide a worst case estimation of the pollutant dispersion around EPS.

9 CONCLUSIONS AND RECOMMENDATIONS

Dispersion modelling undertaken for the proposed EGTG has demonstrated that under worst case pollutant emission rates and meteorological conditions, concentrations of all pollutants assessed are predicted to fall below the DEC assessment criteria for all sensitive receptors surrounding the EPS.

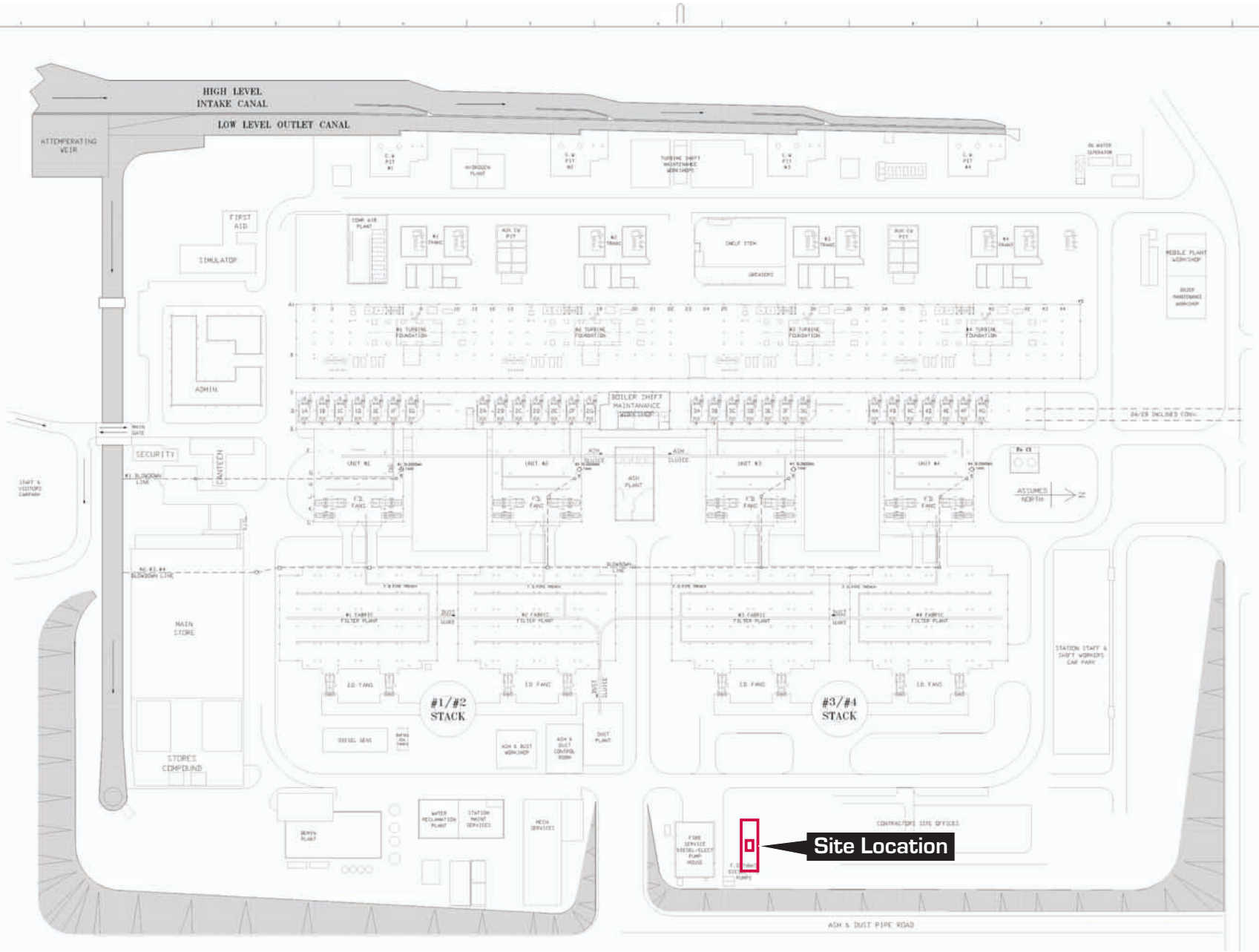
Figures

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

Site Location
Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

HLA

FIGURE
1



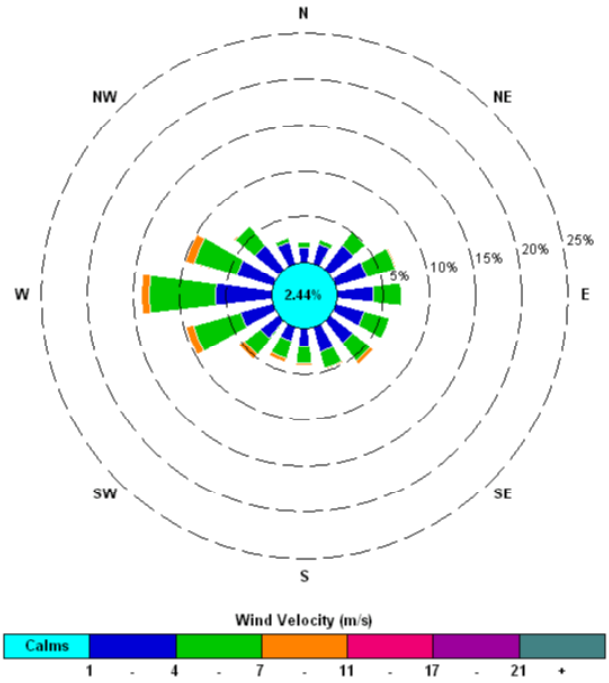
PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

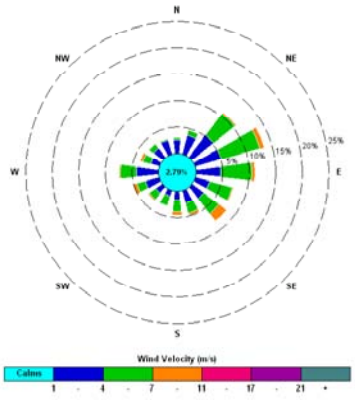
Site Plan
Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek, NSW

HLA

FIGURE
2

Full Year 2004





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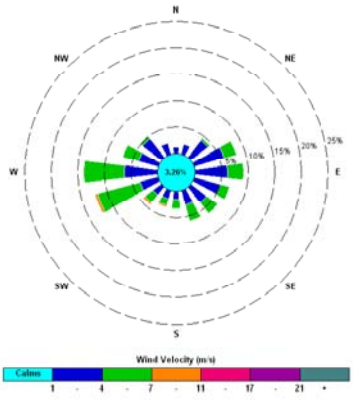

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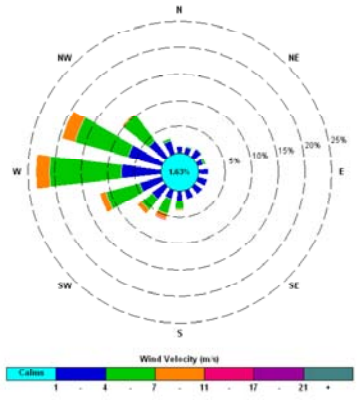
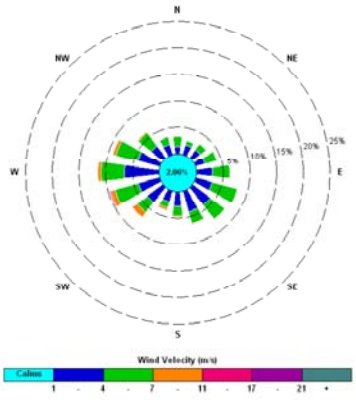


