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Delta Electricity

Proposed Gas Power Facility at Bamarang Stage Two Environmental Assessment

April 2008



Submission of Environmental Assessment

Prepared under the Environmental Planning and Assessment Act 1979, Section 75H

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In respect of:

Project to which Part 3A applies

Applicant name Delta Electricity
Applicant address PO Box Q863
QVB NSW 1230
Land to be developed Lot 1, DP 27482; 681 Yalwal Road, Bamarang NSW
Proposed development Construction and operation of stage two of a gas turbine power facility, involving the conversion of the approved stage one facility (yet to be constructed) to a combined cycle facility with the capacity to generate approximately 400 megawatts of electricity

Environmental assessment An environmental assessment is attached

Certificate

I certify that I have prepared the contents of this document and to the best of my knowledge:

- » It is in accordance with the requirements of Part 3A;
- » It contains all available information that is relevant to the environmental assessment of the development to which it relates; and
- » The information contained in the document is neither false or misleading.

Signature 
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Date 2 April 2008



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Glossary of terms

Acoustic	Pertaining to the sense or organs of hearing, or to the science of sound.
Asset protection zone	A bushfire asset protection zone (APZ) is an area of land, adjacent to a building, in which the bushfire fuel load is managed to significantly minimise the impact of fire on that asset. The APZ acts as a buffer zone between an asset and the bushfire hazard. Usually the focus is on reducing ground and shrub fuel layers, however in some situations tree canopies may need to be pruned or thinned.
Base load facility	A power generating facility that produces electricity at an essentially constant rate.
Combined cycle	Combined cycle facilities use both gas and steam turbine cycles in a single plant to produce electricity with high conversion efficiencies. Waste heat from the gas turbine is used by the steam turbine to also generate electricity.
Consent	See development consent.
dB(A)	The most common measurement of environmental noise (A level weighting) – measured using a simple sound level meter, to simulate the subjective response of the human ear.
Development consent	Approval to undertake a development received from the consent authority. Also referred to as a development approval.
Dispersion model	Mathematical model used to estimate concentration profiles of gases or particles suspended in air at various distances from the initial point of release.
Effluent	Liquid industrial waste or wastewater, which may or may not have been passed through some purification processes.
Emission	The release of material into the atmosphere (eg gas, noise).
Environmental management plan	A document setting out the management, control and monitoring measures to be implemented during construction (a construction environmental management plan) and/or operation (operational environmental management plan) of a development, to avoid or minimise the potential environmental impacts identified during an environmental assessment process.
Flora and fauna	Plants and animals.
Gas turbine	The gas turbine unit consists of a compressor, combustion chamber, turbine and generator. Air is compressed to a high pressure before being admitted into the combustion chamber. Fuel (natural gas in this case) is injected into the combustion chamber where combustion occurs at very high temperature. The resulting mixture of hot gas is admitted into the gas turbine where the hot gases expand. The expansion of the hot gases converts heat energy into power by causing the turbine to turn
Greenhouse gases	Gases that accumulate within the earth's atmosphere (eg primarily carbon dioxide and methane) and contribute to global climatic change/global warming (ie the 'greenhouse effect').
Heat recovery steam generator	The heat recovery steam generator recovers the hot gases exhausted from the gas turbines to produce steam through a steam generator, resulting in an improved overall efficiency of the plant.
Open cycle	In an open cycle configuration for a gas turbine, hot exhaust gas is vented directly to atmosphere through the exhaust stack, without heat recovery.
Particulate	Small particles, usually occurring in suspension.
Peaking facility	Power generating facility used to supply electricity during peak demand times only.
Potable water	Water suitable for drinking.
Process water	Water consumed or used during an industrial or manufacturing process for rinsing or other purposes.
Steam turbine	A device for converting energy of high-pressure steam into mechanical power which can then be used to generate electricity.



List of abbreviations

AHD	Australian height datum
APZ	Asset protection zone
AS	Australian Standard
CAPER	Clear Air (Plant Equipment) Regulation 1997
CO	Carbon monoxide
CO ₂	Carbon dioxide
DECC	Department of Environment and Climate Change
DP	Deposited Plan
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
INP	NSW Industrial Noise Policy
km	Kilometre
kV	Kilovolt
L _{eq}	Equivalent continuous noise level
L ₁₀	Average maximum noise level – the noise level exceeded for 10% of a sampling period.
L ₉₀	Background noise level – the noise level exceeded for 90% of a sampling period.
LEP	Local environmental plan
LGA	Local government area
mg	Milligram
m ³	Cubic metre
m/s	Metres per second
NEMMCO	National Electricity Market Management Company
NEPM	National Environment Protection Measures
NO _x	Nitrogen oxides
NO ₂	Nitrogen dioxide
O ₃	Ozone
OCS	Obstruction Clearance Surface
PAD	Potential archaeological deposit
PM ₁₀	Particulate Matter measuring 10 micrometers or less
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
ppb	Parts per billion
ppm	Parts per million
REMS	Reclaimed Water Management Scheme
RFS	Rural Fire Service
SEPP	State Environmental Planning Policy
SO ₂	Sulphur dioxide
STP	Sewage Treatment Plant
TAPM	The air pollution model
TSC Act	<i>Threatened Species Conservation Act 1995</i>
µg/m ³	Micrograms per cubic metre



Summary of the environmental assessment

Overview

Background

An environmental assessment for the proposal to construct and operate a gas turbine power facility at Bamarang, near Nowra in NSW, was prepared in 2006. The environmental assessment was prepared to support Delta Electricity's (Delta's) application for approval of the facility under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Minister for Planning was the approval authority.

The proposed gas power facility would be developed in two stages. Stage one involves development of a gas turbine peaking facility, a gas pipeline and an electricity transmission line. The second stage involves converting the proposed facility to a base load facility, by adding two heat recovery steam generators and a steam turbine.

On 27 February 2007, the NSW Minister for Planning granted approval to Delta Electricity for the proposed gas power facility at Bamarang, near Nowra. The following approvals were granted:

- » Concept approval for the Bamarang gas turbine facility (comprising both stages one and two); and
- » Project approval for the construction and operation of stage one, an open cycle gas-fired power station.

Why is the proposal needed?

A shortfall in electricity supply is predicted to occur in NSW within the next few years. Analysis of electricity supply and demand shows that the level of demand in NSW is increasing by approximately 3% per year, with summer peak load demand growing by approximately 500 megawatts per year. Based on current rates of supply, it is predicted that NSW will need to rely on imports from interstate to meet minimum requirements from 2005/2006, and that by 2008/09, NSW will not be able to source additional supply from other states.

The Owen Inquiry into Electricity Supply in NSW found that, with a risk-averse approach, New South Wales needs to be in a position where new base load power generation can be operational by 2013-14 if necessary, in order to avoid potential energy shortfalls.

Consistent with this finding, Delta is now progressing the proposed Bamarang gas power facility and seeking project approval for stage two, so that the facility can operate as a base load facility.



Role of this environmental assessment

The requirements for the environmental assessment of the project are specified by condition 2.2 of the concept approval for the Bamarang Gas Turbine Facility, dated 27 February 2007. This environmental assessment addresses those requirements.

As noted by the Department of Planning's Director-General's Assessment Report, the Department confirmed that the main outstanding issues requiring resolution prior to the granting of project approval for stage two were whether water was a feasible cooling option for the facility, and if so, what would be the infrastructure requirements and implications/impacts.

If the water supply feasibility study identifies that wet cooling is not a viable option, it would be necessary to alter the design of the stage two facilities to incorporate air-cooling. Approval would need to be sought for this change, requiring additional studies.

These requirements are confirmed by the conditions of approval that form part of the concept approval.

During the public exhibition of the environmental assessment in 2006, a number of concerns were raised by the community in relation to the proposed use of large amounts of water for cooling in stage two. This issue was noted in the conditions of the concept approval, which required resolution of the following issues:

- » Whether water is a feasible cooling option for the facility; and
- » If so, what are the infrastructure requirements, such as water supply pipelines, and the environmental impacts of this infrastructure.

On behalf of Delta, engineering and environmental consultants GHD have undertaken a water supply feasibility study.

This study has shown that cooling the facility using water (referred to as 'wet cooling') is not a feasible option, due to the large volume of water required and the lack of available water supply to meet the cooling needs.

In order to address this issue, Delta has now modified the design of the project to use air to provide cooling for the power facility (referred to as 'dry cooling').

The facility will still use some water, but dry cooling uses considerably less water than wet cooling. The change to dry cooling has meant that the infrastructure required for the facility will need to change slightly, and this in turn has meant that the impact of the gas turbine facility on the environment has also changed.

In accordance with the requirements of the NSW Department of Planning, Delta has undertaken additional technical studies for the modified dry cooling proposal and an assessment of the potential environmental effects of stage two of the proposed gas power facility using dry cooling.

What would the proposal involve

Delta is seeking project approval for the construction and operation of infrastructure required to enable the Bamarang gas turbine power facility to operate as a base load facility (in combined cycle configuration) and provide a constant supply of electricity. These works and infrastructure



are referred to as 'the project' for the purposes of this environmental assessment and were described as 'stage two – base load facility' by the 2006 environmental assessment.

Approval is sought for the construction and operation of the following equipment and infrastructure:

On site

- » Combined cycle equipment:
 - Two heat recovery steam generators which would be connected to the approved gas turbines; and
 - A steam turbine.
- » A cooling system including an air cooled condenser proposed as the cooling medium.
- » Other facilities:
 - Water treatment plant (to treat the small amount of process water to be used in dry cooling);
 - Piping;
 - Steam generator step-up transformers;
 - Additional electrical equipment in the switchyard; and
 - Water storage tanks – above ground tanks would be used to store sufficient water on site for at least two continuous days of operation.
- » A pipeline (approximately 140m in length) to provide the water supply to meet process water requirements.

The 2006 environmental assessment indicated that the proposed gas power facility would be constructed in a staged manner, with stage one (previously approved) being constructed first and the facility operating in open cycle configuration, producing electricity during peak periods only. Stage two was expected to be constructed at a later time, with the facility then operating in combined cycle configuration, producing constant (base load) electricity.

However, as the recent Owen Inquiry found that new base load electricity generation is required in order to avoid potential energy shortfalls, it is possible that the two stages of the proposed gas power facility may be constructed concurrently. Should this occur, the infrastructure required for both stage one and stage two would be constructed at the same time, and the facility would operate as a base load facility from the commencement of operation.