Winter



Spring

HLA

Wind Rose - TAPM Generated Meteorlogical File

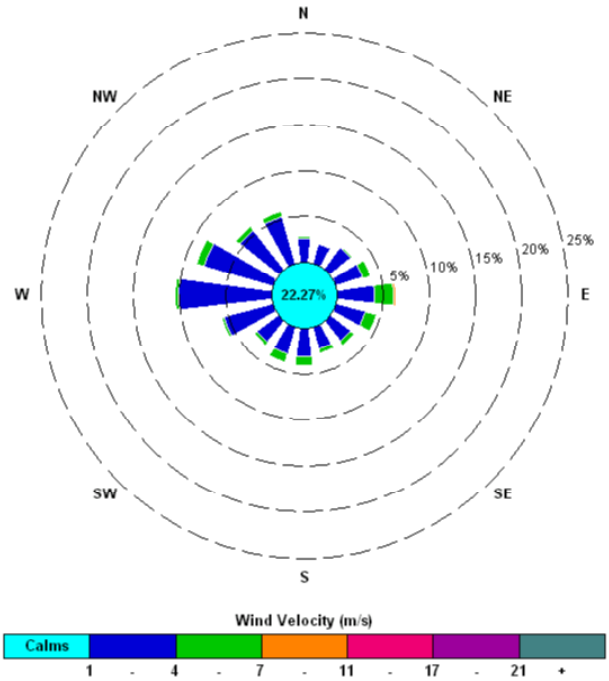
Eraring Power Station
Eraring Energy
Rocky Point Road, Eraring, NSW

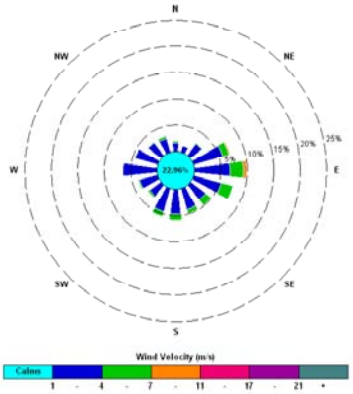
ATTACHMENT

3

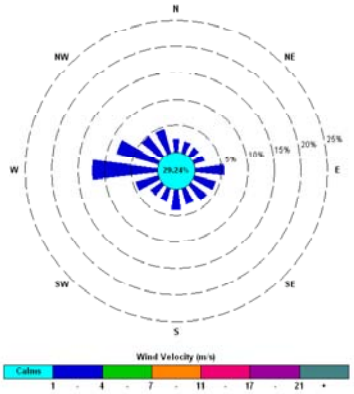
PROJECT FILE NAME: S6036302 DATE: 20 DEC 2005 DRAWN: DR APPROVED:

Full Year 2004

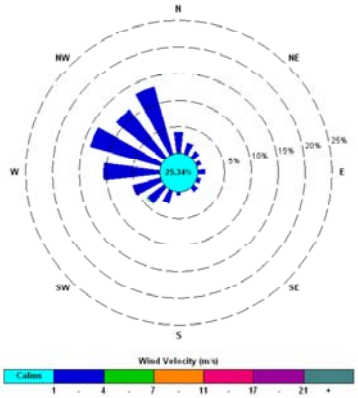




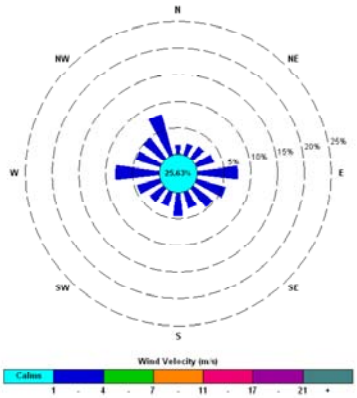
Summer



Autumn



Winter



Spring

HLA

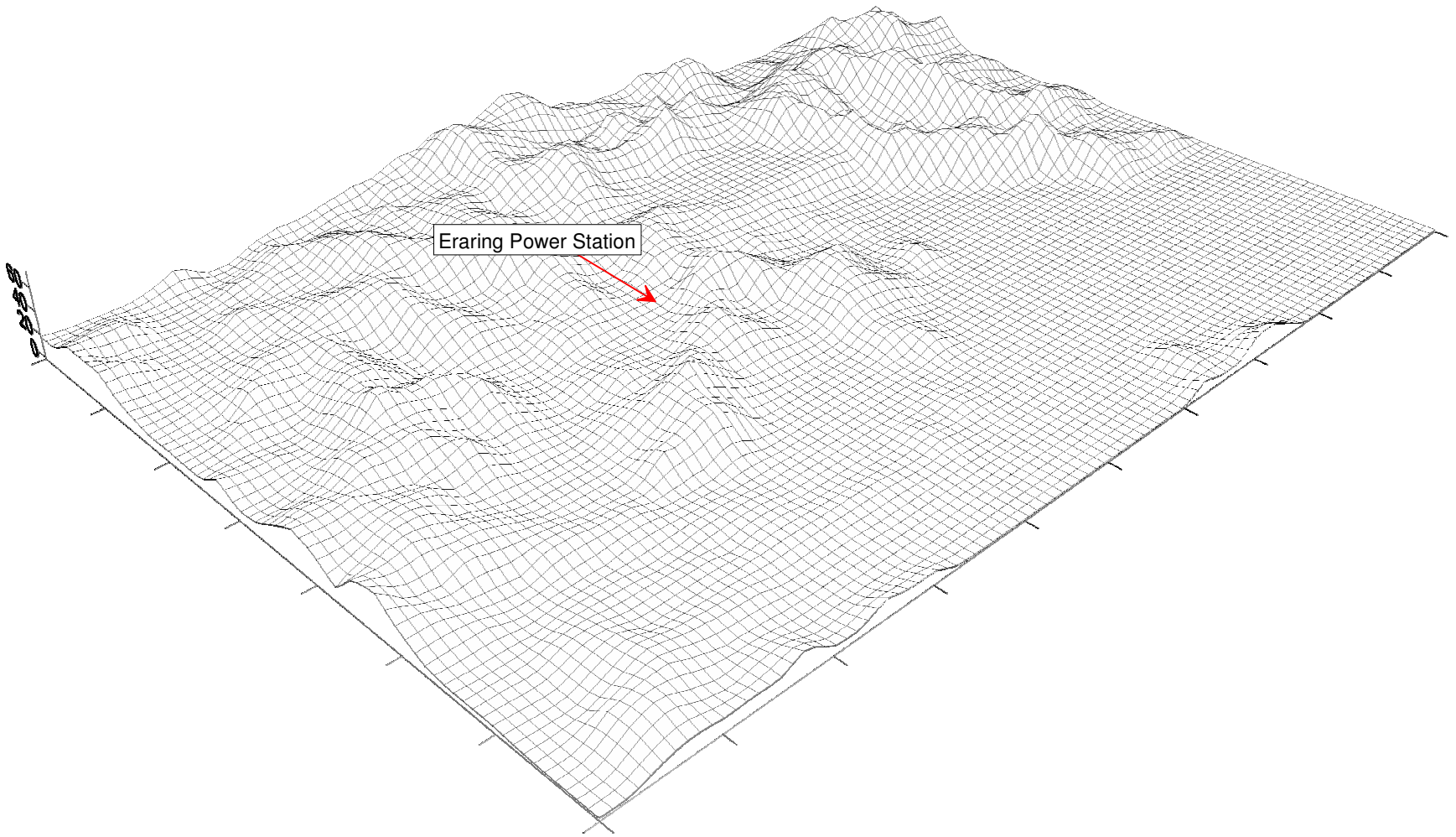
Wind Rose - Eraring Power Station Ash Dam Meteorlogical Station

Eraring Power Station
Eraring Energy
Rocky Point Road, Eraring, NSW

ATTACHMENT

4

PROJECT FILE NAME: S6036302 DATE: 20 DEC 2005 DRAWN: DR APPROVED:



PROJECT-FILE NAME	S6036302
DATE	January 2006
DRAWN	DR
APPROVED	

Topographical Representation

Black Start Generator AQIA
Eraring Power Station
Eraring Energy
Rocky Point Road
Eraring, NSW

HLA

FIGURE
5

PROJECT-FILE NAME	S6036304
DATE	3 May 2006
DRAWN	TO
APPROVED	

Proposed ash dam expansion

Sensitive receptor

Sensitive Receptor Locations
Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