It is also possible, however, that the facility would be constructed in a staged manner as originally proposed.

Impact assessment

The environmental assessment considers the impacts of the change from wet cooling to dry cooling, and also assesses proposed water pipeline. The issues that are required to be addressed are set out in the concept approval. These are summarised below.



Air quality

The potential air quality impacts of the proposal were assessed. Dispersion modelling was used to assess the impacts on local air quality during operation. Equipment specifications provided to prospective equipment suppliers would dictate the technical and environmental performance the units would be expected to meet.

The results of the assessment indicate that ground level concentrations of all pollutants would not exceed their respective criteria at sensitive receptors. The existing air environment in the Bamarang area is consistent with a rural environment, and the proposal is not expected to impact significantly on the existing air quality environment.

The findings of the current air quality assessment are consistent with the findings of the air quality impact assessment completed for the revised stack operations report (GHD Pty Ltd, 2006c)

In addition, an assessment was conducted of the potential hazard that exhaust plumes from the proposed gas turbine power facility present to aviation activities in the surrounding region.

The plume rise from a single stack from each source type was modelled, and an hourly-varying plume rise enhancement factor was applied to the vertical velocity inputs to conservatively account for the impact of enhanced buoyancy as a result of plume merging.

Results of the assessment indicate that the probability of an exceedance of the critical vertical velocity (4.3 m/s) decreases significantly with altitude. Approximately 98% and 99.7% of all predicted exceedances of the critical vertical velocity occur beneath 100 m AGL, (60 m above stack height) for the exhaust stacks and air cooled condenser respectively.

The interaction between the plume from the air cooled condenser and the exhaust stacks is unlikely to significantly increase the plume rise from the facility.

Noise

A noise model was developed, using SoundPLAN noise prediction software, and the CONCAWE industrial noise algorithm. The model was based on the plant noise emission data of the December 2005 study and validated against the results of the previous study.

Predicted noise levels at the nominated receiver locations (without mitigation) is summarised in the following points:

- » At the distant receivers of 190 Bamarang Road (to the north) and 213 Gannet Road (to the southeast), which are representative of the residential receivers in these areas, the design criterion is exceeded by 3 dBA under neutral conditions and by up to 7 dBA for meteorologically enhanced conditions; and
- » At the single isolated receiver Lot 22 (mud brick business to the north), the design criterion is exceeded by 15 dBA to 17 dBA.

Concept noise mitigation that will result in compliance of the design criterion has been considered. Two options for mitigation were addressed: the first to achieve a nominal reduction of 7 dBA in order to comply at the more distant residences; and the second to achieve a nominal 17 dBA reduction in order to comply at the single nearby residence.



With moderate mitigation measures, the project would achieve compliance with the design goal at both 213 Gannett Road and 190 Bamarang Road, and a 11 dBA exceedance at Lot 22. With major mitigation measures, there would be a minor 1 dBA exceedance of the design goal at Lot 22, which in consideration of the modelling tolerances is considered acceptable for assessment based on preliminary design information.

To address the significant exceedances of the design criterion at Lot 22 (mud brick business), consideration could be given to either negotiating an agreement with the owner or acquiring the property in order to minimise the degree of mitigation required.

Ecology

The revised facility layout would result in an increase in the extent of total clearing on the site. However the amount of partial clearing required for bushfire asset protection zones would decrease. None of the vegetation to be cleared on the site is considered to be a part of an endangered ecological community. Partial clearing for the bushfire asset protection zones would decrease the amount of potential fauna habitat present within the site.

The revised layout has reduced the number of hollow-bearing trees that would be removed as a result of the proposal, which is considered to be a positive impact.

The preferred route for the water pipeline is proposed to be constructed within the Delta site, and is located within the required asset protection zone (APZ) for bushfire purposes, where partial clearing is required. The exact route of the proposed water pipeline will take into account significant vegetation which is to be retained after clearing for the APZ.

Mitigation measures will minimise any direct and indirect impacts on flora and fauna and their habitat.

Indigenous heritage

The 2006 environmental assessment did not find any Aboriginal sites or potential archaeological deposits on the site of the proposed gas power facility. As such, the increased footprint of the facility as a result of the now proposed air cooled condenser is not expected to impact on any Aboriginal sites. As such, it is considered that there are no Aboriginal heritage constraints to the modified proposal.

Similarly, as the proposed water pipeline is proposed to be constructed within the Delta site, the proposed water pipeline is not expected to impact on any Aboriginal sites. As such, the proposed pipeline is not likely to have any impact on Aboriginal heritage.

Bushfire

Bushfire asset protection zones, ranging from 20m to 40m in width, would be required to surround the proposed facility. It is considered that the implementation of bushfire asset protection zones, together with other site management practices proposed, would adequately protect the proposed facility from risk associated with bushfire hazards.



Visual impact

The air cooled condenser has a height of approximately 31.1m, which is less than the height of the approved exhaust stacks. However, it would be one of the largest structures in the plant, and requires a large footprint to complement its height, and is therefore a large, bulky structure.

Heavily wooded areas would surround the majority of the proposal, significantly reducing its overall visibility.

Partial views of the air cooled condenser will be visible from the site entrance off Yalwal Road and as part of the entire site as viewed from longer distances including the Nowra Hill lookout and the Cabbage Tree lane area.