HLA

0 400m

FIGURE 6

HLA

Predicted Increase in 10 Minute Average SO_2 Concentration

Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

Proposed ash dam expansion
Contour line (ug/m3)
Sensitive receptor

N
0 500m

FIGURE 7

PROJECT-FILE NAME	S6036304	DATE	3 May 2006	DRAWN	TO	APPROVED

HLA

Predicted Increase in 1 Hour Average SO_2 Concentration

Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

Proposed ash dam expansion
Contour line (ug/m3)
Sensitive receptor

N
0 500m

FIGURE 8

PROJECT-FILE NAME	S6036304	DATE	3 May 2006	DRAWN	TO	APPROVED

Predicted Increase in 24 Hour Average SO_2 Concentration

Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

Proposed ash dam expansion
Contour line (ug/m3)
Sensitive receptor

N
0 500m

FIGURE 9

PROJECT-FILE NAME	S6036304	DATE	3 May 2006	DRAWN	TO	APPROVED

HLA

Predicted Increase in 1 Hour Average NO_2 Concentration

Eraring Energy

Air Quality Impact Assessment

Eraring Power Station

Rocky Point Road, Dora Creek NSW

FIGURE 10

PROJECT-FILE NAME	S6036304	DATE	3 May 2006	DRAWN	TO	APPROVED

HLA

Predicted Increase in 24 Hour Average PM_{10} Concentration

Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

Proposed ash dam expansion
Contour line (ug/m3)
Sensitive receptor

N
0 500m

FIGURE 11

PROJECT-FILE NAME	S6036304	DATE	3 May 2006	DRAWN	TO	APPROVED

Predicted Increase in 15 Minute Average CO Concentration
Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

HLA

Proposed ash dam expansion
Contour line (ug/m3)
Sensitive receptor

N
0 500m

FIGURE 12

PROJECT-FILE NAME S6036304 DATE 3 May 2006 DRAWN TO APPROVED

HLA

Predicted Increase in 1 Hour Average CO Concentration

Eraring Energy

Air Quality Impact Assessment

Eraring Power Station

Rocky Point Road, Dora Creek NSW

Proposed ash dam expansion

Contour line (ug/m3)

Sensitive receptor

N

0 500m

FIGURE

13

PROJECT-FILE NAME	S6036304	DATE	3 May 2006	DRAWN	TO	APPROVED

Predicted Increase in 1 Hour Average CO Concentration
Eraring Energy
Air Quality Impact Assessment
Eraring Power Station
Rocky Point Road, Dora Creek NSW

HLA

Proposed ash dam expansion
Contour line (ug/m3)
Sensitive receptor

N
0 500m

FIGURE 14

PROJECT-FILE NAME S6036304 DATE 3 May 2006 DRAWN TO APPROVED

Appendix A: Ausplume Output Files

Eraring Energy Blackstart Generator - NO2 Emissions

Concentration or deposition	Concentration
Emission rate units	grams/second
Concentration units	microgram/m3
Units conversion factor	1.00E+06
Constant background concentration	0.00E+00
Terrain effects	Egan method
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.800m
Adjustment for wind directional shear	None

PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	PRIME method.
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No
Disregard temp. gradients in the hourly met. file?	No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

Wind Speed Category	Stability Class A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES
Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Urban" values (unless overridden by met. file)

AVERAGING TIMES
1 hour

STACK SOURCE: S1

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
362050	6340825	15m	15m	3.40m	546C	37.9m/s

No building wake effects.
(Constant) emission rate = 1.52E+01 grams/second
No gravitational settling or scavenging.

Eraring Energy Blackstart Generator - NO2 Emissions

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):
358000.m 358250.m 358500.m 358750.m 359000.m 359250.m 359500.m
359750.m 360000.m 360250.m 360500.m 360750.m 361000.m 361250.m
361500.m 361750.m 362000.m 362250.m 362500.m 362750.m 363000.m
363250.m 363500.m 363750.m 364000.m 364250.m 364500.m 364750.m
365000.m 365250.m 365500.m 365750.m 366000.m 366250.m 366500.m
366750.m 367000.m 367250.m 367500.m 367750.m 368000.m

and these y-values (or northings):
6337000.m 6337250.m 6337500.m 6337750.m 6338000.m 6338250.m 6338500.m
6338750.m 6339000.m 6339250.m 6339500.m 6339750.m 6340000.m 6340250.m
6340500.m 6340750.m 6341000.m 6341250.m 6341500.m 6341750.m 6342000.m
6342250.m 6342500.m 6342750.m 6343000.m 6343250.m 6343500.m 6343750.m
6344000.m