However, although the amount of infrastructure visible at these distances may increase, it is considered that the air cooled condenser will not be viewed as a distinguishable or stand out component of the development and therefore not create significant additional visual impact.

Land use

The proposed water pipeline route travels within the Delta site. Neither the land uses along or adjacent to the corridor preclude its use for a water pipeline.

Greenhouse

As part of the updated air quality impact assessment for the revised dry cooling option for stage two, the greenhouse gas impacts of the dry cooling option were confirmed. This assessment shows that the greenhouse gas impacts of the proposed gas power facility are unchanged from that assessed in the 2006 environmental assessment.

Draft statement of commitments

The environmental assessment provides Delta's commitments for environmental mitigation, management and monitoring. The draft statement of commitments is generally consistent with the statement of commitments contained in the 2006 environmental assessment. The statement of commitments includes recommended mitigation measures to reduce and avoid identified impacts, management measures (such as the preparation of construction and operation environmental management plans) to ensure a high level of environmental performance against identified criteria, and measures to monitor performance. The statement of commitments would be finalised following exhibition.

Conclusion

This environmental assessment has considered the potential impacts of the proposed development of stage two of the gas power facility on Yalwal Road, Bamarang near Nowra in the local government area of Shoalhaven.

The environmental assessment has been prepared in accordance with the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* and the requirements of condition 2.2



of the concept approval for the gas power facility project, to seek project approval for the construction and operation of stage two.

The environmental assessment demonstrates that the project is consistent with the requirements of the concept approval and generally consistent with the scope and intent of the concept outlined in the Major Project Application, environmental assessment of the concept plan, and the submissions report.

This environmental assessment has examined a number of key issues surrounding the modified proposal, and has found that the impacts of the modified proposal are generally consistent with the impacts identified in the original environmental assessment for concept approval. Any adverse impacts would be mitigated through implementation of the Statement of Commitments.



Chapter 1. Introduction

1.1 Overview

An environmental assessment for the proposal to construct and operate a gas turbine power facility at Bamarang, near Nowra in NSW, was prepared in 2006¹. The environmental assessment was prepared to support Delta Electricity's (Delta's) application for approval of the facility under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Minister for Planning was the approval authority.

The proposal, as described in the environmental assessment for the proposed gas power facility (referred to in this document as the 2006 environmental assessment), involved the construction and operation of a gas power facility in two stages. Stage one involved development of a gas turbine peaking facility; a gas pipeline to supply the proposed facility with gas from the Eastern Gas Pipeline; a 132 kilovolts electricity transmission line to transfer the electricity produced to the national electricity network; and ancillary infrastructure. The peaking (stage one) facility, which would incorporate two gas turbines in open cycle configuration, would have the capacity to generate approximately 300 megawatts of electricity at any one time.

The second stage, as described in the environmental assessment, would involve construction and operation of infrastructure required to enable the gas turbine power facility to operate as a base load facility (in combined cycle configuration) and provide a constant supply of electricity. This infrastructure would include addition of two heat recovery steam generators, a steam turbine and a cooling system. The facility would have a generation capacity of approximately 400 megawatts.

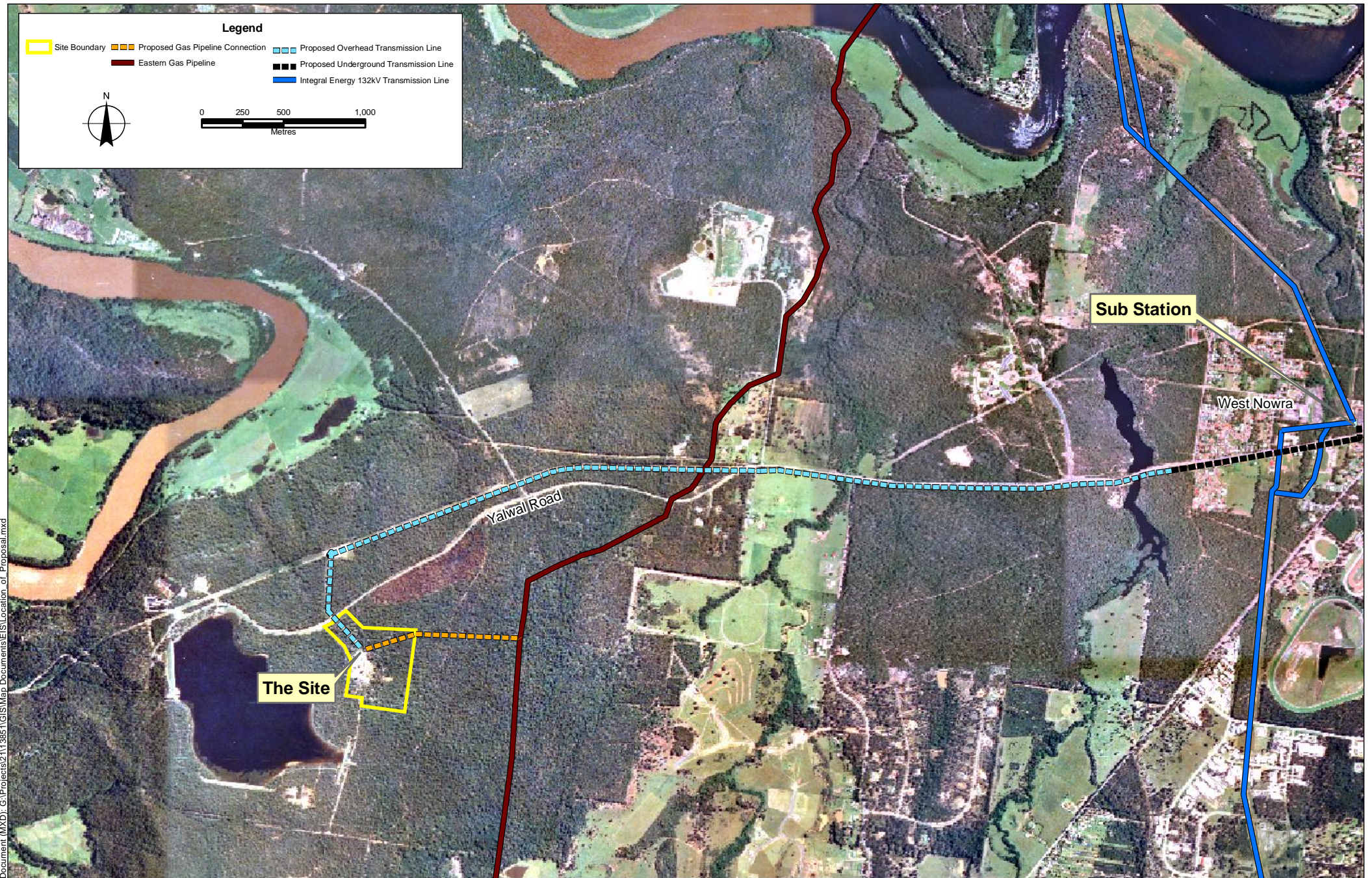
Figure 1.1 shows the location of the proposed gas power facility and associated infrastructure.

1.2 Background to the project

1.2.1 Project need

Delta is an electricity generation company owned by the NSW Government (a State owned corporation). Delta produces around 12% of the electricity consumed in the national electricity market, which covers consumers in NSW, South Australia, Queensland, Victoria, the ACT and Tasmania.

¹ 'Proposed Gas Power Facility at Bamarang near Nowra, Environmental Assessment', May 2006, GHD



Document (MXD): G:\Projects\2113851\GIS\Map Documents\EIS\Location of Proposal.mxd

Figure 1.1 Location of the Proposal



Electricity is currently produced by Delta using a range of fuels including coal, water and biomass materials. Delta currently operates four major power stations in NSW: Vales Point, Munmorah, Mt Piper and Wallerawang, which have a combined generating capacity of 4,240 megawatts. In order to secure NSW's future electricity supply, Delta is developing a number of other power facilities' projects, of which this project is one.

The strategic justification for development of the gas power facility at Bamarang was provided in the 2006 environmental assessment. The National Electricity Market Management Company (NEMMCO) in its annual assessment of the National Electricity Market indicated that New South Wales needs future investment in generation capacity to maintain the State's electricity supply. In response, the NSW Government has acted to secure the medium term peak supply. Delta has approval to construct two gas peaking power stations, including the facility at Bamarang.

Gas peaking facilities supplement electricity supply during times of peak demand, such as on hot summer days. The 2006 environmental assessment noted that when the overall level of demand increases further, Delta would seek project approval to convert the facility to a combined cycle facility (stage two), allowing the Bamarang gas power facility to operate efficiently full time, producing a constant supply of electricity.

The NSW Government has identified that the level of electricity demand is now such that suppliers need to focus on securing future base load supply of electricity.

In May 2007, the NSW Government commissioned the Owen Inquiry into Electricity Supply in NSW, with the following terms of reference:

1. Review the need and timing for new base load generation that maintains both security of supply and competitively priced electricity.
2. Examine the base load options available to efficiently meet any emerging generation needs.
3. Review the timing and feasibility of technologies and/or measures available both nationally and internationally that reduce greenhouse gas emissions.
4. Determine the conditions needed to ensure investment in any emerging generation, consistent with maintaining the NSW AAA Credit Rating.

The Owen Inquiry report was released on 11 September 2007. The key findings of the Inquiry, as relevant to this project, are as follows:

- » With a risk-averse approach, New South Wales needs to be in a position where new baseload generation can be operational by 2013-14 if necessary, in order to avoid potential energy shortfalls.
- » To be ready for 2013-14 baseload supply needs, preparation should start now.
- » Most of NSW extra baseload energy needs are likely to be met by coal-fired and/or gas-fired generation as other technologies can only contribute on a relatively small scale or will not mature until 2020 at the earliest.
- » Combined cycle gas turbines (CCGTs) may be able to meet emerging generation needs. CCGTs are capable of running efficiently at high capacity factors. They are cheaper to build than coal-fired generators, but have higher fuel costs, and it is this that reduces their attractiveness for baseload power.



- » Though not as firm as coal supply, adequate domestic gas is likely to be available for electricity generation until at least 2020 and possibly well beyond.

Gas fired combined cycle plants produce less carbon dioxide per unit energy output than other fossil fuel technologies because of the relatively high thermal efficiency of the technology and the high hydrogen-carbon ratio of methane (the primary constituent of natural gas).