DISCRETE RECEPTOR LOCATIONS (in metres)

No.	X	Y	ELEVN	HEIGHT	No.	X	Y	ELEVN	HEIGHT
1	360000	6338675	14.0	0.0	6	362000	6339925	33.0	0.0
2	359625	6339075	25.0	0.0	7	362875	6340150	25.0	0.0
3	360700	6339325	25.0	0.0	8	364125	6340900	20.0	0.0
4	360150	6340475	22.0	0.0	9	365650	6341050	45.0	0.0
5	361425	6339475	12.0	0.0	10	366275	6342250	40.0	0.0

METEOROLOGICAL DATA : AUSPLUME METFILE

Appendix B: Emission Factor Calculations

Eraring Energy Black Start Generator

The following emissions information is sourced from the GE Frame 6 PG6581 specification gas turbine (from GE paper GER- 4217A)

Due to the cost of fuel, the blackstart GT will be expensive to operate compared to the Station's coal fired units. Suggested model is for 30 hrs a month for summer (3 month period) and same for winter (3 month period). Remaining months would see the machine run for 3 hrs maximum per month for routine start testing purposes only.

Emission Inventory

Stack Conditions

Stack Area =	9	m^2
Stack Diameter =	3.385	m (equivalent diameter calculated from stack X-sectional area)
Stack Velocity =	37.9	m/s
Stack VFR =	341.1	m^3/s
Stack Temperature =	546	°C
	819	K
Stack Height =	15	m
Stack X Coordinate =	362050	
Stack Y Coordinate =	6340825	
Stack Z Coordinate =	15	

Generator Blackstart Data

Fuel Usage =	12355	L/hr
	12.355	m^3/hr
	0.0034	m^3/s
Fuel Sulfur Content =	500	ppm
	0.05	%

Sulfur content based on maximum legal sulfur content in fuel (BP Australia)

Pollutant Emission Rates

Oxides of Nitrogen (NO_X)

Manufacturers guarantee =	65	ppm
	44	mg/m^3
	15167	mg/s
	15.2	g/s

Carbon Monoxide (CO)

Manufacturers guarantee =	20	ppm
	8	mg/m^3
	2842	mg/s
	2.8	g/s

Sulfur Dioxide (SO_2)

NPi Estimate =	0.8	kg/m^3
	0.0028	kg/s
	2.8	g/s
	8.4	

PM_{10} Particulates

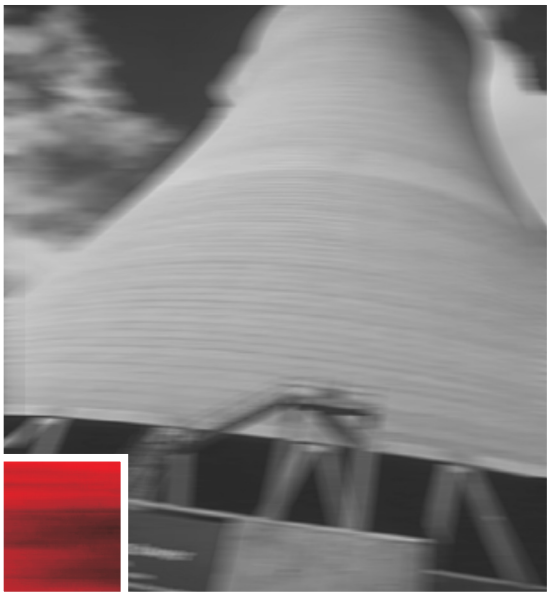
NPi Estimate =	1.64	kg/m^3
	0.0056	kg/s
	5.6	g/s
	16.5	

Volatile Organic Compounds

NPi Estimate =	1.32	kg/m^3
	0.0045	kg/s
	4.5	g/s
	13.3	

Summary Table

Pollutant	Emission Rate (g/s)	Data Source
Oxides of Nitrogen	15.2	Eraring Energy
Carbon Monoxide	2.8	Eraring Energy
Sulfur Dioxide	2.8	NPi
PM_{10} Particulates	5.6	NPi
Volatile Organic Compounds	4.5	NPi



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