A combined cycle gas turbine power facility consists of one or more gas turbine generators equipped with heat recovery steam generators to capture heat from the gas turbine exhaust. Steam produced in the heat recovery steam generators powers a steam turbine generator to produce additional electric power. Use of the otherwise wasted heat in the turbine exhaust gas results in high thermal efficiency.

Because of their high thermal efficiency, relatively low initial cost, high reliability, relatively low gas prices and low air emissions, combined cycle gas turbines are increasingly playing an important role in base load power generation. Other advantages include significant operational flexibility, the availability of relatively inexpensive power augmentation for peak period operation and relatively low carbon dioxide production.

1.2.2 Approvals granted

The 2006 environmental assessment was placed on public exhibition by the Department of Planning between 19 May and 19 June 2006. Following exhibition the Department of Planning provided Delta with a copy of submissions received. The submissions report, prepared by GHD, was lodged with the Department of Planning in August 2006. Subsequent to lodgement of the submissions report, there was a need to resolve issues raised by the Department of Defence in relation to the potential impacts of plume rise from the stacks on the flight zone of the HMAS Albatross base. The design of the stacks was modified to address these issues and the following approvals were granted by the Minister for Planning on 27 February 2007:

- » 'Concept approval for the Bamarang Gas Turbine Facility'; and
- » 'Project approval for the construction and operation of an open cycle gas-fired power station (stage one)'.

The project approval received for the construction and operation of stage one covers the following:

On site facilities

Construction and operation of on-site equipment/infrastructure that would enable the power facility to operate as a peaking facility in open cycle configuration, including:

- » Two gas turbines, each with a capacity of approximately 140 megawatts;
- » Step-up transformers;
- » 132 kilovolts switchyard;
- » Installation of a fuel gas supply system;
- » Electrical and control building;
- » A single storey administration building; and



- » Other on site facilities including roads, car parking area, security and site drainage.

Other infrastructure

- » A gas pipeline, approximately 900 metres in length, to connect the facility to the Eastern Gas Pipeline; and
- » A 132 kilovolts electricity transmission line, approximately 7.2 kilometres in length, to connect the facility to the electricity distribution network via the existing substation located at the corner of Yalwal and Albatross Roads in West Nowra.

Construction

- » Construction works (including clearing) associated with the above.

1.2.3 Project approval for stage two

Consistent with the need for increased base load power generation capacity in NSW, Delta has decided to progress with seeking a project approval for the works described as stage two in the 2006 environmental assessment, so that the facility at Bamarang can operate as a base load facility.

As noted by the Department of Planning's Director-General's Assessment Report, the Department confirmed that the main outstanding issues requiring resolution prior to the granting of project approval for stage two were whether water was a feasible cooling option for the facility, and if so, what would be the infrastructure requirements and implications/impacts.

If the water supply feasibility study identifies that wet cooling is not a viable option, it would be necessary to alter the design of the stage two facilities to incorporate air-cooling. Approval would need to be sought for this change, requiring additional studies.

These requirements are confirmed by the conditions of approval that form part of the concept approval.

1.3 Role of this environmental assessment

1.3.1 What is Delta seeking approval for?

Delta is seeking project approval for the construction and operation of infrastructure required to enable the Bamarang gas turbine power facility to operate as a base load facility (in combined cycle configuration) and provide a constant supply of electricity. These works and infrastructure are referred to as 'the project' for the purposes of this environmental assessment and were described as 'stage two – base load facility' by the 2006 environmental assessment.

It should be noted that following investigation of water supply options for water cooling of the facility, Delta has decided to implement dry cooling of the facility as it requires significantly less water than wet cooling. This has resulted in a modification of the layout of the proposed facility.

Approval is sought for the construction and operation of the following equipment and infrastructure:



On site

- » Combined cycle equipment:
 - Two heat recovery steam generators which would be connected to the approved gas turbines; and
 - A steam turbine.
- » A cooling system including an air cooled condenser proposed as the cooling medium.
- » Other facilities:
 - Water treatment plant (to treat the small amount of process water to be used in the dry cooled facility);
 - Piping;
 - Steam generator step-up transformers;
 - Additional electrical equipment in the switchyard; and
 - Water storage tanks – above ground tanks would be used to store sufficient water on site for at least two continuous days of operation.
- » A pipeline from the rising main that runs along the western boundary of the site (approximately 140m in length within the Delta site) to provide the water supply to meet process water requirements.

The 2006 environmental assessment indicated that the proposed gas power facility would be constructed in a staged manner, with stage one (previously approved) being constructed first and the facility operating in open cycle configuration, producing electricity during peak periods only. Stage two was expected to be constructed at a later time, with the facility then operating in combined cycle configuration, producing constant (base load) electricity.

However, as the recent Owen Inquiry found that new base load electricity generation is required in order to avoid potential energy shortfalls, it is possible that the two stages of the proposed gas power facility may be constructed concurrently. Should this occur, the infrastructure required for both stage one and stage two would be constructed at the same time, and the facility would operate as a base load facility from the commencement of operation.

It is also possible, however, depending on the future electricity demand and other developments, the facility would be constructed in a staged manner as originally proposed.

1.3.2 This environmental assessment

This environmental assessment considers the potential impacts of the project with particular focus on the requirements specified by condition 2.2 of the concept approval for the gas turbine facility. It assesses only those impacts that are related to stage two.

It has been prepared in accordance with the requirements of Part 3A of the EP&A Act to assist the Minister for Planning assess the application for project approval for the project.



Chapter 2. The environmental assessment process

2.1 Statutory framework

The Bamarang gas power facility is considered to meet the definitions included in Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005* as it is an electricity generation facility with a capital investment value of more than \$30 million. As a result, the gas power facility component of the proposal is a project to which Part 3A of the EP&A Act applies.

Under clause 75B(3) of the EP&A Act, if part of any development is a project to which Part 3A of the Act applies, the other parts of the development are taken to be a project to which Part 3A applies. Accordingly, the requirements of Part 3A of the Act apply to the construction and operation of all aspects of the facility and associated infrastructure, both on and off site.

2.2 Environmental assessment requirements

The requirements for the environmental assessment of the project are specified by condition 2.2 of the concept approval for the Bamarang Gas Turbine Facility, dated 27 February 2007. This environmental assessment addresses those requirements.

The environmental assessment requirements for the project, together with the section of this document that addresses each requirement, are listed in Table 2.1.

Table 2.1 Environmental assessment requirements

Requirements (as per condition 2.2 of the concept approval)	Where addressed
a) a detailed project specific Statement of Commitments, consistent with the Statement of Commitments prepared for the concept plan, with a clear indication of any new or amended commitments relating to the project	Chapter 8
b) a demonstration that the project is consistent with the requirements of this approval and generally consistent with the scope and intent of the concept outlined in the documents under condition 1.1 of this approval	Chapter 6
c) details of the outcomes of consultation with the Commonwealth Department of Defence with respect to the potential aviation hazards posed by the project, and how these hazards have been or will be mitigated	Chapter 3
d) a Water Supply Feasibility Study developed in consultation with Council and DNR that quantitatively demonstrates water availability for the combined cycle gas turbine facility operation and the viability of these water sources for sustainable use over the life of the project. Consideration shall be given to security of supply, current and future water demand in the region, and in the event water source sharing is proposed, how the proposal will likely impact on potentially affected users	Chapter 4 and Appendix B



Requirements (as per condition 2.2 of the concept approval)	Where addressed
e) an updated Air Quality Impact Assessment, prepared in accordance with Approved Methods for Modelling and Assessment of Air Pollutants in NSW (EP, 2001), including use of monitoring data from operation of stage one of the development (open cycle gas turbine facility), as relevant	Section 7.5 and Appendix C
f) an updated Noise Impact Assessment, prepared in accordance with NSW Industrial Noise Policy (EPA 2000), including use of monitoring data from operation of stage one of the development (open cycle gas turbine facility), as relevant	Section 7.6 and Appendix D
g) if a water pipeline is proposed as part of the stage two development, the following assessments will be undertaken for areas potentially affected by the water supply infrastructure:	
i) a Strategic Impact Assessment clearly detailing the proposed route for the water pipeline and describing the ownership, land use and zoning provisions for the land along the route. Suitability of the proposed route must be considered, specifically with respect to potential land use conflicts with existing and future land users	Chapter 4 and Section 7.1
ii) a Flora and Fauna Impact Assessment prepared in accordance with the DEC's Guidelines for Threatened Species Assessment. Specific consideration must be given to impacts associated with the proposed route on any threatened species and their habitat, and communities listed under both State and Commonwealth legislation recorded with the area	Section 7.2
iii) a Heritage Impact Assessment prepared in accordance with the DEC's Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation	Section 7.3

2.3 The next steps

In accordance with the requirements of the EP&A Act, the environmental assessment will be placed on public exhibition by the Department of Planning for at least 30 days. Submissions will be invited from relevant agencies and members of the public. Delta will be provided with copies of these submissions.

The Director General of the Department of Planning may require Delta to submit a response to the issues raised in the public submissions, prepare a preferred project report and/or a revised statement of commitments.

Following the exhibition period, the Director General will provide a report on the project to the Minister for Planning. The Minister will then consider whether the project should be approved.



Chapter 3. Stakeholder consultation

3.1 Previous stakeholder consultation

3.1.1 Consultation during preparation of the environmental assessment

The following tools were used to engage with the community and other stakeholders during preparation of the environmental assessment, provide information on the project, and seek input:

- » Project information telephone line (1800 810 680);
- » Planning focus meeting with government agencies organised by Department of Planning;
- » Distribution of two newsletters to local residents and community groups;
- » Media advertisements and releases;
- » Project website;
- » Meetings with landowners potential affected by property acquisition;
- » Meetings with Council;
- » Discussions and correspondence with the Department of Defence; and
- » Discussions with other government agencies as required.

3.1.2 Consultation during exhibition

The environmental assessment was exhibited from 19 May to 19 June 2006. The exhibition of the environmental assessment, including receipt of submissions, was coordinated and managed by the Department of Planning. To supplement this, Delta carried out the following consultation activities:

- » Provided updated information on the project website including an electronic copy of the environmental assessment;
- » Distribution of a newsletter to local residents and community groups; and
- » Distribution of a summary brochure, which provided an overview of the environmental assessment to people who had requested (by registering in response to the advertisement, or newsletters 1 and/or 2) to be on the project mailing list.

In total, 74 submissions were received in response to public exhibition. Of those 74 submissions, 14 were unique submissions. Others were a form letter. Delta considered all submissions received in the submissions report.



3.2 Current stakeholder consultation

For stage two, consultation has focussed on those stakeholders with a high level of interest in the project.

- » Landowners (public and private) affected by property acquisition for the transmission line and gas pipeline (which is the subject of the stage one approval);
- » The Commonwealth Department of Defence as required by condition 2.24 of the project approval;
- » The NSW Department of Environment, Conservation and Climate Change (DECC) in relation to the compensatory habitat package as required by condition 2.31 of the project approval;
- » Shoalhaven City Council in relation to general infrastructure requirements and land use planning; and
- » TransGrid and Integral Energy in relation to transmission line connection (which is the subject of the stage one Project Approval).

The outcomes of meetings with statutory agencies as relevant to this stage two application for project approval are summarised below.

Delta has also communicated information to the general community about stage two of the project by means of the following:

- » Updating the project website;
- » A media release; and
- » Distribution of a newsletter to local residents and community groups in association with public exhibition.

3.2.1 Consultation with statutory agencies

Department of Defence

Condition 2.2(c) of the concept approval requires that Delta consult with the Commonwealth Department of Defence with respect to the management of aviation hazards associated with operations at HMAS Albatross.

Appendix A contains copies of correspondence between the Department of Defence and Delta in relation to the proposed transmission line:

- » Letter from Department of Defence dated 16 January 2007 requesting design details of the proposed 132 kV transmission line, as well as details of timing of construction of stage one of the project;
- » Letter from Delta dated 5 March 2007 providing available details of the proposed transmission line and likely timing of construction of stage one; and
- » Letter from Department of Defence dated 31 May 2007 confirming that the proposed alignment of the transmission line does not infringe any Obstruction Clearance Surface at HMAS Albatross.



Meetings were held with representatives of HMAS Albatross on 25 June 2007 and 3 December 2007. A summary of the outcomes of the meetings is provided below:

- » 25 June 2007:
 - HMAS Albatross advised that changes to the operating procedures for flight paths will likely be required, and Defence will require details on the location of stacks and extent of plume emitted;
 - Delta advised that the stage two plume height is lower than stage one due to lower exhaust gas temperatures;
 - HMAS Albatross advised that they are on side with the project and are willing to work towards a favourable outcome to the benefit of all parties.
- » 3 December 2007:
 - Delta and HMAS Albatross representatives met on site, and discussed the site facilities as well as the transmission line route;
 - Delta provided HMAS Albatross with a copy of the Plume Rise Assessment that was prepared with the Submissions Report and based on the original wet cooling option;
 - Delta outlined the now proposed dry cooling option, and described the process being undertaken for approval, including the additional air quality and plume rise assessment, which would identify any changes to the plume rise impacts, if any.

Following completion of the draft Air Quality and Plume Rise Assessment for the dry cooling option, a copy of the draft report was provided to the Department of Defence and the Commanding Officer at HMAS Albatross. Copies of correspondence are included in Appendix A.

Verbal advice from the Department of Defence was provided to GHD on Friday 11 January 2008. This advice stated:

- » The Department of Defence is unable to provide comments on the revised Plume Rise Assessment until the end of February 2008 at the earliest; and
- » Provided that the plume height does not exceed that outlined in the Plume Rise Assessment that was prepared with the Submissions Report, the Department of Defence is not likely to raise concern with the modified design.

This issue is further discussion in Section 7.5.

Further discussions with the Department of Defence have been held since January 2008, and a revised draft Air Quality and Plume Rise Assessment for the dry cooling option was provided to the Department in March 2008. At the time of finalising this environmental assessment, no formal correspondence had been received from the Department of Defence.

Shoalhaven City Council and Shoalhaven Water

Meetings were held with officer representatives of Council and Shoalhaven Water on 22 May 2007, 25 June 2007, and 3 December 2007.

The following items were discussed at meetings:

- » Issues raised in Council's submission on the 2006 environmental assessment;



- » Options for water supply for use in wet cooling and confirmation that Shoalhaven Water can supply up to 0.5ML of treated or raw water per day, for use in dry cooling;
- » The transmission line easement; and
- » Council's strategic planning process and proposed Future Long Term Living Area in the vicinity of the site.

Confirmation that Shoalhaven Water can supply the required 0.5ML per day for dry cooling is contained in the Water Feasibility Assessment contained in Appendix B.

Department of Environment and Climate Change

Delta staff met with DECC (Queanbeyan Branch) and National Parks and Wildlife Service (NPWS) on 22 May 2007.

The discussion focussed on methodology of calculating the offsets required for vegetation clearing as part of the project, and the hierarchy of preference offsets..

The principle of the habitat offset was described by DECC as maintaining or improving the habitat or ecology of the area. DECC indicated that, by using their biometric software tool, taking into consideration the area to be cleared, type of vegetation and habitat, the offset requirements are determined.

DECC stated the options for offsetting, in order of preference:

1. Purchase of land with conservation value;
2. Conservation Management Agreement with landholder and payment of management fee; or
3. BioBanking (not yet operational).

Delta is currently investigating a range of options including purchase of a land and BioBanking by purchasing credits under that scheme to satisfy the offset requirements as defined in the Minister's Conditions of Approval. However, as the BioBanking scheme is not yet operational, Delta has not been able to finalise its position in this regard. Delta commits to resolving the habitat offset with DECC prior to commencement of construction.